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1 **Dual storage and release of molecular oxygen in comet 67P/Churyumov-**
2 **Gerasimenko**

3
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26 **One of the biggest surprises of the *Rosetta* mission was the detection of O₂ in the**
27 **coma of 67P/Churyumov-Gerasimenko in remarkably high abundances. The**
28 **measured levels of O₂ in the coma are generally assumed to reflect the overall**
29 **abundance and chemical origin of cometary O₂ in the nucleus. Along with its strong**
30 **association with H₂O and weak association with CO and CO₂, these measurements**
31 **led to the consensus that the source and release of cometary O₂ are linked to H₂O.**
32 **We analyzed ROSINA observations and found a previously unrecognized change in**
33 **the correlations of O₂ with H₂O, CO₂ and CO that contradict the prevailing notion**
34 **that the release of O₂ is linked to H₂O at all times. These findings can be explained**
35 **by the presence of two distinct reservoirs of O₂: a pristine source in the deeper**
36 **nucleus layers dating back prior to nucleus formation, and a water-trapped**
37 **secondary reservoir formed during the thermal evolution of the nucleus. These**
38 **results imply that O₂ must have been incorporated into the nucleus in a solid and**
39 **distinct phase during accretion in significantly lower abundances than previously**
40 **assumed.**

41 **Main**

42 The Rosetta Orbiter Spectrometer for Ion and Neutral Analysis/Double Focusing Mass
43 Spectrometer (ROSINA/DFMS¹) detected O₂ for the first time in a cometary
44 environment². The detected levels of O₂ in the coma of 67P/Churyumov-Gerasimenko
45 (67P) were about an order of magnitude higher than predicted by models describing the
46 chemistry in molecular clouds^{2,3}, and well over 2 orders of magnitude higher than the O₂
47 observed in the gas phase in ρ Oph^{4,5}.

48 The first measurements of O₂ in the coma of 67P were taken over a six-month period
49 (September 2014-March 2015) early in the mission². Over this time, the *in situ* O₂
50 abundance relative to H₂O was between 1 and 10%, which made it the fourth most
51 abundant coma species following H₂O, CO₂ and CO. O₂ had a persistently high
52 abundance relative to H₂O, the O₂/H₂O ratio remained fairly constant, and O₂ showed a
53 strong correlation with H₂O, but it weakly correlated with CO and N₂ – two molecules
54 with similar volatility². These observations led to the initial conclusion that the origin
55 and/or the release of O₂ and H₂O were linked, and that cometary O₂ is likely primordial².
56 The O₂-H₂O correlation was found to extend through later parts of the comet's orbit⁶⁻⁸,
57 further suggesting that O₂ is controlled by H₂O.

58 The high relative O₂ abundance, the strong O₂ -H₂O correlation, and the weak O₂ - CO
59 correlation were key requirements that all proposed formation and production hypotheses
60 needed to satisfy⁹. While the strong association of O₂ with H₂O provides a very
61 important clue to the mystery of cometary O₂, the details of *when, where, and for how*
62 *long* this association is truly present make the interpretation less obvious. 67P
63 experiences strong hemispheric differences in outgassing, largely due to the seasons, with
64 the majority of CO₂ coming from the southern hemisphere^{6,8}. The minor species also
65 showed strong latitudinal heterogeneity, with the less volatile species typically following
66 H₂O and the more volatile species following CO₂ (refs. 10-14). However, the correlations
67 between the major and minor volatiles appear to be very different when looking at shorter
68 (several days) versus longer (months to entire orbital segments) time intervals^{8,13}. This
69 makes the interpretation of the observations potentially dependent on the location and the
70 time interval considered.

71 This study presents abundances (count rates) from ROSINA/DFMS¹ of the four most
72 abundant species in the innermost coma (< 35 km) over significant time intervals at ~2.5
73 – 3.7 au. We looked at short- and long-term correlations over the southern hemisphere
74 only (sub-spacecraft latitudes between 25 and 90°S) 3-7 months before the pre-perihelion
75 equinox (May 2015) and after the post-perihelion equinox (March 2016). The southern
76 hemisphere was poorly illuminated at these times, which resulted in lower temperatures,
77 hence lower H₂O production rates over the southern hemisphere compared to the
78 northern hemisphere^{9-13,15-17}. That, along with the stronger erosion experienced by the
79 southern hemisphere¹⁸ provided a unique opportunity to see relationships otherwise
80 masked by the strong H₂O outgassing¹¹⁻¹³.

81 **Correlations with the major cometary species**

82 Figs. 1 and 2 show the correlations between the major cometary species before the pre-
83 perihelion and after the post-perihelion equinox over the southern hemisphere. The strong
84 O₂-H₂O correlation before the pre-perihelion equinox (Fig. 1) is consistent with previous
85 results^{2,7}. At the same time, the Pearson correlation coefficients suggest a moderate
86 correlation between O₂-CO₂ and O₂-CO. These data are strongly heteroscedastic (non-
87 equal variance), so the Pearson coefficient of correlation is meaningless and misleading
88 as an indicator of a relationship between two species. Looking at shorter time intervals,
89 there is a moderate correlation early on in the mission at ~3.3-3.2 au (September 2014)
90 between O₂ and CO₂ as well as O₂ and CO. That correlation weakens and disappears by
91 ~3.17 au (mid-October of 2014), and the species remain uncorrelated/weakly correlated
92 all the way to the end of our pre-perihelion equinox interval at ~2.4 au in January 2015
93 (Table 1).

94 O₂ and H₂O seem to be well-correlated again at first glance after the post-perihelion
95 equinox (Fig. 2). However, when divided into shorter time intervals O₂ and H₂O only
96 correlate for the earlier three periods, but show no correlation over the short intervals past
97 ~3.3 au post-perihelion equinox (Table 1). This is key because before the pre-perihelion
98 equinox, when the O₂-H₂O correlation was this strong over the whole interval (Fig. 1),
99 the correlations over the shorter time periods were also very strong. Moreover, when O₂
100 does not correlate with H₂O, it strongly correlates with CO and CO₂ (Table 1). While the
101 count rates of all species have decreased by this time, H₂O production decreases even
102 more rapidly and drops below those of CO₂ and CO in the southern hemisphere^{8,13}. This
103 also happens to be around the same time that the correlation between O₂ and H₂O begins
104 to weaken. For O₂-CO₂ and O₂-CO it is the exact opposite: they do not correlate up to
105 ~3.3 au following the post-perihelion equinox, but they correlate very strongly beyond
106 (Table 1). The correlations between O₂, CO₂ and CO and the lack of correlation between
107 O₂ and H₂O are key because they show a previously unrecognized change in outgassing
108 that comes with important consequences.

109 This shift in correlations may happen because the measurements over the time interval
110 after the post-perihelion equinox span different sublimation regimes. Over the time
111 intervals, or distances covered by the yellow and dark blue dots (Fig. 2), the comet still
112 experienced an appreciable H₂O sublimation, albeit decreasing over time. After that
113 point, the H₂O sublimation began to turn off due to the low surface temperatures over the
114 poorly illuminated southern hemisphere. That is precisely where the transition in
115 correlations after the post-perihelion equinox occurs, and where the shorter time intervals
116 indicated by the purple, green and light-blue markers in Fig. 2 begin to show no

117 correlation between O₂ and H₂O. Thus, in Figure 2 we are mixing two different regimes
118 of sublimation and outgassing. When mixing data for different time intervals driven by
119 different physical processes, as is the case in Fig. 2, relationships revealing key
120 information may be masked, and the linear regression may lead to inadvertently
121 misconstrued interpretations. In order to get a true sense of the changes occurring
122 between the two sublimation regimes, we honed in on this later time interval between
123 ~3.3 – 3.7 au, starting where the correlation between O₂ and H₂O declines and where
124 H₂O production is lower than it was at any time before the pre-perihelion equinox (Fig.
125 3). The interesting thing to notice here is that despite the lack of correlation between O₂
126 and H₂O for the shorter time periods (Table 1), there is still a moderate correlation for the
127 whole interval (Fig. 3).

128 Diurnal re-freezing of sublimating volatiles from the subsurface onto the nucleus surface
129 can be considered as a possible mechanism at play to explain the O₂-CO-CO₂
130 correlations. Diurnal refreezing and subsequent sublimation of H₂O was invoked as an
131 explanation of outbursts observed on comet 9P/Tempel 1 (ref. 19). Surface ice patches of
132 H₂O and CO₂ detected on 67P were attributed to the refreezing of volatiles coming from
133 deeper layers, providing a source of localized activity^{20,21}. However, the measured
134 amounts of CO₂ and CO at >3.3 au post-perihelion (Fig. 3) are simply too high to explain
135 the observed strong correlations between O₂, CO and CO₂. The strong correlation with
136 O₂ extends all the way to the highest measured CO and CO₂ counts and the observations
137 suggest a continuous background activity instead of short-lived surges or mini-
138 outbursts²². The high observed fluxes of CO and CO₂ indicate that these species come

139 out together from the interior of the nucleus, suggesting that significant surface
140 contribution to the observed correlations is unlikely.

141 **Two distinct O₂ nucleus reservoirs**

142 Instead, our observations can be explained by the following. As the nucleus cools near
143 the post-perihelion equinox following an intense southern hemisphere summer, the
144 surface and near-surface temperatures drop until they become low enough that H₂O
145 sublimation declines precipitously. After the post-perihelion equinox when the H₂O
146 counts were well below the pre-perihelion equinox levels (Fig. 3), the hypervolatile
147 species CO, CO₂ and O₂ still leave the porous nucleus from the deeper, colder, and more
148 volatile-rich layers. The subsurface temperature is too low for H₂O to sublimate at these
149 depths. During this release, some of the O₂ leaves the nucleus and enters the coma, but
150 some of it gets trapped in the porous near-surface-H₂O ice depleted in the more volatile
151 species (Fig. 4a). O₂ can be (re-)trapped in porous H₂O very easily because O₂ attaches to
152 the surrounding solid water with significant stabilization energy but without actually
153 modifying the ice environment. A related scenario was considered for the radiolytic
154 production of O₂ from and incorporation into H₂O ice grains in the ISM²³. In that case,
155 H₂O molecules are removed by radiolysis of icy grains, creating voids for the trapping of
156 O₂. Here, we propose that macroscopic cavities pocket the H₂O ice consistent with the
157 high porosity of the nucleus²⁴ and as a result of the H₂O ice in the upper layers being
158 depleted in the more volatile species due to sublimation; the latter process leaving voids
159 behind. Hence, O₂ trapping in porous H₂O ice as proposed here is a process that could be
160 happening in the current-day nucleus of 67P (Methods).

161 Since H₂O sublimation beyond ~3.3 au is low (Fig. 3), the trapped O₂ may be bound to
162 the H₂O structure and unable to leave until the next onset of H₂O sublimation. In that
163 case, the O₂ measured in the coma by ROSINA/DFMS at distances >3.3 au post-
164 perihelion is O₂ released from depth together with CO and CO₂. This O₂ coming from the
165 deeper nucleus layers may either leave the nucleus or keep accumulating in the near-
166 surface H₂O ice while away from the Sun. This accumulation can happen as long as there
167 is O₂ release happening at depth and there are enough cavities in the near-surface H₂O
168 ice to trap it. This mechanism leads to two O₂ reservoirs with distinct ice properties: a
169 polar-ice dominated source with O₂ trapped in H₂O closer to the surface, and a non-polar
170 (or weakly polar) source, where O₂ is released from together with CO and CO₂.

171 As 67P makes its way back toward the next pre-perihelion equinox, H₂O sublimation in
172 the southern hemisphere gradually turns on and the trapped O₂ is released together with
173 the sublimating H₂O (Fig. 4b). The release of accumulated O₂ from the secondary, water-
174 trapped reservoir closer to the surface by the sublimation of H₂O ice explains the
175 surprisingly high O₂ relative abundances measured by ROSINA/DFMS early in the
176 mission². While O₂ at depth continues to be released along with CO₂ and CO, the
177 accumulated O₂ source in H₂O ice is significantly stronger; hence the strong correlation
178 between O₂ and H₂O up until the H₂O sublimation begins to turn off.

179 Since the dominant source of O₂ measured in the coma of 67P is the water-trapped O₂
180 reservoir, the relatively small correlation between O₂ and H₂O in Fig. 3 can be explained
181 by the general decrease of H₂O as sublimation ceases. When H₂O sublimation stops, O₂
182 release from the trapped reservoir stops with it. With the dominant source of O₂ cut off,
183 the O₂ density in the coma also dramatically decreases with the decreasing H₂O.

184 However, looking at the short time intervals individually, especially where the spread of
185 H₂O counts is large enough (purple dots in Fig. 3), it becomes clear that O₂ does not truly
186 follow H₂O. Combining several uncorrelated time intervals into a longer period makes it
187 appear as if the O₂-H₂O data were moderately correlated due to the decline of the
188 dominant O₂ source, when in fact the correlation in this case does not imply a true
189 association related to the formation of comet 67P.

190 This dominant water-trapped reservoir explains the key pre-equinox observations²: the
191 strong correlation of O₂ with H₂O pre-equinox, the small scatter in the O₂/H₂O ratio, and
192 the persistently high O₂ abundance relative to H₂O pre-perihelion. Consequently, the
193 surprisingly high O₂ abundance is not indicative of the true abundance of O₂ overall in
194 the nucleus, but rather of the amount of O₂ accumulated in and then released from the
195 secondary, trapped H₂O ice reservoir. That means that trying to reproduce these high
196 relative abundances with chemical models of the origin of O₂ is unnecessary, as these
197 values overestimate the true importance of O₂ relative to the major species. At the same
198 time, the O₂ coming from depth beyond 3.3 au. after the post-perihelion equinox does not
199 represent the bulk O₂ content of the nucleus either, as some of that O₂ gets trapped in the
200 porous, volatile-depleted, near-surface H₂O ice. However, the strong erosion in the
201 southern hemisphere around perihelion likely exposed fresh, more volatile-rich
202 layers^{12,20,25,26}, so one might argue that the relative O₂ abundances measured farther than
203 ~3.3 au may be used to derive a lower limit for the bulk nucleus O₂ content.

204 CO and CO₂ can also incorporate into to the porous H₂O ice via inclusion with a similar,
205 but somewhat higher propensity (Methods, Table 3). Both of these molecules are able to
206 fill the holes in the overlying H₂O ice, but the large difference between their bulk

207 abundances must be considered when evaluating their outgassing. CO is the second most
208 abundant species in the ISM after H₂, and it is one of the most abundant cometary
209 species. While our interpretation suggests that the large count rates of O₂ observed by
210 ROSINA/DFMS closer than 3.3 au can be attributed to the accumulation and subsequent
211 release of water-trapped O₂, the majority of CO comes from the deeper and colder layers
212 instead, as the bulk abundance of CO in the nucleus is much higher than that of O₂. Thus,
213 CO sublimating from depth at any time will overpower the CO that may be trapped and
214 released from the H₂O ice in the shallower nucleus layers upon H₂O sublimation. The
215 difference between the bulk abundances and the dominant source of O₂ and CO leads to
216 their fundamentally different correlations with H₂O.

217 **Implications for origin**

218 Because of the association of O₂ with CO and CO₂, at least some and perhaps all of the
219 comet's O₂ is primordial, incorporated into the nucleus pre-agglomeration. Were the bulk
220 of the O₂ formed from H₂O after nucleus agglomeration, i.e., via *in situ* reactions, we
221 would see a much stronger correlated signal of co-sublimation of the two species. We
222 cannot rule out, of course, that a minority of the O₂ formed in this way. Recent
223 experimental work indicates that high abundances of O₂ can be formed from the
224 photolysis of H₂O:CO₂ ices²⁷. However, the fact that the isotopic ratios of O₂ do not
225 match the isotopic ratios of H₂O in comet 67P (ref. 28) makes it less likely that O₂
226 formed from H₂O by radiolysis of ISM grains prior to their agglomeration into the
227 nucleus. Instead, O₂ in the comet nucleus largely or entirely originates from a solid phase
228 independent of and distinct from H₂O, and the O₂ in comet 67P must have formed either
229 during the PSN phase, or in the ISM via various chemical routes prior to nucleus

230 agglomeration²⁹⁻³¹. Once formed, O₂ (and other volatiles) could have been adsorbed by
231 amorphous grains in the ISM before being agglomerated by forming comets, if the PSN
232 was cold enough to prevent the destabilization of amorphous ice. If the PSN was warm
233 enough to destabilize the amorphous ice, then O₂ was released in the gas phase of the
234 disk. Subsequently, O₂ either condensed or it was trapped in clathrates during the cooling
235 of the disk. This implies that the primordial O₂ may have been supplied either in the form
236 of pure condensate, clathrates, or amorphous ice in the forming nucleus. Whatever the
237 O₂-bearing solid phase that has been incorporated into the cometary nucleus, its thermal
238 evolution led to the progressive release of O₂, and then to the formation of a secondary
239 accumulated reservoir in the voids and pores of the overlying H₂O matrix. This process
240 could very well be happening on other comets too e.g., on 1P/Halley, where the presence
241 of O₂ was confirmed in comparable levels to 67P (ref. 32). A flyby, however, does not
242 provide the same temporal and spatial resolution necessary for constraining the
243 observations to specific times and locations with low H₂O outgassing, as we did in this
244 paper. Further analysis of O₂ correlations with various minor volatile species (e.g., CH₄,
245 C₂H₆, N₂) may narrow how O₂ was supplied to the nucleus, and consequently, may
246 unravel the origin of O₂ in comet 67P.

247 **Materials and Methods**

248 **ROSINA/DFMS Data Treatment**

249 We used ROSINA/DFMS¹ mass spectra taken in high resolution mode for the analysis
250 for masses 32 (O₂), 18 (H₂O), 28 (CO), and 44 (CO₂). The L3 spectra have been
251 corrected for the ageing of the Micro Channel Plate (MCP) by calibration measurements
252 that were performed every few weeks throughout the mission.

253 For each individual mass spectrum, we performed a spectral fit to the species of interest
254 by fitting a Gaussian to the pass peak. On some occasions, based on the shape of the peak
255 two Gaussians were necessary to properly fit the shape (Supplementary Information). The
256 area under the Gaussian(s) fitted to the mass peaks provides the abundance of a species at
257 a given time. We then produced time series files containing the count rates (signal) of
258 each species for each time a measurement was taken. We emphasize that we used count
259 rates and not densities or concentrations.

260 The measurements have an associated ion statistical counting uncertainty given by \sqrt{n} ,
261 where n is the number of ions hitting the detector. Because the data were not corrected
262 for instrument sensitivity, the counts in the figures and the slopes of the linear fits of the
263 species do not represent absolute abundances¹¹. Since we look at correlations between
264 count rates and not absolute ratios or densities, any uncertainties in the absolute number
265 stemming from using different gains for the different species is not important for the
266 purpose of this study. Because the ion beam typically falls at the center of the MCP it
267 causes a preferential degradation of these center pixels over time compared to the pixels
268 along the edges of the MCP. The uncertainty in the individual pixel gains (i.e., mass
269 peaks do not always fall on the same pixel) is important when determining
270 concentrations, but it is less important when trying to get an idea about the correlation
271 between two species. The individual pixel gain uncertainty was around 4% for the studied
272 time intervals. We note that the major cometary species were well-measured throughout
273 the mission; thus, the expected uncertainties are significantly lower than for other
274 cometary species. Nevertheless, we applied a 10% uncertainty² in addition to the ion
275 statistical counting uncertainty in order to quantify the possible variation of the Pearson

276 correlation coefficients. The consistently small standard deviations around the mean
277 correlation coefficients show that even with this more conservative uncertainty our
278 determined correlations are robust.

279 The measurements used in this work are orders of magnitude higher than the background²
280 and well above the limiting sensitivity of ROSINA/DFMS. ROSINA/DFMS scanned
281 through successive masses covering a mass range of 1-150 amu, with a maximum
282 cadence of a high-resolution measurement at mass 32 every 45 minutes. In order to be
283 able to make direct comparisons between species located on different masses, we
284 restricted our data to measurements where the time difference between the measurements
285 of two different species were less than 20 minutes. In addition, we discarded the first
286 measurement following a data gap in the acquisition of longer than 2 hours (e.g., due to
287 reaction wheel offloading), and only considered measurements when the instrument was
288 pointing directly to the comet (nadir angle <10 deg). Lastly, we restricted our analysis to
289 measurements that were taken within a distance of 40 km from the nucleus in order to
290 exclude potential reactions between species in the coma. Reactions in the coma were
291 minimal at heliocentric distances $>\sim 3$ au during the time that a molecule propagates from
292 the comet to Rosetta, and collisions were negligible within ~ 100 km (ref. 33).

293 Furthermore, the measurements show a $1/r^2$ dependence as expected for a species that is
294 not affected by any significant loss processes. In addition, the diurnal, longitudinal and
295 latitudinal variations were clearly visible within this distance, indicating that the coma
296 measurements by ROSINA/DFMS do reflect outgassing from the nucleus, and not that of
297 a point source. This variation was visible to even larger spacecraft distances from the
298 nucleus; thus, our approach weighing in the number of measurements vs. nucleus

299 proximity was rather conservative. The above constraints on our data treatment then
300 defined our pre-inbound and post-inbound equinox time intervals as: September 2014
301 through February 2015, and May 2016 through the end of mission in September 2016.

302 **Statistical Analysis of the Derived Data:** When looking at correlations for the shorter
303 time intervals within the long (pre- and post-equinox) time periods, we selected the
304 length of the short time periods making sure that: 1. there was homoscedasticity in the
305 data; i.e., the data showed fairly equal variability in the scatter plots; 2. no visibly
306 discontinuous distribution of data was present; 3. multiple slopes were not visually
307 present. These steps allowed us to rely on the derived Pearson correlation coefficients as
308 indicators of a true link between two species, and ensured that we do not miss potential
309 changes in outgassing. We have extensively tested the possibilities by splitting up the
310 long time periods into several short ones and visually examining the scatter plots. We
311 selected the data used in the short time intervals listed in Table 1 by ensuring all the
312 above was true and the correlation was statistically significant at $p < 0.01$.

313 The Pearson correlation coefficient for each time interval was determined by performing
314 Monte Carlo simulations: we took 10,000 samples with a normal distribution within the
315 boundaries of the uncertainties (discussed above) on each measurement point, and
316 calculated the Pearson correlation coefficient 10,000 times. We report the mean of the
317 resulting distribution of the correlation coefficients. Considering the overall small
318 standard deviations, the correlations listed in Table 1 are robust.

319 **Modeling gas trapping in solid H₂O:** To determine whether O₂ could be trapped and
320 remain stable in the porous ice of the bulk nucleus, we modeled the interactions of H₂O
321 ice structures with O₂ either adsorbed on the surface, or trapped in the voids or cracks of

322 the H₂O ice. We employed a method based on the first principle periodic density
323 functional theory (DFT) to quantify these interactions between O₂ and the icy bulk, using
324 the Vienna ab initio simulation package³⁴⁻³⁶ (VASP). VASP is well adapted to model
325 bulk and surface ice structures interacting with atomic and molecular volatiles, and has
326 been used many times for various planetary applications^{30, 37-39}.

327 The stabilization energy (E_{stab}) of O₂ is defined as the difference between the energy of
328 the whole system, [O₂ interacting with the ice], and the sum of the energies of the
329 isolated O₂ and H₂O ice:

$$330 \quad E_{stab} = E_{[ice+O_2]} - (E_{ice} + E_{O_2}).$$

331 A negative value of E_{stab} means repulsion, whereas a positive E_{stab} indicates an effective
332 trapping in that particular environment. In all cases of adsorption or insertion into the
333 perfect crystalline ice or into the cavities found inside the bulk, the neighboring shells of
334 water molecules are relaxed in order to allow O₂ to fit into the void. At the same time, the
335 outer shells are kept frozen to maintain a global bulk structure. In the cases when O₂
336 inclusion is possible, that is when the hole is large enough (at least two neighboring H₂O
337 molecules extracted), the stabilization energy of O₂ interacting with the ice is around 0.2-
338 0.3 eV (Supplementary Table S1). While these values are lower than the ice cohesion
339 energy (~0.55 eV), they stay in the order of that of an H₂O dimer. Thus, O₂ can
340 effectively be stabilized in the ice cavities and pores, and the presence of O₂ will not
341 disturb the structure of the surrounding ice until the onset of H₂O sublimation.

342 Taking into account the fact that several O₂ molecules can be present in the same cavity,
343 we consider the possibility that these O₂ molecules could agglomerate, and eventually
344 form dimers. According to high-level ab-initio calculations, the ground state of the O₂

345 dimer is a singlet state contrary to the monomer that is a triplet⁴⁰. To make space large
346 enough for a dimer, a large cavity is needed. Therefore, we considered only those
347 obtained following the loss of 4 H₂O molecules. The order of magnitude of the values
348 reported in Table 2 indicates that a couple of the O₂ molecules can also easily be trapped
349 in the same cavity within the ice either in the form of two O₂ molecules in triplet state or
350 as a proper O₂ dimer in its ground singlet state. It can be noted that the dimer seems to be
351 stabilized the most strongly of all; this might be a first step toward bigger structures,
352 possibly a route to the construction of pure condensate. For comparison, some identical
353 situations have been evaluated for the CO and CO₂ molecules (see Supplementary Table
354 S2). The strength of the interaction is systematically larger, but is within the same order
355 of magnitude. It stays in the same order of magnitude. CO and CO₂ stick slightly better
356 than O₂ but the difference seems too small to induce significantly different behaviors.

357 **Data Availability:** All data processed as described above are included in this published
358 article and in a supplementary source file. The ROSINA/DFMS spectra used to derive
359 count rates are available in the NASA Planetary Data System (PDS) and ESA Planetary
360 Science Archive.

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367 **Author contributions:**

368 AL-K conceptualized and led the study, performed the data analysis, interpreted the
 369 results and wrote the manuscript. OM contributed to the conceptualization and
 370 methodology of gas trapping, and the implications of the results for cometary origin. FP,
 371 YE and OO performed the chemical modeling of gas trapping in H₂O ice and assisted in
 372 the interpretation. JIL contributed to the interpretation of the results and to the chemistry
 373 of ice trapping. SAF supported all steps of data analysis and assisted the correlation
 374 study. KEM contributed to the data analysis and interpretation. KJT and SMP developed
 375 the fitting routine, performed the spectral fits to the ROSINA/DFMS mass spectra and
 376 provided the time series files of the count rates of the analyzed species. All authors
 377 contributed to the discussion of the results and the interpretation, and the writing of the
 378 manuscript.

379 **Competing interests:** The authors declare no competing interests.

380 **Table 1. Short-term correlations over the southern hemisphere before the pre-perihelion equinox**
 381 **(top half of the table above the line) and after the post-perihelion equinox (bottom half).** Pearson
 382 correlation coefficients for shorter time intervals before the pre-perihelion equinox and after the post-
 383 perihelion equinox. The coefficients were determined as the mean of 10,000 Monte Carlo simulations for
 384 each time interval, assuming a normal distribution within the measurement uncertainties (Methods). The
 385 standard deviations of the correlation coefficients are smaller than 0.02 for each time period. The dates in
 386 the table are color-coded to match the appropriate data in Figs. 1, 2 and 3. Time intervals after the post-
 387 perihelion equinox are listed below the horizontal line in the middle of the table.

	Time interval	Heliocentric distance (au)	Average cometocentric distance (km)	Sub-spacecraft latitude (°S)	No. data points	O ₂ -H ₂ O	O ₂ -CO ₂	O ₂ -CO
1	09/27-10/12/2014	3.29-3.19	17.9	25.6 - 56	128	0.94	0.51	0.69
2	10/15-10/27/2014	3.17-3.10	9.9	25.1 - 50.1	48	0.97	0.12	0.32

3	10/30-11/05/2014	3.08-3.03	32.6	25.3 - 66.6	127	0.80	0.02	0.46
4	11/20-11/25/2014	2.94-2.91	30.8	29.6 - 56.9	86	0.96	0.19	0.26
5	12/04-12/23/2014	2.85-2.70	21.6	25.4 - 56.2	158	0.95	0.13	0.10
6	01/01-01/31/2015	2.65-2.43	28.2	25 - 64.8	167	0.93	-0.21	0.24
7	05/01-05/08/2016	2.91-2.97	17.1	25 - 85.6	99	0.71	0.25	0.22
8	06/09-06/14/2016	3.17-3.21	29.4	26 - 78.4	105	0.83	-0.20	0.00
9	06/23-06/25/2016	3.26-3.27	20.8	25.3 - 74.6	147	0.51	0.32	0.36
10	07/02-07/09/2016	3.32-3.36	14.4	25.4 - 77.2	115	0.27	0.67	0.65
11	07/10-07/27/2016	3.36-3.47	11.2	26.2 - 80.3	72	0.33	0.79	0.74
12	07/29-09/05/2016	3.48-3.70	11.9	25.5 - 80	75	-0.22	0.69	0.87

388 **Figure legends**

389 **Fig. 1. Correlation of O₂ with H₂O (left), CO₂ (middle), and CO (right) prior to the pre-**
 390 **perihelion equinox.** The data were taken between 3.29-2.43 au. The colored dots indicate the
 391 short time intervals listed in Table 1 (rows 1-6). The uncertainty on the correlation coefficients is
 392 < 0.01.

393 **Fig. 2. Correlations of O₂ with H₂O (left), CO₂ (middle), and CO (right) after the post-**
 394 **perihelion equinox.** The data were taken between 2.91-3.70 au. The different colors designate
 395 different short time periods as indicated in Table 1 (rows 7-12). The uncertainty on the
 396 correlation coefficients is < 0.01.

397 **Fig. 3. O₂ correlations with the major cometary volatile species during low H₂O**
 398 **production.** The heliocentric distance for the corresponding time period was between 3.32-3.70
 399 au. The different colors correspond to different short time periods as shown in Table 1 (rows 10,
 400 11, 12). The uncertainty on the correlation coefficients is < 0.01.

401 **Fig. 4. O₂ trapping in and release from the two distinct nucleus reservoirs (arbitrary**
402 **scales).** (a) Trapping of O₂ in the porous near-surface H₂O ice beyond 3.3 au. O₂ is released
403 from a deep, primordial reservoir. The wavy blue lines indicate O₂ released from depth getting
404 trapped in the overlying H₂O ice. (b) Release of large amounts of accumulated, water-trapped O₂
405 with H₂O sublimation closer than 3.3 au. The wavy blue lines indicate O₂ released from the
406 secondary, H₂O-trapped reservoir. The insets show one possible calculated arrangement of the
407 H₂O ice molecules on a microscopic scale based on the first principle DFT periodic model
408 (Methods). The red dashed circles indicate locations of missing H₂O molecules where O₂ from
409 source ‘a’ can incorporate and stabilize, and subsequently be released via H₂O sublimation
410 (source ‘b’).

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FIG 1

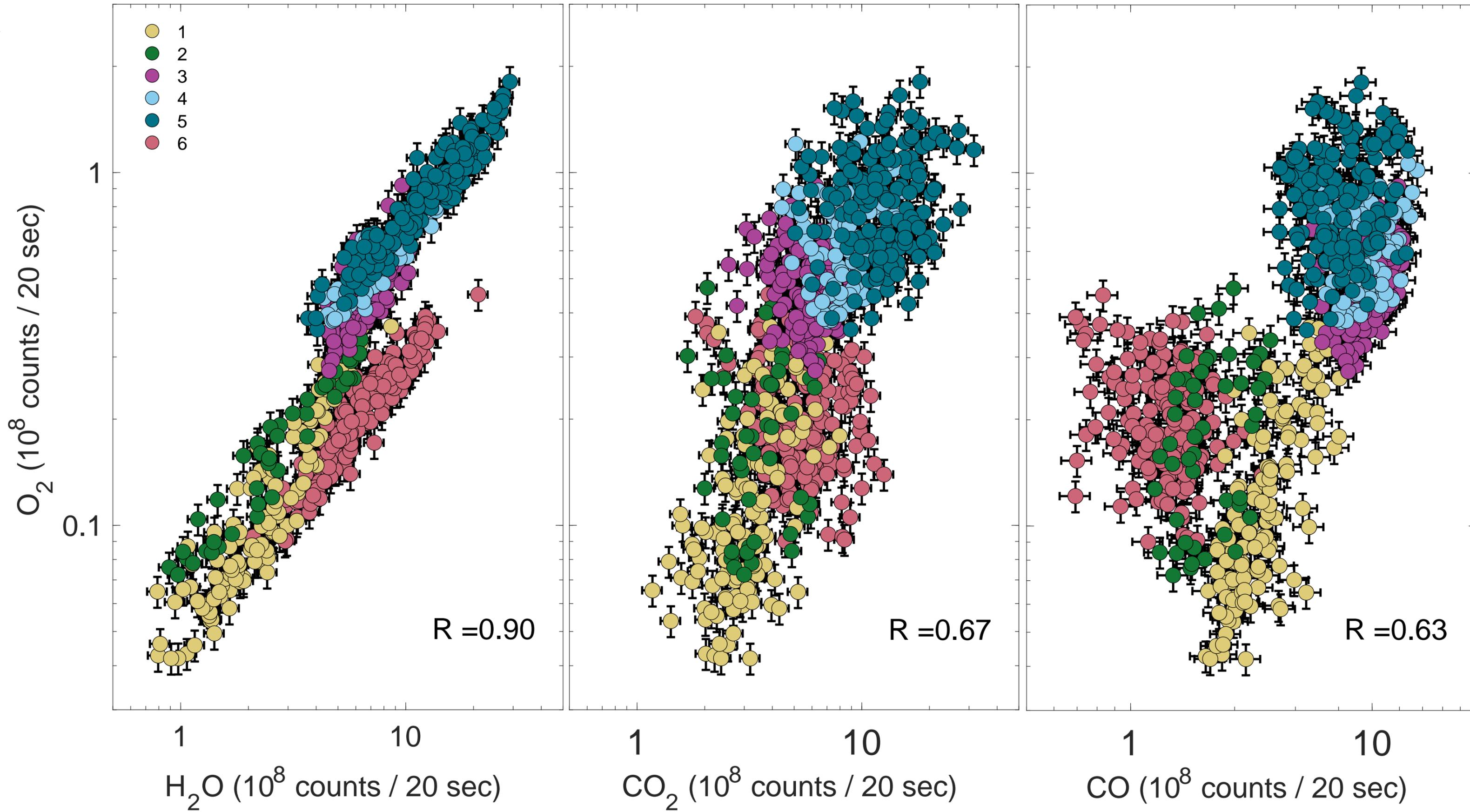


FIG 2

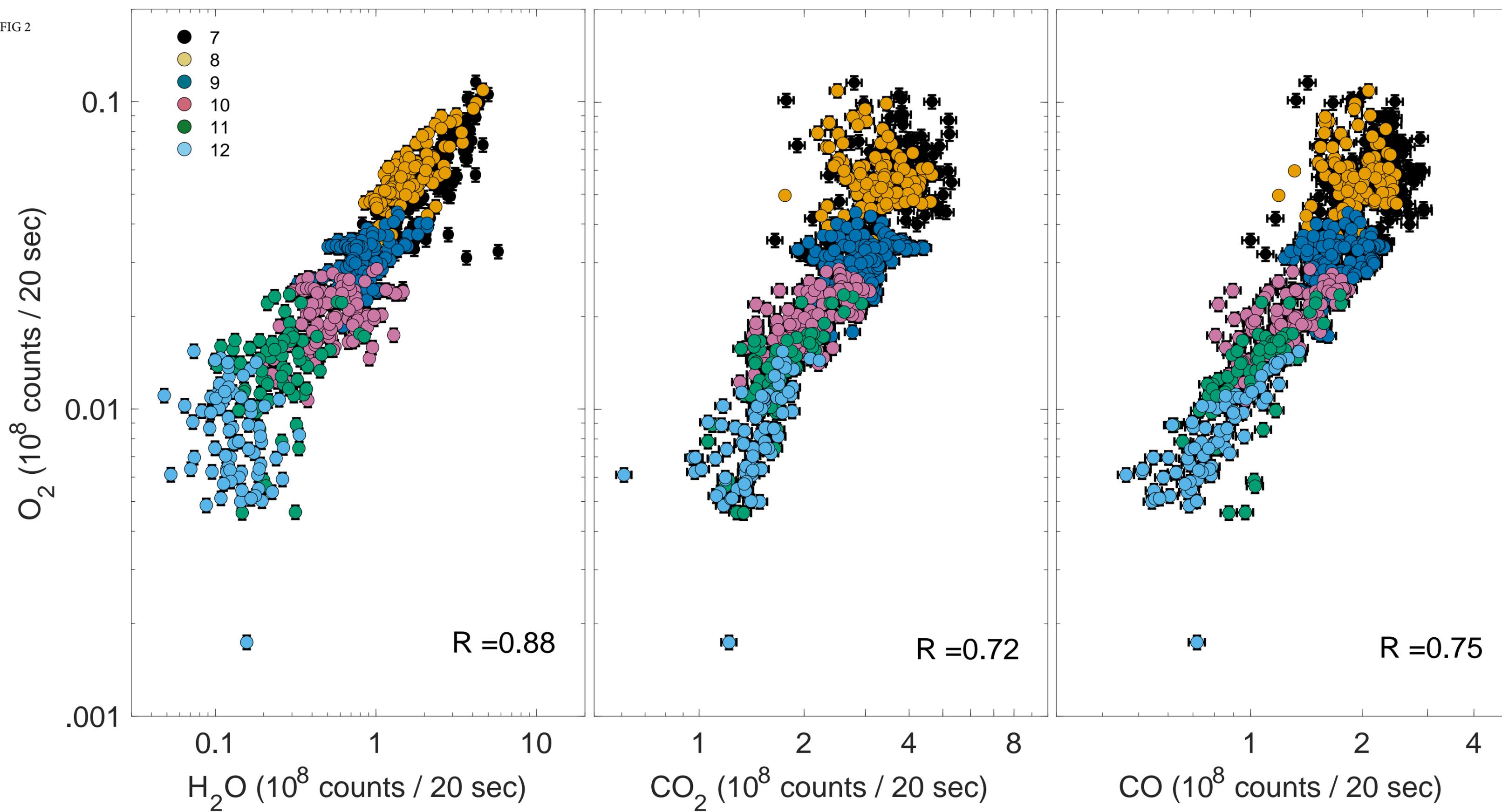
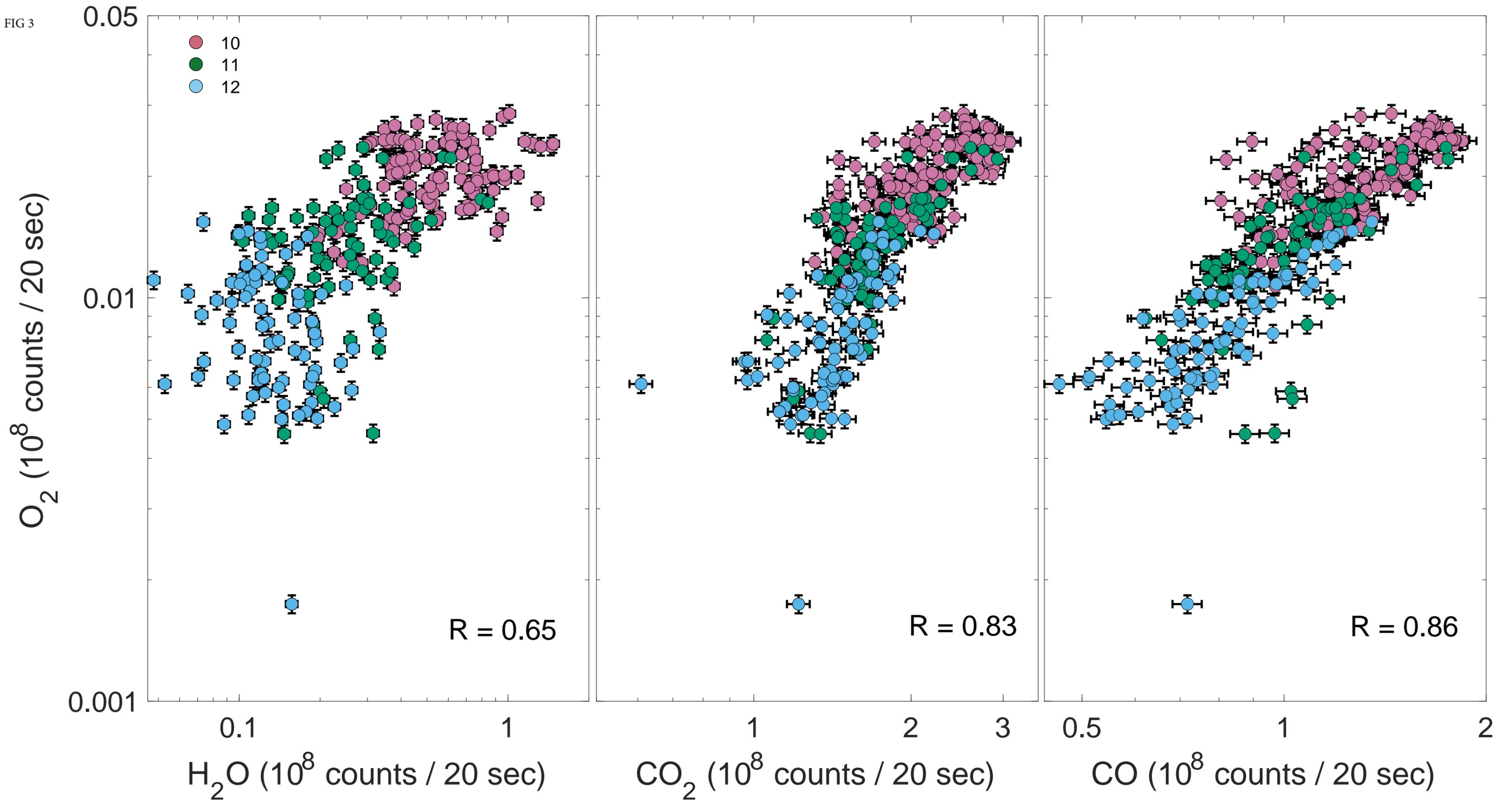


FIG 3



Datetime				ft distance from comet in km at the time of species measurement				longitude at time of species measurement (db-scaled)				latitude at time of species measurement (db-scaled)				derived 'abundance' from spectra (particles/20s)				abundance scaled by cometocentric distance (particles/20s) (uncertainty+10% uncertainty in sign)			
time_O2	time_H2O	time_CO2	time_CO	d_O2	d_H2O	d_CO2	d_CO	lon_O2	lon_H2O	lon_CO2	lon_CO	lat_O2	lat_H2O	lat_CO2	lat_CO	O2 signal	H2O signal	CO2 signal	CO signal	O2_scaled	H2O_scaled	CO2_scaled	CO_scaled
'2014-09-27 1'	'2014-09-27 1'	'2014-09-27 1'	'2014-09-27 1'	22,353	22,366	22,341	22,357	-127.13	-123.874	-129.812	-126.169	-25.612	-25.465	-25.732	-25.568	19980.3	59520.0	31990.0	45800.0	9983288.94	297741631.	159665878	222826643
'2014-09-27 1'	'2014-09-27 1'	'2014-09-27 1'	'2014-09-27 1'	22,23	22,244	22,219	22,234	-156.035	-152.83	-158.714	-155.106	-26.916	-26.771	-27.038	-26.874	13469.0	38465.0	31856.0	39280.0	7100770.4	190283519	157267963	194200751
'2014-09-27 1'	'2014-09-27 1'	'2014-09-27 1'	'2014-09-27 1'	22,208	22,122	22,097	22,112	-175.139	-178.285	-172.433	-176.066	-28.224	-28.081	-28.347	-28.182	11905.0	30660.0	27860.0	30790.0	5819171.31	164755642	196683107	1991404954
'2014-09-27 2'	'2014-09-27 2'	'2014-09-27 2'	'2014-09-27 2'	21,621	21,634	21,61	21,625	58.02	61.152	55.396	58.926	-33.584	-33.44	-33.704	-33.542	23013	54260.0	33370.0	42690.0	10757832.8	255665683	155832644	199663841
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	21,486	21,499	21,475	21,49	24.949	28.127	22.285	25.822	-35.103	-34.957	-35.226	-35.063	17096.7	47960.0	30060.0	46550.0	7892660.71	221424886	138564628	209966508
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	21,369	21,382	21,359	21,373	-0.403	-0.91	-6.677	-3.141	-36.434	-36.29	-36.555	-36.393	14324.7	36179.0	25670.0	36740.0	6541147.37	165407463	111708306	167571716
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	21,255	21,267	21,244	21,258	-32.818	-29.566	-32.423	-31.942	-37.751	-37.607	-37.87	-37.711	11863.0	30050.0	31322.0	36920.0	5345380.23	135934344	141358546	198588582
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	21,141	21,153	21,145	21,145	-61.661	-58.462	-60.259	-60.688	-39.066	-38.92	-39.184	-39.022	16458.5	54163.0	36442.0	47640.0	7955925.95	242343074	252024345	213003667
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	21,039	21,041	21,019	21,032	-90.537	-87.799	-91.139	-89.587	-40.373	-40.227	-40.491	-40.321	23271	74089.0	60040.0	60090.0	10298794.6	324009548	273607261	247739007
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	20,92	20,932	20,91	20,923	-118.894	-115.723	-121.491	-117.988	-41.647	-41.505	-41.763	-41.606	18471.7	55703.0	43320.0	46250.0	8084073.01	244061928	189419573	282407028
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	20,813	20,824	20,803	20,816	-147.364	-144.623	-150.004	-146.476	-42.911	-42.774	-43.027	-42.871	15957.1	42400.0	40750.0	44070.0	9120130.04	184026381	176351660	190858230
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	20,707	20,719	20,698	20,71	-175.836	-172.687	-178.437	-174.906	-44.156	-44.019	-44.269	-44.116	12601	32080.0	47080.0	44730.0	543054.08	13754680	10720680	191878827
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	20,605	20,616	20,596	20,608	-156.048	-159.088	-153.495	-156.944	-45.364	-45.234	-45.472	-45.326	10173.5	25085.0	47180.0	43321.0	4323266.38	106616311	202417473	183979809
'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	'2014-09-28 0'	19,473	19,479	19,468	19,475	-129.092	-131.947	-126.694	-129.941	-56.028	-56.02	-56.033	-56.026	11282.5	30640.0	35800.0	40500.0	47471.784	79475709.6	610038661	42554.736
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,455	19,461	19,45	19,457	-120.096	-123.006	-117.685	-120.924	-56.042	-56.039	-56.043	-56.041	11093.8	29750.0	32640.0	40900.0	4199870.3	97553407.6	236681176	169999036
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,437	19,443	19,433	19,439	-111.117	-114.04	-109.706	-111.986	-56.041	-56.043	-56.039	-56.042	12096.8	30540.0	36160.0	46931.0	4570134.37	115476900	253639130	177340330
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,42	19,426	19,416	19,422	-102.182	-105.076	-99.771	-103.023	-56.026	-56.033	-56.02	-56.028	13092.1	37400.0	41120.0	50020.0	497507.46	141151279	268229561	187808890
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,387	19,392	19,383	19,389	-83.864	-86.828	-81.467	-84.747	-55.95	-55.967	-55.936	-55.955	18093.3	36045.0	42780.0	50250.0	694572.05	190045052	273592756	19058836.7
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,372	19,377	19,368	19,373	-75.207	-78.13	-72.838	-76.049	-55.893	-55.914	-55.875	-55.899	21029.8	36819.0	40760.0	52960.0	7898195.24	213337236	266244762	198799611
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,357	19,362	19,353	19,358	-66.224	-69.206	-63.87	-67.11	-55.819	-55.845	-55.797	-55.827	20268.6	34231.0	39460.0	46560.0	52770.884	2448558.46	241131096	241286388
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,342	19,347	19,338	19,344	-57.227	-60.223	-54.87	-58.14	-55.731	-55.761	-55.705	-55.74	25844	36847.0	59202.0	50780.0	5933894.77	256313800	221390760	189744436
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,328	19,333	19,324	19,329	-48.322	-51.207	-45.993	-49.151	-55.628	-55.663	-55.598	-55.638	25681	36950.0	54000.0	50780.0	56757.541.84	259228376	201757192	189745433
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,314	19,319	19,311	19,316	-39.257	-42.172	-37.868	-40.107	-55.509	-55.549	-55.476	-55.521	26352	36710.0	52025.0	49470.0	898102.27	248977571	194109571	184591381
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,302	19,306	19,298	19,303	-30.375	-33.271	-29.963	-31.218	-55.379	-55.423	-55.341	-55.392	23675	36126.0	47208.0	48174.0	8831705.57	228367929	175808637	179491922
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,289	19,293	19,285	19,29	-21.323	-24.222	-18.853	-21.153	-55.322	-55.328	-55.189	-55.246	22952	53080.0	48074.0	47880.0	8539647.84	204854916	178792602	178118791
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,277	19,281	19,274	19,278	-12.27	-15.249	-9.861	-13.179	-55.07	-55.125	-55.025	-55.087	19936.1	47801.0	50270.0	48000.0	7448039.17	177703545	17783685	186965506
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,265	19,269	19,262	19,266	-3.285	-6.225	-0.873	-1.138	-54.896	-54.955	-54.847	-54.913	18185	41070.0	58400.0	49300.0	6749184.99	152516585	216789699	182386105
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,254	19,257	19,251	19,255	-5.795	-8.715	-3.358	-4.962	-54.707	-54.768	-54.653	-54.725	16851.4	39300.0	66820.0	53610.0	6247092.3	140667711	247658881	198761769
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,243	19,247	19,241	19,244	-14.853	-11.847	-17.249	-13.967	-54.504	-54.573	-54.447	-54.524	15987.6	35625.0	79708.0	60090.0	5920097.15	131971747	259091834	224263662
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,233	19,237	19,231	19,234	-23.833	-20.904	-26.226	-22.998	-54.29	-54.361	-54.231	-54.31	15590.4	35578.0	72540.0	54425.0	57018.109	131660718	268290463	201343522
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,224	19,227	19,219	19,225	-32.893	-29.966	-35.316	-32.069	-54.061	-54.136	-53.998	-54.082	14947.8	36198.0	61920.0	51149.0	553228.36	133815872	226441358	189047004
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,215	19,218	19,212	19,216	-42.048	-39.053	-44.511	-41.154	-53.817	-53.898	-53.749	-53.841	15366.7	36583.0	57990.0	48862.0	627634.96	135112551	210456401	180425210
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,206	19,209	19,204	19,207	-51.062	-48.148	-53.465	-50.223	-53.564	-53.647	-53.495	-53.588	17073.4	36040.0	57940.0	51305.0	628593.12	149955778	176941878	189268685
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	19,202	19,206	19,201	19,202	-177.606	-174.652	-131.903	-176.721	-51.826	-51.836	-51.817	-51.83	11750.7	22416.0	34880.0	51197.0	4612698.33	81143381.6	232807836	185249425
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	18,945	18,951	18,94	18,947	-145.447	-148.395	-143.006	-146.318	-51.596	-51.622	-51.574	-51.603	12260.0	60050.0	63870.0	60050.0	60712333.13	90718865.3	318797663	215594319
'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	'2014-09-29 0'	18,909	18,914	18,904	18,91	-126.982	-129.932	-124.511	-127.839	-51.409	-51.442	-51.38	-51.418	16636.2	31090.0	47					

'2014-10-06 0 '2014-10-06 0 '2014-10-06 0 '2014-10-06 0	18,47	18,471	18,469	18,471	37,728	40,695	35,292	38,617	-50,013	-49,952	-50,063	-49,995	51724	1110980	734660	669190	17645171.9	379041758	2505959436	228312799	1768717,81	37923644,8	25075373,8	22846390
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'2014-10-07 0 '2014-10-07 0 '2014-10-07 0 '2014-10-07 0	18,344	18,344	18,344	18,344	-17,619	-14,606	-20,11	-16,746	-46,101	-46,21	-46,011	-46,133	23563	431800	735620	662990	9759852,25	145301709	247537848	189447450	798176,487	15442225	24769518,2	18958509
'2014-10-07 0 '2014-10-07 0 '2014-10-07 0 '2014-10-07 0	18,342	18,342	18,342	18,342	-36,501	-33,501	-39,056	-35,632	-45,4	-45,514	-45,302	-45,433	23659	490790	706960	680100	8692988	165115971	337081636	228805338	872427,147	16524446,9	2476798,4	22895660
'2014-10-07 0 '2014-10-07 0 '2014-10-07 0 '2014-10-07 0	18,341	18,341	18,341	18,341	-52,777	-52,226	-57,766	-54,399	-44,671	-44,791	-44,575	-44,705	33352	769650	1532060	936180	1219355,4	258904319	315970590	314923726	1125828,07	25906522,4	51593664,3	31511012,9
'2014-10-07 0 '2014-10-07 0 '2014-10-07 0 '2014-10-07 0	18,34	18,34	18,339	18,34	-74,073	-71,08	-76,641	-73,207	-43,911	-44,034	-43,842	-44,047	46611	1116040	1817200	1016640	15677870,9	375386304	609645308	342986124	157146,62	37558005,3	63999222,3	34314681,6
'2014-10-07 1 '2014-10-07 1 '2014-10-07 1 '2014-10-07 1	18,355	18,355	18,356	18,355	45,663	49,727	43,94	47,482	-32,331	-32,501	-32,19	-32,38	59890	1299130	1127080	814930	1621193,4	437684724	379761419	274554827	2022222,1	4378993,3	37995629,3	24747052,4
'2014-10-07 1 '2014-10-07 1 '2014-10-07 1 '2014-10-07 1	18,359	18,358	18,359	18,358	27,123	30,262	24,572	28,028	-31,28	-31,45	-31,141	-31,329	50164	1068320	897120	713360	1690792,07	360041108	302376881	240413857	1699404	36203893,6	30255077,4	24065890,4
'2014-10-07 1 '2014-10-07 1 '2014-10-07 1 '2014-10-07 1	18,362	18,362	18,363	18,362	7,668	10,782	5,076	8,575	-30,217	-30,388	-30,075	-30,267	38437	782530	733840	612170	12959535,9	26384917	247450678	206401120	1895953,23	26400262,8	24760798,4	20654467,7
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'2014-10-07 1 '2014-10-07 1 '2014-10-07 1 '2014-10-07 1	18,37	18,37	18,371	18,37	-31,317	-28,164	-33,977	-30,377	-28,056	-28,232	-27,907	-28,109	28357	542790	831880	564300	9569265,31	183168231	207542120	270798050	9600159,54	18330357	28092176,7	22094662,7
'2014-10-07 1 '2014-10-07 1 '2014-10-07 1 '2014-10-07 1	18,375	18,374	18,376	18,375	-50,814	-47,65	-53,394	-49,873	-26,962	-27,14	-26,816	-27,015	34682	783790	1081120	710600	1710052,2	264610522	365097665	239927428	1774427,21	26477321,1	36526083,2	24008232,4
'2014-10-07 1 '2014-10-07 1 '2014-10-07 1 '2014-10-07 1	18,38	18,379	18,38	18,38	-70,335	-67,205	-73,017	-69,423	-25,858	-26,035	-25,705	-25,909	51881	1189340	1458640	922930	17526667,7	401744353	492764183	311788273	11188273,5	11946532,6	49256161,6	31196428,2
'2014-10-10 2 '2014-10-10 2 '2014-10-10 2 '2014-10-10 2	11,019	11,099	11,035	11,013	101,038	103,96	98,652	101,898	-26,268	-25,855	-26,603	-26,146	165025	3100400	2547800	1727980	20037065	375080194	310248727	209580704	2008182,7	37527386,4	31042486,6	20972484,3
'2014-10-10 2 '2014-10-10 2 '2014-10-10 2 '2014-10-10 2	11,564	11,554	11,558	11,557	29,272	32,127	26,911	30,105	-35,463	-35,135	-35,732	-35,368	263520	4428600	3262500	1649240	325395080	589763748	230837382	22079502	3529886,37	35009931,5	23008931,5	22042790
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	11,713	11,689	11,733	11,706	5,643	14,458	9,333	12,486	-37,416	-37,112	-37,662	-37,325	176714	3012600	1423000	1452920	2424165,7	411619735	195984860	199094261	2429340,1	41182162,1	31007482,3	1992338,4
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	11,865	11,841	11,886	11,858	-11,747	-1,929	-8,051	-4,905	-39,209	-38,93	-39,441	-39,128	112199	1471680	1484640	1358520	15795176,1	246975844	187836759	1583491,92	24713299,9	20989030,3	18973561,2	20973561,2
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	12,022	11,997	12,043	12,014	-23,13	-20,36	-25,433	-22,335	-40,875	-40,62	-41,086	-40,802	88026	1242510	2200000	1409800	17222264,3	205026888	319074468	204851629	1275793,26	20517007,6	31925309,4	20362781,7
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	12,822	12,155	12,203	12,173	-40,441	-37,622	-42,781	-39,636	-42,396	-42,158	-42,591	-42,328	196459	2638000	2638000	1701520	14577234,3	250365547	392833045	252134516	1461560,37	25052377,6	31903124,6	25229393,7
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	12,342	12,316	12,364	12,335	-57,635	-54,881	-59,934	-56,833	-43,769	-43,558	-43,942	-43,708	117684	2229600	2586000	1599320	19762211,1	338194325	395317931	242158474	1796855,04	33837822,6	39551675,7	24267042,0
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	12,505	12,478	12,527	12,497	-74,676	-71,93	-76,967	-73,876	-44,805	-44,546	-44,938	-44,734	134729	2261500	2786000	1659430	12068250,7	407265756	437760614	25916149,9	2111415,09	437769624,1	25932248	25932248
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	12,67	12,643	12,692	12,662	-91,719	-88,968	-94,031	-90,922	-46,078	-45,912	-46,214	-46,03	174256	3065700	3162400	1765510	27973124	490083193	509421099	283057587	2802601,36	49025966,1	50964680	3282255,8
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	12,836	12,809	12,859	12,828	-108,738	-105,945	-110,019	-107,915	-47,023	-46,877	-47,139	-46,958	198931	3438700	3438700	2144700	32776447,7	564189163	693497328	352926605	3283369,84	56442659,9	36396059,5	3531145,4
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	13,003	12,976	13,026	12,996	-125,686	-122,956	-127,972	-124,891	-47,826	-47,706	-47,924	-47,792	166884	2432170	3009000	1882400	28052754,9	409250427	510557118	317929861	285417,15	40927282,3	51078307,3	31810816,6
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	13,171	13,144	13,194	13,163	-142,66	-139,904	-144,913	-141,865	-48,496	-48,376	-48,594	-48,467	171919	3997600	3997600	1591070	20546026,9	342049990	45544539	275676088	2050125,53	34223493,6	4457561,8	27584200
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	13,339	13,312	13,361	13,331	-159,561	-156,829	-161,869	-158,766	-49,403	-49,283	-49,503	-49,378	190050	2361800	2361800	1420750	13621170,6	210887980	421619847	252489383	1368507,79	21103320	42182518,1	25264882,8
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	13,507	13,479	13,529	13,499	-176,605	-173,822	-178,865	-175,808	-49,445	-49,382	-49,605	-49,424	52378	777710	9171280	1202580	9555792,51	141297029	360979581	220165474	958670,495	14141589,9	220165474	220165474
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	13,674	13,647	13,696	13,666	-166,338	-163,115	-168,046	-165,144	-49,727	-49,689	-49,757	-49,717	14449	604860	7773880	1122440	77500256	112649495	332745148	205626396	7777950	11275563,1	33292756,1	20977118,1
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	14,036	14,009	14,058	14,028	-100,321	-103,208	-97,989	-101,198	-49,811	-49,837	-49,787	-49,817	89971	1677310	2646400	1403800	80413617,1	341896469	543283648	287023915	1849553,23	34217139,8	54351673,2	28759233,2
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	14,468	14,442	14,489	14,461	-82,852	-85,694	-80,534	-83,67	-49,599	-49,639	-49,565	-49,611	108588	2304200	2717160	121210	2278996,8	48059013	371923731	2727764,45	48080836,1	37211522,4	2563887,1	2563887,1
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	14,627	14,601	14,649	14,62	-65,409	-68,261	-62,987	-66,232	-49,309	-49,362	-49,263	-49,324	124276	2688300	1400700	1239270	26588742	573116529	300580697	264887023	2664030,62	5735592,8	30075406,9	2650497,2
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	14,785	14,746	14,806	14,768	-47,756	-50,625	-45,401	-48,584	-48,943	-49,007	-48,889	-48,961	123272	2389300	2511500	1153200	2820320,38	519350733	332312014	251846522	2833341	51935786,2	30075406,9	2500251,9
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	14,941	14,916	14,962	14,934	-29,949	-32,837	-27,599	-30,782	-48,508	-48,582	-48,445	-48,529	98424	1807560	2259800	1266800	17187891,6	402158703	505828901	282366677	211390,02	40235924,2	50651700,9	2823471,4
'2014-10-11 0 '2014-10-11 0 '2014-10-11 0 '2014-10-11 0	15,095	15,07	15,115	15,087	12,141	15,019	9,736	12,998	-48,014	-48,098	-47,943	-48,029	98184	1394030	2046000	1529410	17806727,1	316591004	467435758	184898251	17676897,4	46761906,1	2858507,1	2858507,1

'2014-10-24 1' '2014-10-24 1' '2014-10-24 1' '2014-10-24 1'	9,828	9,828	9,828	9,828	-9,609	-6,878	-11,933	-8,814	-31,687	-32,094	-31,34	-31,806	155305	2540200	2969800	1367490	15000845,3	245356861	286851747	132085290	1503957,63	24551350	28702111,4	13220021,9
'2014-10-24 1' '2014-10-24 1' '2014-10-24 1' '2014-10-24 1'	9,826	9,826	9,826	9,826	-26,986	-24,187	-29,327	-26,171	-29,063	-29,49	-28,705	-29,188	160294	2560900	4014460	1526640	15476429,7	247255602	390198285	1473803134	1551577	24741284,5	39039582	14750153,5
'2014-10-26 1' '2014-10-26 1' '2014-10-26 1' '2014-10-26 1'	9,813	9,812	9,813	9,813	-78,106	-75,264	-80,439	-77,721	-81,309	-81,183	-81,958	-81,484	428950	7859800	4146100	1871220	143105727	756704949	396215279	180189072	413699937	24816433,1	39641433,1	18032300,2
'2014-10-26 1' '2014-10-26 1' '2014-10-26 1' '2014-10-26 1'	9,816	9,815	9,817	9,816	-95,403	-91,181	-97,729	-94,565	-34,167	-33,549	-34,505	-34,044	417580	7308400	3887200	1625870	40059115,6	704049050	374623026	156658844	4012240,79	70431438,9	374816575	15678047,0
'2014-10-27 1' '2014-10-27 1' '2014-10-27 1' '2014-10-27 1'	9,838	9,838	9,838	9,838	35,468	37,95	33,445	36,174	-48,335	-48,513	-48,185	-48,386	282380	5020300	4401200	1655710	27330499,6	485895981	425957617	152595562	2738277,82	48611641,7	426182009	16076754,2
'2014-10-27 1' '2014-10-27 1' '2014-10-27 1' '2014-10-27 1'	9,836	9,836	9,836	9,836	4,488	7,018	2,369	5,215	-45,597	-45,854	-45,379	-45,672	185151	2780600	3170000	1582340	19712784,5	269014419	306876660	153086483	179550,18	26917848,6	306862778	15321027,9
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	25,412	25,365	25,449	25,398	30,144	33,948	27,5	31,142	-32,581	-32,501	-32,643	-32,557	107092	1558550	472720	512930	69156773,4	1002744925	306157865	334991730	46923993,4	106036159	30632283,8	33517472,8
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	25,692	25,647	25,729	25,679	10,063	13,246	7,394	10,952	-33,005	-32,977	-33,111	-33,03	83009	1066500	385800	540210	54794286,4	701510221	25392440	366220438	5486650,60	70177508,2	25565229	35649091,7
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	25,968	25,925	26,004	25,956	-9,963	-6,818	-12,602	-10,373	-33,505	-33,434	-33,564	-33,485	62152	809470	411860	506310	4911394,7	544049340	278520333	357492826	4917613,37	544285209	278699918	35768191,0
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	29,618	29,58	29,65	29,607	65,996	69,155	63,315	66,889	-38,781	-38,732	-38,822	-38,767	71716	1163960	515560	5422760	70107807,9	1608437531	453240396	475282432	6778306,84	107815666	45345323,1	67750544,3
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	29,851	29,823	29,892	29,85	45,685	48,815	42,003	45,579	-39,889	-39,941	-39,129	-39,076	82142	1244590	433940	596270	74136002,1	1106878212	387795130	465790922	7423210,44	11072191	38783615	46560674,4
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	30,1	30,063	30,131	30,089	25,455	28,623	22,805	26,349	-39,389	-39,342	-39,427	-39,376	72606	1040640	366660	540870	65781762,1	940513750	332698877	44408134	65862386	94082047,2	33279253,3	44461896,4
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	30,336	30,299	30,367	30,326	5,269	8,437	2,617	6,163	-39,6	-39,635	-39,718	-39,668	57870	775170	334720	48007	53265192,5	71128851	308666164	441504189	5932916,9	71189561,4	30889393,6	44171430,9
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	30,572	30,535	30,603	30,561	-15,064	-11,824	-17,747	-14,138	-39,967	-39,922	-40,005	-39,954	48340	569380	457060	483130	45180844,9	530882069	409325750	451231207	4524806,16	53111247,8	4524806,16	45114362,9
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'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	31,034	30,998	31,064	31,024	-55,498	-52,311	-58,182	-54,603	-40,517	-40,475	-40,553	-40,506	715960	854460	714960	581570	50683619,3	821030110	619055117	559754481	5075481,18	82131664,7	60317999,6	55999107,1
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	31,261	31,225	31,291	31,251	-75,701	-72,538	-78,386	-74,806	-40,783	-40,742	-40,817	-40,771	61261	969180	606180	527970	59867319,7	944951106	593527011	515628702	599446639	94525850,6	59370660,6	51585577,6
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	31,487	31,451	31,517	31,477	-96,042	-92,76	-98,695	-95,084	-41,044	-41,002	-41,077	-41,031	66113	1083360	635580	539570	67529351,2	1046893094	610335165	533956163	6761152,75	10472165,7	533956163	5338271,6
'2014-10-30 1' '2014-10-30 1' '2014-10-30 1' '2014-10-30 1'	31,71	31,675	31,74	31,7	-116,252	-113,08	-118,97	-115,357	-41,297	-41,257	-41,33	-41,286	68090	1066480	647460	46440	68466136	1070005383	652269074	543082762	6854884,02	107032439	652524649	5433157,9
'2014-10-31 1' '2014-10-31 1' '2014-10-31 1' '2014-10-31 1'	33,42	33,416	33,422	33,419	15,867	19,177	13,172	16,813	-44,762	-44,685	-44,824	-44,74	12268	704920	437400	560730	80648855,3	837382462	485572978	521257861	8073866	837183,7	54979333,5	52148617,2
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'2014-10-31 1' '2014-10-31 1' '2014-10-31 1' '2014-10-31 1'	33,479	33,476	33,481	33,478	-45,108	-41,825	-47,784	-44,163	-46,167	-46,092	-46,228	-46,145	59480	805720	543600	554661079,4	652101915	903193879	609254059	5541652,67	65235727,8	90349441,1	60950092,7	54304788,3
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'2014-10-31 1' '2014-10-31 1' '2014-10-31 1' '2014-10-31 1'	33,602	33,6	33,604	33,602	168,371	171,527	165,718	169,266	-49,46	-49,39	-49,518	-49,44	40601	378870	629900	526390	458422631,9	427729075	704525858	594430003	4591006,39	47293589,1	70479128,7	45988779,5
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'2014-10-31 1' '2014-10-31 1' '2014-10-31 1' '2014-10-31 1'	33,634	33,631	33,636	33,633	127,62	130,772	124,969	128,514	-50,352	-50,283	-50,41	-50,332	36468	439430	542280	482950	41254277,5	497014736	613525015	546314060	4113850,7	49723767,4	546314060	4113850,7
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'2014-10-31 1' '2014-10-31 1' '2014-10-31 1' '2014-10-31 1'	33,662	33,66	33,666	33,662	87,417	90,614	84,762	88,31	-51,222	-51,153	-51,279	-51,202	48673	797580	817540	580110	55152848,4	903654431	699863460	575754888	5522711,33	90395523,9	7010098,8	5759487,9
'2014-10-31 1' '2014-10-31 1' '2014-10-31 1' '2014-10-31 1'	33,676	33,674	33,678	33,675	67,226	70,389	64,563	68,118	-51,654	-51,587	-51,711	-51,635	52601	843700	880120	407920	5965337,6	956703723	54455793	534025929	59706082	95701033	54478915	5342570,1
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'2014-10-31 1' '2014-10-31 1' '2014-10-31 1' '2014-10-31 1'	33,701	33,699	33,703	33,701	26,859	30,042	24,215	27,751	-52,511	-52,444	-52,566	-52,492	49624	578120	335600	424250	56360825,3	860938206	381205245	481845077	56435987	86123164,4	38140067	48202458,7
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'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,878	32,883	32,874	32,879	-177,802	-178,994	-175,173	-178,707	-60,925	-60,98	-60,879	-60,94	30425	496560	505630	428690	32890457,7	496583208	601474323	463426168	3294870,79	493820605	53107611,8	4634144,1
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'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,545	32,549	32,541	32,546	-69,569	-66,377	-72,234	-68,639	-55,974	-56,045	-55,914	-55,994	48049	552590	863520	541320	50928396,9	588252167	914395732	573388942	5096373,35	58849515,6	91469812,2	5762829,8
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'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,494	32,498	32,491	32,495	-109,705	-106,493	-112,406	-108,759	-55,069	-55,142	-55,007	-55,09	43297	601190	805020	482440	44715572	634827858	849831504	509420469	4578318,53	63518076,3	85012302,2	5096461,73
'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,468	32,473	32,461	32,467	-129,934	-126,72	-132,59	-129,022	-54,605	-54,679	-54,544	-54,626	569900	457800	6297436	600050250	759200154	482532436	482532436	5002932,9	482532436	5002932,9	759475,69	482532436
'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,443	32,444	32,444	32,444	-149,969	-146,69	-152,62	-149,021	-54,14	-54,217	-54,078	-54,154	37648	499000	704200	491490	39646336,5	512530552	74167405	512489930	3968928,59	512489930	74133963,1	5127636,17
'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,418	32,422	32,414	32,419	-170,059	-166,808	-172,688	-169,125	-53,67	-53,746	-53,608	-53,692	35811	477600	719980	450470	3764736,9	502088521	756459512	477223738	37696840,1	5201259,4	75673435	4774219,3
'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,392	32,396	32,389	32,393	-169,798	-173,082	-167,17	-170,717	-53,193	-53,271	-53,13	-53,215	33820	529590	573760	580140	35485353,1	555805137	790729909	533194579	3554442,27	556040089	79011100	5342548,9
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'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,341	32,345	32,337	32,342	-129,664	-129,98	-130,583	-128,523	-52,308	-52,365	-52,252	-52,346	42599	598840	849800	498300	35829730,3	506349866	626195951	492459137	3589589,88	50675488,8	62644619	4709254,7
'2014-11-03 0'2014-11-03 0'2014-11-03 0'2014-11-03 0	32,315	32,319	32,312	32,316	-109,736	-112,886	-107,068	-110,625	-51,745	-51,822	-51,68	-51,767	34926	543260	573380	422950	3647179,7	567444719	598646187	462583252	3653218,96	56768293	5989298,9	46279883
'2014-11-04 0'2014-11-04 0'2014-11-04 0'2014-11-04 0	32,189	32,193	32,185	32,19	-11,598	-14,852	-8,946	-12,552	-49,3	-49,382	-49,233	-49,324	4016	595760	579200	643800	42497978,7	617439259	599978351	438704705	4256311,91	61768774,1	6002302,6	4389141,5
'2014-11-04 0'2014-11-04 0'2014-11-04 0'2014-11-04 0	32,163	32,167	32,159	32,164	-8,527	-5,365	-11,243	-7,635	-48,788	-48,868	-48,718	-48,81	37501	530290	614860	471250	3893230,8	548699489	635890800	487518915	3885551,5	5489337,2	6364116,6	4873971,3
'2014-11-04 0'2014-11-04 0'2014-11-04 0'2014-11-04 0	32,137	32,141	32,133	32,138	-28,725	-25,562	-31,427	-27,817	-48,251	-48,2	-48,293	-47,34	35402	536360	616860	457300	35881077,9	551262306	685475810	473227262	359409,87	55149799,6	6372401,2	4725401,1
'2014-11-04 0'2014-11-04 0'2014-11-04 0'2014-11-04 0	32,111	32,115	32,107	32,112	-48,887	-45,753	-51,559	-47,974	-47,749	-47,831	-47,68	-47,773	36472	564420	727860	460930	37606874,5	518188891	750321359	474057447	3766818,99	58220110,5	75095527,8	5714693,1
'2014-11-04 0'2014-11-04 0'2014-11-04 0'2014-11-04 0	32,084	32,088	32,081	32,085	-69,17	-66,003	-71,937	-68,274	-47,223	-47,305	-47,15	-47,246	6971120	469540	671120	469540	38363047,7	643957289	690710369	512979933	3842498,56	64402105,2	6909731,3	5123024,7
'2014-11-04 0'2014-11-04 0'2014-11-04 0'2014-11-04 0	32,058	32,062	32,054	32,059	-89,493	-86,325	-92,231	-88,599	-46,691	-46,774	-46,619	-46,715	39877	702070	794740	499170	40992482,7	721708193	816562699	513036684	4105650,81	7219763,8	8168448,5	51326318,7
'2014-11-04 0'2014-11-04 0'2014-11-04 0'2014-11-04 0	32,032	32,036	32,028	32,033	-109,686	-106,484	-112,377	-108,791	-46,16	-46,245	-46,089	-46,184	39877	754880	797420	642100	4030127,5	747373242	689968742	47448953	4036360,99	5701568,3	81602314,5	47470278
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'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	31,004	31,005	31,003	31,004	-104,278	-100,771	-107,22	-103,303	-56,879	-56,883	-56,876	-56,88	84631	1134600	1286200	642360	81351380.8	1263613189	1238603515	5167467276	8144157.28	123896866	123895545	61771575.4
'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	30,996	30,997	30,995	30,997	-126,199	-122,709	-129,205	-125,224	-56,848	-56,854	-56,843	-56,85	80509	1150400	1128400	604280	77349184.1	1105512599	1079854016	581465422	7743713.24	110685409	108018825	57170655.8
'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	30,989	30,99	30,988	30,989	-148,237	-144,748	-151,145	-147,262	-56,805	-56,812	-56,798	-56,807	62423	846810	1110700	584350	59493988.1	813259472	1066556499	561161894	6002336.28	81354465	106688308	56139878.3
'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	30,973	30,974	30,972	30,973	-167,344	-170,841	-164,403	-168,319	-56,679	-56,691	-56,669	-56,682	42461	513410	798760	407920	40733972.2	4925597940	766222339	451161767	4077979.75	4699794.6	45137197.3	4699794.6
'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	'2014-11-22	30,965	30,966	30,964	30,965	145,418	148,906	142,478	146,427	-56,599	-56,612	-56,587	-56,603	41674	555930	797860	456010	39958332.5	533077472	746963671	427386627	4002154.51	53308835.7	76524025	43744575.29
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,837	30,838	30,835	30,837	152,426	155,94	149,465	153,488	-53,701	-53,744	-53,665	-53,714	46402	455590	786120	517800	44124616.2	433172442	79532140	492386671	4419194.26	43338054	7951410.3	45260855.9
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,829	30,83	30,828	30,829	130,691	134,118	127,791	131,658	-53,475	-53,495	-53,444	-53,476	47560	508370	761100	473750	45202319.8	483200042	450093829	450093829	483200042	483200042	483200042	450093829
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,821	30,822	30,82	30,821	108,57	112,346	106,105	109,936	-53,152	-53,197	-53,114	-53,165	54012	723220	862680	464940	51078374.7	687055879	819435922	441662333	51379466.9	68571799.6	81972218	44187249.1
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,813	30,814	30,812	30,813	87,185	90,607	84,254	88,15	-52,862	-52,908	-52,822	-52,875	63391	933390	918660	501090	60186012.5	886256228	872156829	475755375	6026359.21	886256229	8725251.51	47579374.9
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,805	30,806	30,803	30,805	65,422	68,85	62,526	66,387	-52,563	-52,611	-52,523	-52,577	75387	1112970	910660	480920	71583844.8	1056219255	788150816	456339616	1167292.51	105654225	78843155.6	10565532.7
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,759	30,761	30,758	30,76	-53,273	-56,184	-56,184	-52,311	-50,778	-50,833	-50,731	-50,794	69210	879380	810360	549020	65584766.7	832103758	960850857	519470426	6566575.25	83239222	56116083.3	4596834.5
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,751	30,752	30,75	30,751	-75,117	-71,643	-78	-74,156	-50,422	-50,48	-50,375	-50,438	74935	1045990	895640	486470	70806345.5	989177580	846883558	460017708	7094551.31	98949209	84717461	46023218.8
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,742	30,744	30,741	30,743	-96,804	-93,298	-99,71	-95,843	-50,061	-50,12	-50,012	-50,058	47504	1209670	1056400	510090	80969327.6	1143372265	80377958	482102407	8108632.56	114371040	8108632.56	4822219.5
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,734	30,735	30,733	30,734	-118,519	-115,05	-121,466	-117,559	-49,692	-49,752	-49,642	-49,709	87153	1365640	903220	527220	82322872.3	1289868442	853106906	498008211	14261360.43	12902579	85339898.6	4822397.1
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,725	30,727	30,724	30,726	-140,213	-136,779	-143,158	-139,22	-49,316	-49,376	-49,264	-49,333	81058	1203860	803200	494400	76520829.1	1136622648	805390235	466756650	7660830.83	113692559	80567402.9	46697269.6
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,717	30,718	30,716	30,717	-161,986	-158,529	-164,828	-161,019	-48,931	-48,992	-48,88	-48,948	61606	845050	809940	47330	58127361.1	797385398	764156243	446602900	58026034.20	7967777.8	76443267.7	4469132.1
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,708	30,71	30,707	30,709	-176,337	-179,726	-173,489	-177,288	-48,54	-48,602	-48,488	-48,548	61606	845050	809940	47330	58127361.1	797385398	764156243	446602900	58026034.20	7967777.8	76443267.7	4469132.1
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,7	30,701	30,699	30,7	154,692	158,137	151,82	155,667	-48,143	-48,207	-48,09	-48,161	41995	478870	847560	490970	39579867.6	513395589	798764785	462734315	3964278.01	45172704.2	799047409	4629494.28
'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	'2014-11-23	30,691	30,693	30,69	30,692	133,076	136,451	130,238	134,033	-47,74	-47,804	-47,687	-47,758	42009	579670	741200	444920	39598516.6	527242860	679450581	419711435	3963275.02	45727247.7	67971124.4	4193185.7
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,616	30,618	30,615	30,617	-89,595	-85,546	-81,804	-80,002	-43,877	-43,96	-43,827	-43,908	75314	1022610	938260	592890	70594783.8	988854340	879410667	55575495	70678840.5	95915508.3	87970721.6	55601124.4
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,607	30,609	30,606	30,608	-124,291	-129,536	-125,782	-131,924	-43,376	-43,448	-43,314	-43,397	82928	1296870	757360	471000	77498634.8	1214864232	709439739	441251279	7738666.81	121521728	70970609.3	44146623.5
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,598	30,599	30,597	30,598	-106,985	-103,58	-109,806	-106,034	-42,855	-42,929	-42,794	-42,876	94895	1487590	681840	466960	88844267.4	139288841	638322523	437185512	8898582.47	139328513	6387571.53	43739460.1
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,589	30,59	30,588	30,589	-131,047	-127,611	-133,867	-130,096	-42,329	-42,405	-42,267	-42,34	92894	1491650	751880	461710	86919700.8	1328097921	703478284	432016008	8701293.16	132846235	70347351.6	43222385.8
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,572	30,573	30,571	30,572	-176,651	-173,218	-179,509	-175,668	-41,316	-41,393	-41,251	-41,338	52773	704200	624920	411640	43293135.8	658230952	584041509	384738167	4939436.7	65847551.2	58428317.8	38494943.4
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,564	30,565	30,563	30,564	161,937	165,319	159,056	162,887	-40,833	-40,909	-40,767	-40,854	40542	503400	756380	36520	37872637.5	470285958	705632265	40778692	3794147.5	47050281.9	70579807.2	47080676.3
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,556	30,557	30,555	30,556	140,486	143,833	137,605	141,435	-40,345	-40,421	-40,279	-40,366	40865	516420	782840	450740	38154389.2	480534935	730865706	3821615.85	480754116.3	71131605.2	42079051.9	
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,548	30,549	30,547	30,548	118,976	122,347	116,163	119,933	-39,851	-39,929	-39,786	-39,873	43919	708530	651260	429010	40984585.6	661229530	607702316	400343682	4104836.48	68418667.4	60794973.2	40054387.6
'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	'2014-11-24	30,54	30,541	30,539	30,54	97,451	100,812	94,606	98,4	-39,353	-39,431	-39,287	-39,375	61216	106180	67200	418680	57995649	938517093	626914236	390493919	57121120.6	93882344.6	67216461.9	3906693
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'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	23,703	23,693	23,711	23,7	38,511	42,011	35,331	39,448	-50,899	-50,951	-50,854	-50,913	206595	3399800	1556300	645750	116071725	1908505775	87328156	362711318	11617946.2	190984264	87357866	36291077.2
'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	23,762	23,753	23,777	23,759	16,123	19,671	13,182	17,198	-50,554	-50,61	-50,507	-50,57	156157	2301860	1784260	647560	88171339.8	1298720942	1008333322	381234027	8826523.61	192909631	80786069	3812927.3
'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	23,822	23,812	23,83	23,819	-6,562	-2,977	-9,569	-5,525	-50,186	-50,245	-50,136	-50,203	112078	1455000	3326800	614910	6360284.6	82501506	1889186257	519920412	6362623.61	82582873.4	188926090	52014883
'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	'2014-12-22	23,888	23,871	23,888	23,878	-28,785	-25,23	-31,718	-27,784	-49,808	-49,869	-49,757	-49,825	103948	1331870	3694800	1106920	932976804.4	758881060	2108387903	627699319	5935379.58	15975653.8	210884707	627949874
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'2015-01-16 0 '2015-01-16 0 '2015-01-16 0 '2015-01-16 0	28,298	28,297	28,298	28,297	-103,003	-99,518	-105,91	-102	-56,432	-56,351	-56,5	-56,409	27066	980680	1052100	161661	21678325	78525029	842497275	12944523,4	1272038,01	78535018,3	84278753,4	1295690,4
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'2015-01-30 0 '2015-01-30 0 '2015-01-30 0 '2015-01-30 0	27,837	27,836	27,837	27,836	-116,838	-113,314	-119,787	-115,827	-63,15	-63,194	-63,114	-63,163	38708	1405690	811980	180117	29984773,8	1089188910	629202140	139562378	3004954,13	108951894	62945297,9	1396805,4
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'2015-01-30 1 '2015-01-30 1 '2015-01-30 1 '2015-01-30 1	27,892	27,891	27,892	27,891	-35,407	-31,951	-38,391	-34,432	-58,339	-58,414	-58,275	-58,36	17910,9	462870	1612520	308195	13934029,4	360070221	1254481967	239747319	1397135,77	36025997,6	125483615	23990215,7
'2015-01-30 2 '2015-01-30 2 '2015-01-30 2 '2015-01-30 2	27,896	27,896	27,897	27,896	-57,436	-53,952	-60,373	-56,429	-57,858	-57,935	-57,792	-57,88	22355,8	647680	1372220	255295	17396988,8	504016037	1067920073	198667203	1743869,85	50424054	106824686	19880815,3
'2015-01-30 2 '2015-01-30 2 '2015-01-30 2 '2015-01-30 2	27,901	27,9	27,902	27,901	-79,322	-75,877	-82,203	-78,367	-57,445	-57,501	-57,389	-57,489	28887,3	963930	781540	197406	22487775,1	750332751	608445774	153673820	2253519,64	75060667,3	60869244,1	15379778,5
'2015-01-30 2 '2015-01-30 2 '2015-01-30 2 '2015-01-30 2	27,906	27,905	27,907	27,906	-101,252	-97,846	-104,129	-100,298	-56,864	-56,943	-56,797	-56,886	42509	1589190	590600	155551	33813664,2	1237484812	459959663	121134538	3316120	123783659	46017413	12124459,9
'2015-01-30 2 '2015-01-30 2 '2015-01-30 2 '2015-01-30 2	27,911	27,91	27,912	27,911	-123,252	-119,851	-126,126	-122,3	-56,348	-56,428	-56,28	-56,37	43415	1507160	616960	156564	3381323,5	1174029562	480661039	121967101	3387947,96	117437220	48088027,9	12207754
'2015-01-30 2 '2015-01-30 2 '2015-01-30 2 '2015-01-30 2	27,916	27,915	27,917	27,916	-145,095	-141,715	-147,964	-144,144	-55,825	-55,907	-55,756	-55,848	39969	1331500	692300	178606	31147963,8	1037567680	539550159	139188202	3120377,42	103788979	53978244,1	13930618
'2015-01-31 0 '2015-01-31 0 '2015-01-31 0 '2015-01-31 0	27,964	27,963	27,964	27,964	3,641	7,032	0,754	4,615	-50,319	-50,413	-50,238	-50,346	24377,5	682870	431320	101240	19062846,6	539956108	387285898	79168191,4	1910650,76	53418718,3	33746955,1	7925716,79
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'2015-01-31 0 '2015-01-31 0 '2015-01-31 0 '2015-01-31 0	27,984	27,983	27,985	27,984	-82,823	-79,419	-85,733	-81,887	-47,872	-47,97	-47,788	-47,899	34127,5	1194740	664040	129041	26725390,5	935539113	520049716	101052556	2677708,71	93584497,9	52027776,2	10115308,1

time_O2	time_H2O	time_CO2	time_CO	ft distance from comet in km at the time of species measurement				longitude at time of species measurement (db-spaccraft)				latitude at time of species measurement (db)				derived 'abundance' from spectra (particles/20s)				abundance scaled by cometary distance (particles/counting statistical uncertainties+10% uncertainty in sign)							
				d_O2	d_H2O	d_CO2	d_CO	lon_O2	lon_H2O	lon_CO2	lon_CO	lat_O2	lat_H2O	lat_CO2	lat_CO	O2 signal	H2O signal	CO2 signal	CO signal	O2 scaled	H2O scaled	CO2 scaled	CO scaled				
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,686	18,685	18,687	18,686	75,627	79,289	72,688	76,702	-39,207	-38,958	-39,407	-39,134	29061	1105140	508960	380021	100211474	177730852	132690639	1107988,5	38603309,9	17786416,8	13280583	
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,692	18,691	18,692	18,691	53,919	57,341	51,028	54,961	-40,561	-40,443	-40,877	-40,61	33130,5	1197320	797280	408436	112575494	418287910	278562348	142688538	1160955,8	41809424,1	37727925	14280799,1
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,697	18,696	18,698	18,697	32,165	35,688	29,306	33,174	-42,164	-41,917	-42,35	-42,088	29309	1058000	1098200	533980	110754796	369813760	380912755	186667558	10027778,5	37400660,6	38117920	18680418,5
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,713	18,712	18,714	18,713	-33,423	-29,96	-36,304	-32,429	-46,587	-46,354	-46,781	-46,52	19502,9	576625	1063420	612090	6829454,71	201898869	372442355	214339454	685558,793	22004096	37261733,8	21448850,5
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,718	18,717	18,719	18,718	-55,245	-51,788	-58,196	-54,243	-48,055	-47,823	-48,254	-47,987	2166219	751840	1177600	607780	7584284,17	263389167	412442955	212940439	61182,375	26355145,9	42164604,2	23086636,4
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,723	18,723	18,724	18,723	-77,111	-73,617	-80,048	-76,098	-49,524	-49,289	-49,721	-49,456	22117,2	965290	1236560	692770	7732003,58	338383113	433523315	220044198	78104,515	33867605,5	43373152,7	22019252,7
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,728	18,728	18,729	18,728	-99,083	-95,527	-101,973	-98,036	-50,996	-50,758	-51,189	-50,925	189867	808620	1225500	592720	6659762,54	283613749	429879370	207889843	68847,889	28387215,7	43003602,2	20803360,2
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,733	18,733	18,734	18,733	-120,953	-117,468	-123,863	-119,921	-52,457	-52,224	-52,651	-52,388	16355,2	652700	1075880	50680	5802619,84	229048936	377586791	178115366	582670,847	22920000	37781107	17624807,4
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,738	18,738	18,739	18,738	-142,800	-138,318	-145,705	-141,825	-53,913	-53,681	-54,105	-53,848	16564,3	777200	1001640	336000	5815935,17	272019859	351736007	189224466	58005,142	37080506,1	35191355,1	18383166,1
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,743	18,742	18,744	18,743	-164,667	-161,122	-167,645	-163,683	-55,365	-55,133	-55,563	-55,3	18455,5	1054710	961740	534620	6484818,05	370480139	337895362	187812032	580880,064	37067261,7	33807918,1	18794901,7
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,762	18,761	18,762	18,762	-106,903	-102,426	-109,866	-107,913	-61,184	-60,954	-61,374	-61,118	20935,8	859710	774860	477530	3766666,31	320596531	272760517	168095698	739681,344	37027048,4	2725567,2	16826285
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'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,775	18,774	18,776	18,775	-140,263	-135,790	-142,863	-138,893	-65,488	-65,255	-65,682	-65,423	29950,7	1418300	1062800	566430	10576540,5	499898381	374677573	195666429	105031,3	50012196,6	4787113,9	19580822,3
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,779	18,779	18,78	18,779	-173,833	-169,361	-176,443	-172,489	-66,915	-66,685	-67,107	-66,848	28465,2	1248340	1319740	649078	10302876,7	440228151	465456989	250466920	1006996	44001796,7	46567273,4	24520302,9
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,783	18,783	18,784	18,783	-4,713	-1,074	-7,787	-3,683	-68,335	-68,107	-68,527	-68,27	24764,8	1034010	1473220	661180	8737048,41	344799854	519808965	232365024	87666091	36999085,1	52003695,8	23641775,4
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,787	18,787	18,788	18,787	-27,371	-23,7	-30,449	-26,317	-69,745	-69,518	-69,935	-69,68	22322,2	848620	1474200	700080	7870480,05	299521591	522225963	236447741	790671,998	296996465	52645448,6	23631195,5
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,791	18,79	18,792	18,791	-50,101	-46,444	-53,239	-49,038	-71,139	-70,917	-71,33	-71,075	20354,3	714600	1384740	703710	7187137,15	252296606	489006604	248481184	712394,638	25245844,4	48922719,9	24863881,7
'2016-05-01	'2016-05-01	'2016-05-01	'2016-05-01	18,795	18,794	18,795	18,795	-73,152	-69,397	-76,206	-72,043	-72,529	-72,304	-72,711	-72,463	190848	679830	1329200	681080	6720549,13	240125770	469542592	240592889	674647,315	24028074,5	48979528,1	24074800
'2016-05-02	'2016-05-02	'2016-05-02	'2016-05-02	18,798	18,798	18,799	18,798	-96,508	-92,561	-99,646	-95,421	-73,906	-73,676	-74,089	-73,843	174671	631230	1260540	754770	6170102,84	223054465	454477863	266709153	619494,253	22320381,5	44658892,6	26687246,5
'2016-05-02	'2016-05-02	'2016-05-02	'2016-05-02	18,802	18,801	18,802	18,802	-120,247	-116,405	-123,399	-119,143	-75,268	-75,035	-75,445	-75,205	160943	612300	1206240	70260	6059675,64	205769785	425054070	254622861	574453,078	20290203,5	4225163,5	24572824,3
'2016-05-02	'2016-05-02	'2016-05-02	'2016-05-02	18,811	18,81	18,811	18,811	-171,411	-175,566	-180,636	-175,594	-78,882	-78,678	-79,045	-78,824	189871	702730	955540	656760	6716497,48	248637188	338121385	232396970	674241,368	24879487	33830526,5	23254941,8
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'2016-05-02	'2016-05-02	'2016-05-02	'2016-05-02	18,84	18,84	18,84	18,84	-57,223	-61,504	-54,607	-58,818	-74,545	-74,761	-74,367	-74,608	191505,6	660780	1192440	723900	678448,66	234516056	423251331	256945120	680748,987	23466919,5	42345706,5	25705551,5
'2016-05-02	'2016-05-02	'2016-05-02	'2016-05-02	18,84	18,84	18,84	18,84	-34,195	-38,005	-31,121	-35,275	-73,181	-73,405	-73	-73,245	165079	479959</										

'2016-05-07 1' '2016-05-07 1' '2016-05-07 1' '2016-05-07 1	15,458	15,432	15,479	15,45	24,504	28,155	21,558	25,567	-63,307	-63,602	-63,069	-63,393	18326,6	416971	2134200	1037830	4379136,74	99300236	511353127	247732616	440006,313	9939988,55	51157925,8	24789001,1
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'2016-05-08 0' '2016-05-08 0' '2016-05-08 0' '2016-05-08 0	18,113	18,1	18,123	18,109	-83,257	-80,694	-86,091	-82,189	-30,357	-30,373	-29,986	-30,221	10724,6	1021640	707940	3518353,02	133150989	328981776	237158928	529873,277	1336215,4	32916315,4	23231220,5	
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'2016-06-09 1' '2016-06-09 1' '2016-06-09 1' '2016-06-09 1	30,619	30,619	30,62	30,619	-158,953	-156,336	-156,602	-159,903	-29,406	-29,305	-29,493	-29,378	448338	367320	204311	9899494,56	420327259	344939502	191546295	993095,802	4203227,8	34457908	18196469,5	
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'2016-06-09 1' '2016-06-09 1' '2016-06-09 1' '2016-06-09 1	30,626	30,626	30,626	30,626	-116,026	-119,401	-113,06	-117,001	-30,688	-30,588	-30,777	-30,659	91010,6	430269	219680	202820	9483256,24	403571616	299262926	190253599	915405,113	40377250,7	29643591,3	19037332,5
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'2016-06-10 0' '2016-06-10 0' '2016-06-10 0' '2016-06-10 0	30,628	30,628	30,628	30,628	-62,628	-61,889	-65,939	-63,948	-33,98	-33,798	-33,985	-33,87	69962	147178	367660	236796	6544194,52	138063912	339339028	216391247	656977,614	13801614,9	33952324,9	21653834,9
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'2016-06-10 0' '2016-06-10 0' '2016-06-10 0' '2016-06-10 0	30,606	30,605	30,605	30,612	-86,124	-82,756	-89,359	-85,773	-36,728	-36,728	-36,7	-36,7	8726,5	358740	458740	247038	8177555,54	255170923	336151334	231497962	86516,196	25534069,5	33634667,8	21650011,3
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'2016-06-10 0' '2016-06-10 0' '2016-06-10 0' '2016-06-10 0	30,582	30,584	30,581	30,583	-172,23	-168,877	-175,116	-171,279	-39,306	-39,205	-39,392	-39,277	7014,6	245129	269700	180250	6560465,85	229289023	252222782	168591410	656807,925	22944004,5	2528159,7	1687215,3
'2016-06-10 0' '2016-06-10 0' '2016-06-10 0' '2016-06-10 0	30,518	30,522	30,518	30,52	-68,037	-71,409	-65,158	-68,989	-42,901	-42,799	-42,987	-42,872	8466,8	362640	267603	1509711	598605,78	211194811						

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'2016-06-25 3	'2016-06-25 3	'2016-06-25 3	'2016-06-25 3	'2016-06-25 3	15,726	15,745	15,71	15,731	83,422	87,146	80,289	84,842	-55,542	-55,842	-55,289	-55,628	9870,4	87532	962130	50260	2441019,76	96071130,1	243284674	136169739	245664,353	16916914,6	24344064,9	1362864,1
'2016-06-25 4	'2016-06-25 4	'2016-06-25 4	'2016-06-25 4	'2016-06-25 4	15,654	15,673	15,638	15,659	69,142	72,902	66,056	70,215	-54,377	-54,687	-54,123	-54,466	10666,1	320888	939120	611900	2606352,01	78823868,2	227898281	150040500	262429,261	7891265,1	2280492,44	15016299,1
'2016-06-25 5	'2016-06-25 5	'2016-06-25 5	'2016-06-25 5	'2016-06-25 5	15,59	15,608	15,575	15,595	56,338	60,015	53,256	57,409	-53,313	-53,62	-53,058	-53,402	10867,4	103522	1079529	64950	2641300,92	61027144,1	261870636	169014637	265755,3	2620324,6	16914464,3	1031915,8
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'2016-06-25 7	'2016-06-25 7	'2016-06-25 7	'2016-06-25 7	'2016-06-25 7	15,479	15,497	15,465	15,485	33,833	37,138	30,416	34,504	-51,362	-51,68	-51,101	-51,458	11085,9	166430	1289500	714500	2645808,26	39969331	308040484	171326543	266478,25	4003255,23	20858064,62	17145747,5
'2016-06-25 8	'2016-06-25 8	'2016-06-25 8	'2016-06-25 8	'2016-06-25 8	15,426	15,443	15,412	15,431	22,172	25,84	19,144	23,235	-50,382	-50,703	-50,116	-50,475	10993,2	148759	1312520	738560	2520773,51	35476975,9	311672540	178662776	253665,045	3553653,85	31193910,8	17959939
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'2016-06-25 10	'2016-06-25 10	'2016-06-25 10	'2016-06-25 10	'2016-06-25 10	18,783	18,82	18,751	18,793	49,067	45,547	-52,004	48,051	-25,352	-25,16	-25,513	-25,296	6884,2	200809	554460	317049	248753,26	73685832,7	48395169	111974367	244433,71	7377167,32	19509479,5	1128001,6
'2016-06-25 11	'2016-06-25 11	'2016-06-25 11	'2016-06-25 11	'2016-06-25 11	18,666	18,703	18,634	18,677	59,897	55,495	-62,806	58,877	-51,948	-51,669	-51,891	-51,623	7457,3	244107	5975650	34142	260173,35	85389167,8	207488342	19305559	261708,33	8548157,41	2354732,7	1591466,3
'2016-06-25 12	'2016-06-25 12	'2016-06-25 12	'2016-06-25 12	'2016-06-25 12	18,548	18,586	18,516	18,559	70,707	67,234	-73,621	69,707	-65,55	-65,355	-66,713	-66,494	8157,9	277247	676120	377443	2486548,8	95772036,2	231802500	251343,139	282330,176	9586989,94	2319645,73	1301915,8
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'2016-06-25 15	'2016-06-25 15	'2016-06-25 15	'2016-06-25 15	'2016-06-25 15	18,069	18,107	18,035	18,08	114,092	-110,655	-117,063	-113,091	-99,038	-98,836	-99,212	-98,779	6051,4	163378	712200	399702	1970200,04	3556674,6	231651044	130657148	191908,07	536886,381	23180324,5	13077145,3
'2016-06-25 16	'2016-06-25 16	'2016-06-25 16	'2016-06-25 16	'2016-06-25 16	17,947	17,986	17,913	17,975	124,943	-121,478	-127,902	-134,806	-99,679	-99,473	-99,855	-99,269	6501,7	142849	6501,7	15135	1804281,71	47990337,2	201574032	100876592	181771,407	4805961,22	201716009	10097702,9
'2016-06-25 17	'2016-06-25 17	'2016-06-25 17	'2016-06-25 17	'2016-06-25 17	17,701	17,74	17,668	17,712	146,597	-143,178	-149,522	-145,627	-130,982	-130,774	-131,161	-130,923	5459,55	167826	571200	296608	1710615,69	5281611,77	178859720	93050362,1	173968,474	5288879,44	17719395,6	9301468,27
'2016-06-25 18	'2016-06-25 18	'2016-06-25 18	'2016-06-25 18	'2016-06-25 18	17,575	17,615	17,54	17,587	157,664	-154,133	-160,694	-156,643	-131,661	-131,444	-131,849	-131,598	6364,23	155595	582100	29263	1986938,85	6689589,59	180326909	90564721,0	17299,069	6897838,02	18046115,5	9065988,56
'2016-06-25 19	'2016-06-25 19	'2016-06-25 19	'2016-06-25 19	'2016-06-25 19	17,45	17,49	17,416	17,462	168,535	-165,026	-171,43	-167,513	-132,337	-132,118	-132,518	-132,273	6656,1	638760	630860	302070	2026799,09	87707370,8	191350598	97687683	204103,566	8780102,3	19148892,7	978652,01
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'2016-06-25 25	'2016-06-25 25	'2016-06-25 25	'2016-06-25 25	'2016-06-25 25	16,631	16,674	16,595	16,643	121,76	125,374	118,796	122,771	-36,877	-36,632	-37,079	-36,809	7140,6	296504	799740	473190	1975019,7	82343716,9	220243618	130625454	198907,324	8252551,05	22039202,4	13073974,6
'2016-06-25 26	'2016-06-25 26	'2016-06-25 26	'2016-06-25 26	'2016-06-25 26	16,5	16,543	16,465	16,512	114,625	114,434	107,934	111,862	-37,623	-37,377	-37,824	-37,554	6715,2	275826	725280	43187	1844548,2	71317166	196620670	118670685	188321,961	732268,63	19676089,2	11821544,2
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'2016-06-25 30	'2016-06-25 30	'2016-06-25 30	'2016-06-25 30	'2016-06-25 30	15,969	16,011	15,933	15,981	66,877	70,393	63,9	67,894	-40,732	-40,477	-40,948	-40,658	9050,1	29512	623860	427670	2307855,6	74729719,5	209145502	10923051	202428,823	746166,58	2092901,4	10912816,1
'2016-06-25 31	'2016-06-25 31	'2016-06-25 31	'2016-06-25 31	'2016-06-25 31	15,833	15,877	15,797	15,846	55,783	59,389	52,801	56,81	-41,543	-41,278	-41,763	-41,468	9727,5	275642	858160	527440	348527,53	69483595,3	214497110	132437924	245144,332	6956695,21	21429505,5	13253006,6
'2016-06-25 32	'2016-06-25 32	'2016-06-25 32	'2016-06-25 32	'2016-06-25 32	15,698	15,743	15,662	15,711	44,728	48,359	41,786	45,783	-42,362	-42,092	-42,582	-42,283	9833,6	234849	1009960	607650	242326,55	58205457,4	247741415	149898064	243883,34	5828174,94	2478988,13	

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'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	15,895	15,938	15,859	15,908	-111,929	-108,419	-114,883	-110,867	-41,242	-40,977	-41,465	-41,161	7072,7	158549	1170040	609620	1786924,94	40274592,2	219827948	154273159	180029,25	49383005,45	21896612,6	15439736,5
'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	15,76	15,803	15,723	15,772	-122,887	-119,373	-125,872	-121,858	-42,076	-41,807	-42,306	-42,001	6369,1	146232	979600	546280	1581941,77	36519220,6	241749328	135890419	194591,93	3657965,17	24190481,1	136006901
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'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	14,18	14,226	14,142	14,193	-110,803	-114,518	-117,807	-113,86	-52,601	-52,267	-52,871	-52,506	8945,3	270072	819500	653540	1708170,36	51269024,7	174504653	131569337	171214,006	5133462,26	1476365,3	14138404,1
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'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	13,489	13,535	13,451	13,502	-53,855	-57,348	-60,378	-56,391	-57,231	-56,979	-57,529	-57,164	12784,1	243875	144280	860090	222790,63	42718414,2	267192062	149907498	223870,301	4273777,86	20735552,2	1500299,3
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'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	12,764	12,811	12,725	12,777	-25,261	-28,759	-32,159	-28,164	-63,546	-63,158	-63,867	-63,44	16419,6	180549	1815220	1094460	3382180,79	29632012,6	293903603	178672487	23975,234	2968644,79	29410207,7	17880615,6
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'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	11,526	11,569	11,49	11,539	-125,181	-129,201	-133,275	-129,276	-73,836	-73,505	-74,099	-73,738	12722,7	230009	1571180	986510	160193,85	30784809,6	207427341	131352347	170319,46	3084029,29	20757136,4	13146668,7
'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	11,382	11,405	11,327	11,374	-144,747	-149,441	-154,083	-149,204	-75,006	-74,71	-75,235	-74,922	12490,6	217240	1582780	972460	161636,41	28257281,2	203072144	125805885	162633,918	2031043,88	20321464,8	12591724,8
'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	11,089	11,129	11,054	11,1	-179,176	-175,16	-179,255	-176,246	-76,545	-76,36	-76,685	-76,494	12259,2	276244	1569000	941950	154673,82	34214101,4	191175546	116057660	151974,17	3472759,43	1918500,69	11616539
'2016-07-09 0' '2016-07-09 0' '2016-07-09 0' '2016-07-09 0	10,962	11,002	10,929	10,974	-160,919	-166,777	-172,656	-168,599	-76,989	-76,872	-77,07	-76,958	136086	320804	1632180	930100	157039,12</							

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'2016-07-19 1 '2016-07-19 1 '2016-07-19 1 '2016-07-19 1	9,12	9,126	9,115	9,122	3,876	7,596	0,778	4,928	-44,539	-45,202	-43,985	-44,727	16991,9	1514764	1044304	1413291,09	12615258,5	161566963	119019856	142517,928	126050,675	16169407,2	11912895,2	
'2016-07-19 1 '2016-07-19 1 '2016-07-19 1 '2016-07-19 1	9,083	9,089	9,078	9,085	-19,342	-15,694	-22,446	-1,983	-40,338	-41,005	-39,768	-40,529	17272,6	119533	1774640	1434710	142504,86	9874611,69	145918591	118416892	143694,221	196603,558	14869338,8	11852580,2
'2016-07-19 1 '2016-07-19 1 '2016-07-19 1 '2016-07-19 1	9,048	9,053	9,043	9,049	-42,303	-38,684	-45,455	-41,269	-36,078	-36,756	-35,485	-36,272	16864,3	125938	2121000	1414240	1380671,91	10321476,6	173446576	115804195	139623,788	1035360,37	17357827,7	115911860,8
'2016-07-19 1 '2016-07-19 1 '2016-07-19 1 '2016-07-19 1	9,014	9,019	9,014	9,016	-65,279	-61,667	-68,376	-64,253	-31,721	-32,412	-31,128	-31,918	16766,4	163254	1962850	1327520	1364013,12	13279465,8	157187404	139796228	1313590,68	1571277,8	10801560,6	
'2016-07-19 1 '2016-07-19 1 '2016-07-19 1 '2016-07-19 1	8,983	8,988	8,98	8,985	-88,39	-84,708	-91,437	-87,334	-27,256	-27,973	-26,662	-27,462	12282,8	174755	2078800	1448080	991151,813	14117433,1	167635264	116960335	101010,747	1415000,63	1676473,8	11706849,8
'2016-07-21 1 '2016-07-21 1 '2016-07-21 1 '2016-07-21 1	10,006	10,01	10,003	10,007	-125,138	-121,239	-128,237	-124,094	-39,931	-39,975	-40,408	-39,771	10129,4	179719	1606020	9997880	1014155,89	18007861,8	160698376	80100022,4	10022,647	1805029,74	16082514,3	1100895,21
'2016-07-21 1 '2016-07-21 1 '2016-07-21 1 '2016-07-21 1	9,892	9,897	9,888	9,894	136,123	140,089	132,89	137,292	-54,703	-54,131	-55,168	-54,535	376545	1674100	887920	1161166,56	36882821,2	163681162	86919896,3	117194,23	3694354,33	1606893,4	8701281,69	
'2016-07-21 1 '2016-07-21 1 '2016-07-21 1 '2016-07-21 1	9,732	9,739	9,734	9,741	23,338	27,895	19,517	23,755	-69,273	-69,774	-69,674	-69,211	166715	1581160	1164880	1560933,37	23417621,1	149500709	105737324	157393,144	2346601,34	14917230,2	10589011,7	
'2016-07-21 1 '2016-07-21 1 '2016-07-21 1 '2016-07-21 1	9,68	9,687	9,677	9,682	-15,337	-10,251	-25,424	-13,917	-72,905	-72,486	-73,769	-72,719	17996,1	201467	1600600	1528350	1667087,51	18905254,1	149557029	117537308	167999,908	1848473,43	1464933,1	11764572,3
'2016-07-21 1 '2016-07-21 1 '2016-07-21 1 '2016-07-21 1	9,498	9,505	9,493	9,5	-171,905	-166,136	-176,696	-170,256	-75,756	-76,005	-75,528	-75,83	12602,7	167175	1782020	946210	1136941,82	11503429,6	160590284	8395452,5	114975,74	1514229,29	167017108	8548786,22
'2016-07-21 1 '2016-07-21 1 '2016-07-21 1 '2016-07-21 1	9,312	9,319	9,307	9,314	58,538	62,841	55,109	59,854	-63,186	-63,785	-62,702	-63,37	15345	221430	2067400	1064160	1330616,26	19464292,2	179078703	93216514,2	1324125,15	1590841,05	17021252,3	9242129,57
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'2016-07-22 1 '2016-07-22 1 '2016-07-22 1 '2016-07-22 1	8,998	8,993	8,995	9	-149,411	-145,625	-152,447	-148,232	-27,021	-27,746	-27,467	-27,252	99629,3	13099720	133899730	11000	785051,272	25924233,2	105969478	65691000	79931,1584	2597514,9	10607241,9	6577705
'2016-07-24 1 '2016-07-24 1 '2016-07-24 1 '2016-07-24 1	9,692	9,698	9,687	9,693	-25,371	-20,803	-29,11	-24,002	-68,753	-68,243	-69,162	-68,602	16758,4	174383	1406200	1205530	1547198,02	16400931,1	131938061	113264666	158674,473	1644412,92	1520292,5	11337100,9
'2016-07-24 1 '2016-07-24 1 '2016-07-24 1 '2016-07-24 1	9,531	9,537	9,525	9,533	-169,686	-163,383	-174,89	-167,757	-77,055	-77,039	-77,045	-77,053	176620	176620	91950	1150222,55	14240816,5	159882140	81025995,4	111573,551	1427855,35	1600085,8	1111609,2	
'2016-07-24 1 '2016-07-24 1 '2016-07-24 1 '2016-07-24 1	9,362	9,369	9,357	9,364	44,831	49,359	41,015	46,151	-68,41	-68,931	-67,96	-68,563	16093,9	163150	1653340	1047570	1410582,76	14321007	144755619	94223128,9	142245,956	1435885,01	9432019,5	1439285,4
'2016-07-24 1 '2016-07-24 1 '2016-07-24 1 '2016-07-24 1	9,196	9,201	9,191	9,197	-68,999	-65,147	-72,229	-67,921	-51,746	-52,395	-51,198	-51,928	19762,9	1703180	1411260	1617243,8	13257167	143875247	119371158	168417,146	1329357,14	14495919,4	119498041,5	
'2016-07-24 1 '2016-07-24 1 '2016-07-24 1 '2016-07-24 1	9,152	9,158	9,148	9,154	-99,888	-95,932	-103,108	-98,704	-46,292	-47,092	-45,82	-46,602	10232,6	129160	1998440	1291610	858279,539	18886955,2	167241258	108231385	86674,3876	1839043,41	16370758	10833541,9
'2016-07-24 1 '2016-07-24 1 '2016-07-24 1 '2016-07-24 1	9,03	9,034	9,027	9,031	162,238	165,988	159,15	163,382	-28,341	-28,443	-28,644	-28,521	56347	182023	1648800	1072850	495997,944	147069935,6	134193975	87500531,3	4673,731	174528,52	13430870	8759407,3
'2016-07-26 1 '2016-07-26 1 '2016-07-26 1 '2016-07-26 1	8,52	8,537	8,567	8,573	-166,155	-160,38	-171,139	-164,456	-75,956	-75,696	-76,159	-75,882	10795	142814	1646180	794570	989072,271	14015936,4	15067072	72816425,4	99901,7483	1403337,43	15079347	8230781,19
'2016-07-27 1 '2016-07-27 1 '2016-07-27 1 '2016-07-27 1	9,742	9,745	9,748	9,745	134,634	-130,779	-137,722	-133,472	-40,153	-41,039	-39,437	-40,421	12535,4	49599	549594	97859	888502,043	31988407	129821886,7	89792,8082	3004496,53	1029350,63	7290178,19	
'2016-07-29 1 '2016-07-29 1 '2016-07-29 1 '2016-07-29 1	13,125	13,142	13,111	13,13	115,08	118,54	112,146	116,115	-29,426	-29,078	-29,722	-29,322	4343,03	153751	830860	496950	748154,777	26554667,9	142826877	85672639,5	75680,4371	2660619,91	14294638,7	8576519,9
'2016-07-29 1 '2016-07-29 1 '2016-07-29 1 '2016-07-29 1	12,62	12,641	12,603	12,626	21,643	25,147	18,735	22,703	-39,214	-38,833	-39,531	-39,099	9190,6	67504	1318068	792960	1463735,39	10786793,6	208179479	12641013	147583,889	1081963,69	12652289,4	
'2016-07-29 1 '2016-07-29 1 '2016-07-29 1 '2016-07-29 1	11,845	11,87	11,825	11,853	-100,477	-96,876	-103,466	-99,423	-53,054	-52,633	-53,404	-52,931	9048,9	86239	1209900	759060	1269597,09	12150807,8	169181073	106643079	128086,473	1182856,58	16931141,4	1067463,47
'2016-07-30 1 '2016-07-30 1 '2016-07-30 1 '2016-07-30 1	11,775	11,779	11,729	11,757	-114,504	-110,884	-117,511	-113,444	-54,701	-54,275	-55,063	-54,576	7555	79459	1118600	780620	1043062,19	11017040	153888177	107902979	105237,523	1105023,23	11004922,7	10800667,2
'2016-07-30 1 '2016-07-30 1 '2016-07-30 1 '2016-07-30 1	11,035	11,062	11,013	11,043	141,767	145,7	138,497	142,898	-66,951	-66,495	-67,329	-66,82	8001,6	136909	1185380	784500	974364,634	16752329,2	143770199	95648698	98423,5625	1679419,99	14389011,3	9574149,56
'2016-07-30 1 '2016-07-30 1 '2016-07-30 1 '2016-07-30 1	10,308	10,334	10,285	10,315	-19,52	25,091	14,682	21,142	-78,513	-78,173	-78,788	-78,417	12681	155226	1761780	1052740	1347411,93	16573683	18636247	112010720	135002,536	1667154,07	18649876,2	1121455,55
'2016-07-30 1 '2016-07-30 1 '2016-07-30 1 '2016-07-30 1	9,361	9,365	9,34	9,368	160,168	164,683	156,655	161,511	-71,333	-71,933	-70,826	-71,513	10700,9	136884	1663100	7835100	9377013	12057380,5	145081526	90844167,8	94738,5401	1209210,43	14520197,6	90939948
'2016-07-30 1 '2016-07-30 1 '2016-07-30 1 '2016-07-30 1	8,363	8,374	8,354	8,366	-46,651	-43,089	-49,807	-45,634	-30,384	-31,239	-29,624	-30,629	16240,9	189395	1897740	1427310	1135884,79	12898235,1	132441977	99897364,1	114654,258	1293414,92	13255706	999731,28
'2016-08-01 1 '2016-08-01 1 '2016-08-01 1 '2016-08-01 1	12,951	12,931	12,939	12,956	-33,85	-38,637	-36,814	-32,829	-26,358	-26,853	-26,665	-26,252	520,67	111770	75822	48113	87342,462	18689146,8	126939464	12016988,9	18820,8342	173273,77	1270521,32	703078,45
'2016-08-01 1 '2016-08-01 1 '2016-08-01 1 '2016-08-01 1	12,809	12,825	12,796	12,814	-66,092	-62,627	-68,994	-65,068	-29,715	-29,352	-30,019	-29,607	6539,1	61598	943000	521160	1072873,28	24999801,2	154040572	85573740,3	10823,124	2504908,03	15452883,2	6856224,64
'2016-08-02 1 '2016-08-02 1 '2016-08-02 1 '2016-08-02 1	12,328	12,348	12,312	12,334	-161,508	-157,972	-164,442	-160,473	-39,932	-39,945	-40,254	-39,818	4347,26	125985	925500	512560	660694,766	19165106,8	140292236	68868834,1	16688,320	1920888,48	14041086,1	687711,27
'2016-08-02 1 '2016-08-02 1 '2016-08-02 1 '2016-08-02 1	11,127																							

'2016-08-29 1 '2016-08-29 1 '2016-08-29 1 '2016-08-29 1	15,402	15,422	15,385	15,408	168,605	171,988	165,678	169,586	-29,71	-29,511	-29,882	-29,652	2316,81	78207	543680	291785	549597,384	18600603	128688091	69271645,1	55701,0868	1864373,15	12880153,2	6935487,47
'2016-08-29 2 '2016-08-29 2 '2016-08-29 2 '2016-08-29 2	14,777	14,803	14,754	14,785	75,791	79,22	72,862	76,792	-35,413	-35,192	-35,602	-35,348	2488,54	66817	624660	251484	543396,92	14641529,6	135976311	54973453	55076,8466	1467979,39	13609292	5504759,71
'2016-08-30 0 '2016-08-30 0 '2016-08-30 0 '2016-08-30 0	13,964	13,997	13,935	13,974	-17,626	-14,159	-20,64	-16,598	-41,783	-41,535	-42	-41,71	4992,7	47866	892580	459990	973543,029	9377715,69	173324956	89823478,2	98340,9857	940833,874	17345660,8	8991825,35
'2016-08-30 1 '2016-08-30 1 '2016-08-30 1 '2016-08-30 1	12,105	12,153	12,065	12,12	179,448	-176,896	176,392	-179,451	-54,581	-54,266	-54,846	-54,486	3966,52	84644	938020	467880	581218,241	12501530,2	136542154	68728951,9	58884,2008	1253688,77	13665900,6	6881185,48
'2016-08-31 '2016-08-31 '2016-08-31 '2016-08-31	8,926	8,989	8,872	8,944	-59,115	-53,582	-63,873	-57,546	-75,018	-74,732	-75,247	-74,939	12863,2	79843	1487680	927020	1024855,86	6451483,75	117098839	74157091	103497,937	647688,352	11720705,2	7424320,55
'2016-08-31 1 '2016-08-31 1 '2016-08-31 1 '2016-08-31 1	7,125	7,195	7,066	7,145	135,428	140,971	130,865	136,974	-70,634	-71,318	-70,033	-70,83	12558,3	135873	2035000	1004910	637529,948	7033876,86	101604204	51301685,5	64551,4496	706039,832	10170500,3	5137331,07
'2016-09-01 1 '2016-09-01 1 '2016-09-01 1 '2016-09-01 1	15,521	15,541	15,503	15,527	65,784	-176,812	176,809	-179,22	-26,707	-26,512	-26,877	-26,65	2166,66	73507	466080	251612	521951,516	17753607,7	112019070	60660565,7	52917,6137	1779574,27	11212490,9	6073845,06
'2016-09-01 2 '2016-09-01 2 '2016-09-01 2 '2016-09-01 2	14,876	14,903	14,852	14,884	87,131	90,487	84,114	88,097	-32,253	-32,042	-32,443	-32,192	2308,02	75201	558840	249740	510754,154	16702097,7	123269991	55325765,3	51790,086	1674296,59	12338101,8	5540014,66
'2016-09-02 0 '2016-09-02 0 '2016-09-02 0 '2016-09-02 0	12,133	12,182	12,092	12,148	-168,103	-164,508	-171,166	-167,039	-51,126	-50,815	-51,393	-51,034	3877,51	75908	921180	451672	570807,041	11264832,5	134691682	66655000,4	57836,2219	1129839,56	13480773,9	6673664,29
'2016-09-02 1 '2016-09-02 1 '2016-09-02 1 '2016-09-02 1	6,97	7,046	6,907	6,992	149,014	155,346	143,791	150,831	-73,122	-73,703	-72,594	-73,295	12584,3	106463	1276340	946080	611356,62	5285474,45	60889904,4	46252019,6	61917,555	530846,461	6096793,64	4632002,84
'2016-09-05 0 '2016-09-05 0 '2016-09-05 0 '2016-09-05 0	14,803	14,837	14,775	14,813	5,348	8,788	2,467	6,314	-32,819	-32,608	-32,997	-32,76	3400,22	45168	708960	351695	745086,159	9943128,55	154766411	9717064,5	75371,7996	997466,128	15489081,6	7725851,13
'2016-09-05 1 '2016-09-05 1 '2016-09-05 1 '2016-09-05 1	12,905	12,953	12,864	12,919	-154,646	-151,131	-157,577	-153,612	-43,746	-43,479	-43,97	-43,667	3075,97	64579	751420	341123	512269,045	10835078,1	124346857	56933620,1	51942,6342	1086799,48	12445836,8	5700807,44
'2016-09-05 2 '2016-09-05 2 '2016-09-05 2 '2016-09-05 2	9,637	9,704	9,582	9,657	-5,621	-1,55	-9,015	-4,455	-63,505	-63,061	-63,876	-63,378	11904,2	51071	1646360	919650	1105564,11	4809234,32	1511160089	85764396,9	111607,869	483116,428	15128303,6	8585700,6

Datetime				ft distance from comet in km at the time of species measurement (dub-spectracraft longitude at time of species measurement)										derived 'abundance' on spectra (particles/20s)				abundance scaled by comocentric distance (particles/20s) (uncertainty+10% uncertainty in sign)									
time_O2	time_H2O	time_CO2	time_CO	d_O2	d_H2O	d_CO2	d_CO	lon_O2	lon_H2O	lon_CO2	lon_CO	lat_O2	lat_H2O	lat_CO2	lat_CO	O2 signal	H2O signal	CO2 signal	CO signal	O2_scaled	H2O_scaled	CO2_scaled	CO_scaled	Uncertainty	Uncertainty	Uncertainty	Uncertainty
2016-07-02	2016-07-02	2016-07-02	2016-07-02	18.783	18.82	18.751	18.793	-49.067	-45.547	-52.004	-48.051	-25.352	-25.16	-25.13	-25.296	6884.2	208039	554480	317049	2428753.26	73685832.7	194955169	111974367	244443.771	773717.32	19509479.5	11208018.5
2016-07-02	2016-07-02	2016-07-02	2016-07-02	18.666	18.703	18.634	18.677	-59.893	-56.405	-62.806	-58.877	-25.948	-25.755	-26.109	-25.891	7467.3	224407	597560	341242	2601753.35	85389167.8	207488342	119035559	261788.33	8548157.41	20732345.7	11914466.3
2016-07-02	2016-07-02	2016-07-02	2016-07-02	18.548	18.586	18.516	18.559	-70.707	-67.234	-73.621	-69.707	-26.55	-26.355	-26.713	-26.494	8157.9	274747	676120	377443	2806548.5	95772036.2	23180256	130005139	28230.136	9586899.94	2319387.47	11301915.8
2016-07-02	2016-07-02	2016-07-02	2016-07-02	18.429	18.467	18.397	18.44	-81.585	-78.094	-84.492	-80.528	-27.162	-26.965	-27.327	-27.105	8419.1	296953	744560	424988	2895962.44	101269908	251966041	144510200	287627.209	101370564.1	25215478.5	14463041.0
2016-07-02	2016-07-02	2016-07-02	2016-07-02	18.189	18.228	18.156	18.2	-103.341	-99.796	-106.243	-102.529	-28.41	-28.204	-28.579	-28.349	6846	202610	794260	446100	264928.73	67319195.4	261820133	147766136	272997.841	6740214.36	26198194.2	1478772.33
2016-07-02	2016-07-02	2016-07-02	2016-07-02	18.069	18.107	18.035	18.08	-114.092	-110.655	-117.063	-113.091	-29.038	-28.836	-29.212	-28.979	6055.4	163378	712200	399702	197020.04	53565674.6	231651044	130657148	199107.08	5363886.31	23180324.3	13071745.3
2016-07-02	2016-07-02	2016-07-02	2016-07-02	17.947	17.986	17.913	17.955	-124.943	-121.478	-127.907	-124.806	-29.679	-29.473	-29.855	-30.269	5601.71	148439	628200	317135	1804281.71	47990337.2	201574032	100876592	18171.407	4036938.21	20171600.9	10097702.9
2016-07-02	2016-07-02	2016-07-02	2016-07-02	17.701	17.74	17.668	17.712	-146.597	-143.178	-149.522	-145.627	-30.982	-30.774	-31.161	-30.923	5459.55	167826	572100	296608	170615.69	52816117.7	178585720	93050362.1	17269754.9	4288972.4	17871935.6	9314682.47
2016-07-02	2016-07-02	2016-07-02	2016-07-02	17.575	17.615	17.54	17.587	-157.554	-154.133	-160.594	-156.643	-31.651	-31.444	-31.849	-31.598	6364.4	215595	585140	322893	198339.85	66896590.8	180326099	90564701.1	187986.069	6697836.02	18046119.5	9065988.56
2016-07-02	2016-07-02	2016-07-02	2016-07-02	17.45	17.49	17.418	17.462	-168.535	-165.026	-171.43	-167.513	-32.337	-32.118	-32.518	-32.273	6656.1	286719	630806	320370	2026799.09	87073707.8	31550598	187035058	240103.566	8870102.3	19148892.7	937562.01
2016-07-02	2016-07-02	2016-07-02	2016-07-02	17.293	17.333	17.258	17.305	-177.91	-174.379	-179.943	-175.933	-33.19	-32.968	-33.379	-33.125	8067	410139	685700	373233	2412419	123219205	204227903	11769483	242795.906	12333014.9	20437081.2	1187520.54
2016-07-02	2016-07-02	2016-07-02	2016-07-02	17.149	17.191	17.114	17.161	-165.57	-169.187	-172.583	-166.593	-33.98	-33.747	-34.172	-33.914	8068.7	488650	760606	423550	2372909.47	144410925	22277170	124735462	238831.372	14433014.2	2242062.6	1248471.72
2016-07-02	2016-07-02	2016-07-02	2016-07-02	17.02	17.063	16.985	17.032	-154.618	-158.264	-161.466	-155.643	-34.69	-34.452	-34.884	-34.623	8307.2	506300	821000	467124	24069133.02	147407204	236850475	135507545	242194.57	14752861.5	23700437.4	13562395.3
2016-07-02	2016-07-02	2016-07-02	2016-07-02	16.892	16.935	16.858	16.904	-143.776	-147.391	-150.469	-144.81	-35.402	-35.164	-35.595	-35.334	8305.6	462135	869940	501400	236647.11	132537649	246945929	143277651	285311.165	13265277.6	24710308.4	13592324.8
2016-07-02	2016-07-02	2016-07-02	2016-07-02	16.761	16.803	16.725	16.773	-132.71	-136.251	-139.697	-133.736	-36.139	-35.902	-36.341	-36.07	7191.1	385552	855780	507780	2020203.78	108857064	239385595	142855539	203441.717	10896135.8	23958381.6	14295706.0
2016-07-02	2016-07-02	2016-07-02	2016-07-02	16.631	16.674	16.595	16.643	-121.76	-125.374	-128.796	-122.771	-36.877	-36.632	-37.079	-36.809	7140.6	296504	799740	451590	1975019.7	82434716.9	220243618	130625454	198097.324	825259.05	2302902.4	13073974.6
2016-07-02	2016-07-02	2016-07-02	2016-07-02	16.5	16.543	16.465	16.512	-110.85	-114.434	-117.934	-111.862	-37.623	-37.377	-37.824	-37.554	6775.2	725280	817580	433187	1844548.2	73137166	196620670	118106765	185126.361	7322268.63	19676008.2	1182544.2
2016-07-02	2016-07-02	2016-07-02	2016-07-02	16.369	16.411	16.333	16.381	-99.919	-103.456	-106.922	-100.949	-38.38	-38.134	-38.59	-38.309	6315.7	262598	651780	401325	1692254.94	70723135.2	17387323	107690411	170526.361	7800723.3	174000518.4	10779418.5
2016-07-02	2016-07-02	2016-07-02	2016-07-02	16.238	16.279	16.199	16.248	-88.88	-92.455	-95.836	-89.911	-39.156	-38.903	-39.371	-39.083	7255.4	271943	636360	380600	1912579.28	72066483.4	166985701	100477540	192640.888	7215137.54	16711492.4	10507768.8
2016-07-02	2016-07-02	2016-07-02	2016-07-02	16.102	16.146	16.067	16.115	-77.877	-81.475	-84.95	-79.91	-39.938	-39.681	-40.149	-39.865	8129.5	289638	636360	420445	2107771.27	75506690.7	180001778	104512240	121228.943	5759358.52	18013594.3	10641467.1
2016-07-02	2016-07-02	2016-07-02	2016-07-02	15.969	16.011	15.933	15.981	-66.877	-70.393	-73.93	-67.894	-40.732	-40.477	-40.948	-40.658	9050.1	295112	823860	427670	2307856.6	74729719.5	209145502	109223651	232403.824	784616.58	20929021.1	10932816.1
2016-07-02	2016-07-02	2016-07-02	2016-07-02	15.833	15.877	15.797	15.846	-55.781	-59.389	-62.901	-56.84	-41.543	-41.278	-41.763	-41.468	9727.5	275642	858160	400445	2438527.53	69483595.3	214149717	132437924	35454.332	695669.21	21429605.5	13255300.6
2016-07-02	2016-07-02	2016-07-02	2016-07-02	15.698	15.743	15.662	15.711	-44.728	-48.359	-51.786	-45.783	-42.362	-42.092	-42.582	-42.283	9833.6	234849	1039960	607650	2423266.55	58205457.4	247741415	149989604	234883.34	582814.9	24789881.3	15011207.5
2016-07-02	2016-07-02	2016-07-02	2016-07-02	15.564	15.607	15.527	15.576	-33.744	-37.393	-40.794	-34.764	-43.187	-42.919	-43.41	-43.11	9934.2	187370	1107900	672780	240641.69	45639294	274333727	163224951	242195.44	4570685.08	2749993.5	1635211
2016-07-02	2016-07-02	2016-07-02	2016-07-02	15.427	15.471	15.391	15.441	-22.647	-26.215	-29.694	-23.724	-44.031	-43.758	-44.257	-43.948	10245.3	153379	1233720	724110	2438302.81	37190249.7	292247148	172645551	245391.787	3725123.35	2942180	1727694.6
2016-07-02	2016-07-02	2016-07-02	2016-07-02	15.291	15.335	15.254	15.304	-11.608	-15.14	-18.553	-12.635	-44.802	-44.608	-45.119	-44.802	10465.7	133698	1324360	786710	2447034.31	31440719.2	308158066	184257250	346627.71	3149679.12	30835531	18439299.1
2016-07-02	2016-07-02	2016-07-02	2016-07-02	15.153	15.197	15.116	15.166	-0.432	-3.989	-7.539	-1.461	-45.754	-45.475	-45.996	-45.673	10555.7	133370	1350060	701740	2423730.26	30801642.7	308479875	161405502	349259.86	3085714.19	30865551.1	16152545.8
2016-07-02	2016-07-02	2016-07-02	2016-07-02	14.86	14.905	14.823	14.873	-23.285	-26.856	-29.233	-23.643	-47.435	-47.885	-48.578	-48.256	11825.6	156174	1295580	734990	2611334.26	3405495.6	285545445	16258429	3475436.64	28517442.6	16271800	16271800
2016-07-02	2016-07-02	2016-07-02	2016-07-02	14.725	14.771	14.688	14.738	-34.219	-30.553	-37.229	-33.164	-48.53	-48.231	-48.776	-48.444	12326	173600	1288460	779590	2672552.65	37876471.8	277968389	169333687	268894.072	3789380.5	26713566.5	16964381.5
2016-07-02	2016-07-02	2016-07-02	2016-07-02	14.591	14.636	14.553	14.604	-45.108	-41.439	-48.153	-44.049	-49.424	-49.122	-49.676	-49.337	12675.4	215005	1242380	785960	2688558.42	46056757.7	263123249	167627046	271498.548	4612462.28	26328563.4	16775651.7
2016-07-02	2016-07-02	2016-07-02	2016-07-02	14.455	14.5	14.418	14.468	-56.058	-52.413	-59.07	-55.014	-50.333	-50.029	-50.585	-50.246	13214.9	256464	1218720	793950	2611124.04	53921556	253459929	166192015	277783.904	5399498.73	26352051.8	17662109.3
2016-07-02	2016-07-02	2016-07-02	2016-07-02	14.317	14.363	14.28	14.33	-67.262	-63.585	-70.285	-66.213	-51.273	-50.963	-51.528	-51.185	12909.5	292174	1239060	801470	2464143.98	60274260	256267133	164580983	266214.906	603518105	252826088	16470977.2
2016-07-02	2016-07-02	2016-07-02	2016-07-02	14.176	14.222	14.138	14.189	-78.724	-75.005	-81.832	-77.653	-52.245	-51.928	-52.514	-52.154	13112.2	309648	1275840	784330	2635014.29	62631040.7	255018783	157907371	265124.701	6271018.04	26511847.6	15830303.3
2016-07-02	2016-07-02	2016-07-02	2016-07-02	14.036	14.082	13.996	14.049	-90.176	-86.394	-93.416	-89.064	-53.225	-52.901	-53.494													

'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	15,485	15,529	15,449	15,498	-144,956	-141,43	-147,88	-143,924	-43,794	-43,516	-44,025	-43,713	5856,89	172441	920860	490428	1404395,69	41584119,7	219783130	117794922	141624,641	4164860,55	21993138,1	11790345,6
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	15,316	15,36	15,278	15,328	-158,584	-155,017	-161,584	-157,567	-44,88	-44,594	-45,122	-44,798	6633,1	230242	934900	499921	1555991,64	54320903	218221819	117455231	156846,558	5349460,57	12138654,2	11756360,8
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	15,16	15,204	15,122	15,173	-171,069	-167,494	-174,093	-170,032	-45,892	-45,601	-46,14	-45,808	7214,3	310822	823540	531470	1658030,83	71850115,8	188322914	122354986	16060,728	7193488,03	1884601,45	1224660,5
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	15,022	15,067	14,984	15,035	-177,924	-178,485	-174,912	-178,963	-46,798	-46,501	-47,048	-46,712	8184	389642	935660	586950	1848605,4	88454379,5	232531139	132680767	186039,512	885484,297	23268362,8	13279595,4
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	14,881	14,927	14,842	14,895	-166,686	-170,371	-163,596	-167,839	-47,736	-47,427	-47,997	-47,639	8846,5	438130	1026060	638200	1959005,77	97622080,1	203776809	142701011	97030,222	9772088,4	12891955,9	14282961,2
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	14,744	14,789	14,707	14,757	-155,811	-159,375	-152,854	-156,838	-48,657	-48,354	-48,91	-48,57	9265,2	443596	981480	667620	1041210,47	97020886,7	212290050	145256311	208831,244	9711938,58	2124357,5	1453763,8
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	14,459	14,505	14,422	14,473	-133,12	-136,713	-130,145	-134,17	-50,619	-50,305	-50,88	-50,527	8967,3	340447	932480	701960	1874277,78	71628355,1	193950323	147037967	108881,985	7171298,8	20490858,9	14715922,6
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	14,233	14,268	14,184	14,236	-122,222	-125,835	-119,167	-123,275	-51,58	-51,26	-51,852	-51,487	9213,3	275836	919200	685770	1889887,95	56943425	187546817	104900605	190323,527	5701888,58	14863876,5	14105878,3
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	14,18	14,226	14,142	14,193	-110,803	-114,518	-107,807	-111,86	-52,401	-52,267	-52,871	-52,506	8495,3	253032	872540	65140	1708170,36	51263024,7	17450465,2	131569337	17214,006	53136975,9	17463637,5	13168404,1
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	14,039	14	14,052	14,085	-99,534	-103,228	-96,455	-100,578	-53,62	-53,285	-53,901	-53,226	8954	254124	1018780	617080	1764775,39	50144955,2	199680880	121847817	177805,987	5048595,87	19982218,8	12195820,2
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	13,898	13,944	13,859	13,911	-88,235	-91,954	-85,16	-89,283	-54,555	-54,313	-54,939	-54,559	9401,8	279371	877660	626690	1815998,08	52646839,7	168612221	121274493	182947,498	527394,115	18874207,2	12138461,7
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	13,756	13,802	13,718	13,769	-76,82	-80,566	-73,738	-77,891	-55,712	-55,364	-56	-55,613	9973	269523	967460	637900	181766,22	51342838,9	182060032	120839813	190090,363	1541448,28	18219496,2	12094974
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	13,613	13,66	13,575	13,627	-65,318	-69,12	-62,227	-66,431	-56,789	-56,432	-57,08	-56,684	10703,7	296962	1087740	709530	198254,499	5541802,6	200494407	131756265	199762,682	5546624,17	20059987,0	13187105
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	13,489	13,535	13,451	13,502	-50,35	-54,378	-47,391	-51,622	-60,097	-59,729	-60,4	-59,993	12784,1	243875	1544920	860090	2223790,63	42718419,2	267192062	149907498	23270,760	428377,8	20253552,2	15002993,7
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	13,049	13,094	13,011	13,062	-18,859	-22,666	-15,671	-19,969	-61,221	-60,855	-61,529	-61,115	14233,8	207881	1695680	948500	2423680,24	35641787	287055000	161829128	34924,841	357014,78	22722451,7	16195634
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	12,764	12,811	12,725	12,777	-5,261	-9,227	-8,599	-14,164	-63,546	-63,158	-63,867	-63,444	14619,6	180549	1815220	109460	238120,79	2963210,67	293930633	78672487	23929,394	3968644,79	29410027,7	17808615,6
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	12,624	12,67	12,586	12,638	-17,441	-13,42	-20,759	-16,195	-64,714	-64,329	-65,031	-64,595	15443,1	215463	1864680	1126360	2461095,44	34588038,4	293739103	79901142	247678,332	3464685	29550090	18003527
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	12,484	12,53	12,446	12,498	-29,754	-25,69	-33,155	-28,527	-65,885	-65,5	-66,205	-65,768	15854,7	235752	1825300	1148780	2470599,05	3701327,62	282744293	179439441	248667,834	370741,47	282921244,3	179537390
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	12,344	12,39	12,307	12,358	-42,397	-38,239	-45,823	-41,147	-67,07	-66,682	-67,387	-66,954	16217,9	257140	1753400	1163200	247191,74	39474101,4	265270983	177640095	248691,177	39539298	2654383,8	1777737,8
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	12,207	12,252	12,117	12,22	-55,111	-50,917	-56,611	-53,895	-68,238	-67,856	-68,554	-68,127	16483,5	275715	1702320	1147020	2456220,33	41387993,3	25128743	171282661	247189,266	415232,68	2522875,8	17414353,6
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	12,067	12,112	12,03	12,081	-68,459	-64,089	-72,007	-67,108	-69,429	-69,044	-69,738	-69,31	16372,2	293451	1636180	1131710	2383996,79	4309421,3	236789442	165970599	239943,699	4311503,34	23694332	166099420
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	11,931	11,975	11,894	11,944	-81,797	-77,39	-85,493	-80,537	-70,209	-70,201	-70,88	-70,467	15425,9	280397	1599280	1088620	2198587,59	4200910,6	226245721	155018539	10270,618	402725,17	23699631,6	15546260,9
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	11,795	11,839	11,759	11,808	-95,723	-91,129	-99,5	-94,377	-71,706	-71,34	-72	-71,599	14670,5	276796	1587200	1046460	2040899,67	38796259,1	219468621	145652968	200525,599	388554,52	21961676,6	14577365,5
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	11,66	11,703	11,624	11,672	-110,102	-105,415	-114,117	-108,75	-72,996	-72,45	-73,084	-72,697	13887,7	251699	1557700	1010060	1888110,59	34454942,8	210472337	137606114	190185,144	345136,12	21061741,3	13772342
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	11,526	11,569	11,49	11,539	-125,181	-120,201	-129,275	-123,676	-73,836	-73,505	-74,099	-73,738	17222,7	230009	1571180	986510	1690193,85	30784809,6	207427341	131352347	170319,46	3884029,37	2075136,4	13416695,7
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	11,362	11,405	11,327	11,374	-144,747	-139,441	-149,083	-143,204	-75,006	-74,711	-75,235	-74,922	12499,6	217240	1582780	972660	1613636,41	28257281,2	203072144	125805085	162633,93	3034028,3	20321464,8	12591724,6
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	11,099	11,129	11,054	11,1	-179,176	-175,16	-174,355	-179,206	-76,545	-76,36	-76,685	-76,494	12099,2	276244	1629000	941950	1507463,82	34214101,4	191717547	116057660	151974,17	3427259,43	19186500,9	11616539
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	10,962	11,002	10,929	10,976	-160,919	-166,777	-159,967	-162,599	-76,989	-76,872	-77,07	-76,958	12068,6	320804	1563180	930100	1570394,12	38831400,7	193877555	112010712	158292,566	3889371,55	19401795,5	112116540
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	10,838	10,877	10,805	10,849	-142,088	-148,133	-137,028	-143,81	-77,7	-77,16	-77,213	-77,191	13738,6	353589	1610300	953420	1613766,79	41832806,6	197999345	112218298	162647,02	4189748,49	18813645,8	11232421,1
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	10,716	10,755	10,683	10,727	-122,936	-128,443	-117,796	-124,701	-77,447	-77,195	-77,086	-77,164	14488,8	34271	1635000	989150	1662868,73	4301935,9	186516010	113820035	16796,395	433577,25	1867324	1132872,8
'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	'2016-07-09 1'	10,595	10,634	10,563	10,606	-105,619	-109,901	-98,555	-105,482	-76,81	-76,52	-76,763	-76,855	14674,2	375952	1708920	1007140	1647280,01	1427678	80676114	10267589	166007,249	4253784,91	19081419,9	11339683,3
'2016-07-10 1'	'2016-07-10 1'	'2016-07-10 1'	'2016-07-10 1'	'2016-07-10 1'	9,034	9,033	9,033	9,035	-155,064	-149,913	-151,912	-156,137	-81,453	-80,739	-80,735	-81,697	17187,19	244750	1490720	1254170	586566,259	19970398	12163541	102379433	59422,800	2001508,63	1214752	10248061,6
'2016-07-10 1'	'2016-07-10 1'	'2016-07-10 1'	'2016-07-10 1'	'2016-07-10 1'	9,033																							

'2016-07-19 1'	'2016-07-19 1'	'2016-07-19 1'	'2016-07-19 1'	'2016-07-19 1'	8,983	8,988	8,98	8,985	-88,39	-84,708	-91,437	-87,334	-27,256	-27,973	-26,662	-27,462	12282,8	174755	2078800	1448780	991151,813	14117433,1	167635264	116960335	100110,747	1415500,63	16776473,8	11706848,4
'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	10,006	10,01	10,003	10,007	-125,138	-121,259	-128,237	-124,094	-39,931	-39,375	-40,408	-39,771	10129,4	179719	1606020	799880	1014155,89	18007861,8	160698376	80100022,4	102422,642	1805029,74	16028514,34	8018952,1
'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	9,892	9,897	9,888	9,894	136,123	140,089	132,89	137,292	54,303	-54,131	-55,168	-54,535	11866,6	376545	1674100	799880	1014155,89	18007861,8	160698376	80100022,4	117194,23	3694354,33	16038095,4	8701281,9
'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	9,732	9,739	9,727	9,734	23,328	27,985	19,517	24,755	-69,273	-68,772	-69,674	-69,121	16476,5	246896	1581160	1116480	1560519,37	23417621,7	14960079	105783734	157301,144	3246601,34	14972302	10589071,2
'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	'2016-07-21 1'	9,68	9,687	9,677	9,682	-15,237	-10,251	-25,424	-13,917	-72,905	-72,486	-73,973	-72,79	17791,3	201467	1600600	1253850	1667087,51	18905254,1	149527029	117537308	147289,908	1384667,43	14964973,43	111764572,3
'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	9,498	9,505	9,493	9,5	-171,905	-166,136	-176,696	-170,256	-75,756	-76,005	-75,528	-75,83	12602,7	167175	1782020	946210	1136914,82	15103429,6	160590384	85395452,5	114757,744	1514228,27	16071710,8	8548786,7
'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	9,312	9,319	9,307	9,314	58,538	62,841	55,109	59,854	-63,186	-63,785	-62,702	-63,37	15345	224130	2067400	1064160	1330616,26	19464292,2	179078703	152316514,2	134215,15	1950841,05	19271252,3	14291259,57
'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	9,134	9,14	9,129	9,136	-50,035	-46,302	-53,197	-48,979	-45,662	-46,324	-45,099	-45,85	19146,9	129773	1724540	1438140	1597425,02	10841184,5	143720820	120036509	161006,395	1087411,05	14384070,4	12014606,8
'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	'2016-07-22 1'	8,998	9,003	8,995	9	-149,411	-145,425	-152,447	-148,232	-27,021	-27,76	-26,427	-27,252	9696,3	319939	1309720	811000	785051,272	25942382,5	105969478	6591000	79391,1584	2957514,9	10670241,9	5572705
'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	9,692	9,698	9,687	9,693	-25,371	-20,803	-29,111	-24,202	-68,753	-68,243	-69,162	-68,602	16758,4	174383	1406020	1205530	1574198,02	16400931,1	131938061	113226466	158674,473	1644142,32	13205292,5	11337109,7
'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	9,531	9,537	9,525	9,533	-169,686	-163,353	-174,889	-167,757	-77,055	-77,039	-77,045	-77,053	12165,7	155571	1763260	891590	1105212,55	14240816,5	159882140	81025995,4	111573,551	142785,35	16000858,4	8116008,9
'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	9,362	9,369	9,357	9,364	44,831	49,359	41,015	46,151	-68,41	-68,931	-67,96	-68,563	16059,9	1633340	1704570	1074570	1410582,76	14321007	14321007	94322128,9	1447588,01	14487593,4	942019,75	
'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	9,196	9,201	9,191	9,197	-69,999	-65,147	-72,729	-67,921	-51,746	-52,395	-51,198	-51,928	19762,5	165696	1703180	1411260	1617243,8	13257167	143875247	119371158	1684714,56	1329357,44	14399519,5	11948041,5
'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	9,152	9,158	9,148	9,154	99,888	-95,932	-103,108	-98,704	-46,392	-47,092	-45,82	-46,602	10247	225196	1998440	1291610	85279,539	18886955,2	167412158	108213185	168745,3876	1893401,74	1637058	10833541,9
'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	'2016-07-24 1'	9,03	9,034	9,027	9,031	162,238	165,988	159,15	163,382	-28,121	-28,848	-27,521	-28,343	5636,41	180203	1646820	1072850	49997,944	14706935,6	134193975	87005031,3	46637,31	1474258,52	13430981,7	8759403,7
'2016-07-26 1'	'2016-07-26 1'	'2016-07-26 1'	'2016-07-26 1'	'2016-07-26 1'	9,572	9,577	9,567	9,573	-166,255	-160,38	-171,139	-164,456	-75,956	-75,696	-76,159	-75,882	10795	152814	1648180	794570	85997,271	14015936,4	150670722	72816245,4	49607,7483	1405331,7	15079347	7290157,78
'2016-07-27 1'	'2016-07-27 1'	'2016-07-27 1'	'2016-07-27 1'	'2016-07-27 1'	8,42	8,435	8,408	8,425	-134,634	-130,79	-137,722	-133,472	-40,153	-41,039	-39,437	-40,421	12532,4	449596	1544520	877590	888502,043	31988407	109189014	62291886,7	579807,8082	3204965,53	10299630,7	6237081,97
'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	13,125	13,142	13,111	13,123	115,08	118,54	112,146	116,115	-29,426	-29,078	-29,272	-29,322	4343,03	153751	83080	876590	748514,777	26554667,9	142826877	85672639,5	78680,431	2606619,91	14924638,7	8057819,19
'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	12,62	12,641	12,603	12,626	21,643	25,147	18,735	22,703	-39,214	-38,833	-39,531	-39,099	9190,6	67504	310660	729260	1463735,39	10786793,6	280179479	126410413	147583,389	1801963,69	12023376,4	12652284,5
'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	'2016-07-29 1'	11,845	11,87	11,825	11,835	-100,477	-96,176	-103,466	-99,423	-53,054	-53,623	-54,404	-52,931	9048,9	86239	1209900	759060	1269597,09	12150807,8	169181073	106643079	128086,473	1218656,58	16933111,4	10674626,4
'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	11,75	11,775	11,729	11,757	-114,504	-110,884	-117,581	-113,444	-54,701	-54,275	-55,063	-54,576	7555	79459	1118600	780620	1430662,19	11017040	153885177	107902799	105327,523	1105023,19	15400922,7	10800665,7
'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	11,035	11,062	11,013	11,043	141,767	145,7	138,497	142,898	-66,951	-66,495	-67,329	-66,82	8001,6	136909	1185380	780620	974364,634	16753252,6	143770199	95643698	98423,5625	1679418,99	14389001,3	9574140,56
'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	10,308	10,334	10,285	10,315	19,52	25,091	14,682	21,142	-78,513	-78,173	-78,788	-78,417	12681	155226	1671780	1052740	1347417,93	1657826,1	186363247	112100720	135902,576	1661754,07	18649976,2	112116655,8
'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	9,361	9,385	9,34	9,368	160,168	164,683	156,455	161,511	-71,333	-71,933	-70,788	-71,513	10709,9	136894	1663100	1035150	937701,9	12057380,5	145081526	90844167,8	94738,5401	1290210,43	14520197,6	909958,49
'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	'2016-07-30 1'	8,363	8,374	8,354	8,366	-46,651	-43,089	-49,807	-45,634	-30,384	-31,239	-29,624	-30,629	16240,9	183935	1897740	1273110	1135884,79	12898235,1	132441977	99897364,1	114664,528	1293414,92	1325706	9999731,28
'2016-08-01 1'	'2016-08-01 1'	'2016-08-01 1'	'2016-08-01 1'	'2016-08-01 1'	12,951	12,931	12,939	12,956	-36,85	-36,637	-36,814	-37,800	-26,853	-26,665	-26,252	-26,507	61170	758220	111770	481312	873462,41	18689146,8	126939464	70216988,9	18828,8342	1873237,77	12705213,2	7030078,45
'2016-08-01 1'	'2016-08-01 1'	'2016-08-01 1'	'2016-08-01 1'	'2016-08-01 1'	12,809	12,825	12,796	12,816	-66,092	-62,627	-68,994	-65,068	-29,159	-29,352	-30,019	-29,607	65391,1	151988	943000	521160	127873,28	24999081,2	154404572	85573740,3	108323,124	2504908,03	15452883,2	8566624,64
'2016-08-02 1'	'2016-08-02 1'	'2016-08-02 1'	'2016-08-02 1'	'2016-08-02 1'	12,328	12,348	12,312	12,334	-161,508	-157,972	-164,442	-160,473	-39,932	-39,545	-40,254	-39,818	4347,26	125695	925500	451520	660694,766	19165106,8	140292236	68886834,1	66882,308	1920808,3	14504108,1	887751,27
'2016-08-02 1'	'2016-08-02 1'	'2016-08-02 1'	'2016-08-02 1'	'2016-08-02 1'	11,127	11,151	11,107	11,134	1,297	5,116	1,994	2,425	-62,724	-62,275	-63,103	-62,592	11639,5	80236	1794500	970610	1441088	9976929,45	221379298	120325597	145309,253	1000851,57	22152808,6	12043228,8
'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	10,446	10,471	10,425	10,454	-114,172	-109,338	-117,827	-112,776	-74,59	-74,208	-74,907	-74,481	10248,1	93809	1452620	118261	118261,55	157817649	91481222	112883,635	1031746,23	15799729,6	9157666,78	
'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	12,863	12,867	12,852	12,867	176,657	177,864	173,723	177,664	-32,17	-31,814	-32,472	-32,069	4973,26	201199	903100	517100	822859,531	33357059,1	149168553	865410915,1	33357059,1	1448148,45	14929068,7	8570344,13
'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	12,469	12,486	12,456	12,474	81,515	85,043	78,588	82,53	-42,181	-41,8	-42,499	-42,071	5020,77	124427	856820	474851	780609,041	19398193,7	132937282	73887136,6	78944,4294	1944223,71	14309258	7397304,7
'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	'2016-08-05 1'	11,443	11,465	11,424	11,449</																				

'2016-09-01 2'	'2016-09-01 2'	'2016-09-01 2'	'2016-09-01 2'	14,876	14,903	14,852	14,884	87,131	90,487	84,114	88,097	-32,253	-32,042	-32,443	-32,192	2308,02	75201	558840	249740	510754,154	16702097,7	123269991	55325765,3	51790,086	1674296,59	12338101,8	5540014,66
'2016-09-02 0'	'2016-09-02 0'	'2016-09-02 0'	'2016-09-02 0'	12,133	12,182	12,092	12,148	-168,103	-164,508	-171,166	-167,039	-51,126	-50,815	-51,393	-51,034	3877,51	75908	921180	451672	570807,041	11264832,5	134691682	66655000,4	57836,2219	1129839,56	13480773,9	6673664,29
'2016-09-02 1'	'2016-09-02 1'	'2016-09-02 1'	'2016-09-02 1'	6,97	7,046	6,907	6,992	149,014	155,346	143,791	150,831	-73,122	-73,703	-72,594	-73,295	12584,3	106463	1276340	946080	611356,62	5285474,45	60889904,4	46252019,6	61917,555	530846,461	6096793,64	4632002,84
'2016-09-05 0'	'2016-09-05 0'	'2016-09-05 0'	'2016-09-05 0'	14,803	14,837	14,775	14,813	5,348	8,788	2,467	6,314	-32,819	-32,608	-32,997	-32,76	3400,22	45168	708960	351695	745086,159	9943128,55	154766411	77170664,5	75371,7996	997466,128	15489081,6	7725851,13
'2016-09-05 0'	'2016-09-05 0'	'2016-09-05 0'	'2016-09-05 0'	12,905	12,953	12,864	12,919	-154,646	-151,131	-157,577	-153,612	-43,746	-43,479	-43,97	-43,667	3075,97	64579	751420	341123	512269,045	10835078,1	124346857	56933620,1	51942,6342	1086799,48	12445836,8	5700907,44
'2016-09-05 1'	'2016-09-05 1'	'2016-09-05 1'	'2016-09-05 1'	9,637	9,704	9,582	9,657	-5,621	-1,55	-9,015	-4,455	-63,505	-63,061	-63,876	-63,378	11904,2	51071	1646360	919650	1105564,11	4809234,32	151160089	85764396,9	111607,869	483116,428	15128303,6	8585700,6