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OMEGA/Mars Express data analysis: possible correlation between water vapor and presence of gypsum in the north polar cap region? R. MELCHIORRI¹, T. ENCRENAZ¹, P. DROSSART¹, T. FOUCHET¹, F. FORGET², Y. LANGEVIN³, B. GONDET³, J.P. BIBRING³ and the OMEGA Team; ¹(LESIA-Observatoire de Paris, Meudon, FRANCE Contact : riccardo.melchiorri@obspm.fr), ²(LMD-Jussieu, Paris, FRANCE), ³(IAS-ORSAY,FRANCE)

Introduction: in recent works [1,2] we have presented the analysis of the atmospheric water vapor on Mars as detected by OMEGA [3], the Visible-Near Infrared spectrometer of the Mars Express mission. Results seem to be in agreement with previous works [4,5,6] and present some new features of interest.

We report on the detection of a seasonal variation of the water vapor content over a north polar region. In a previous work [7], a neighbouring region has been the subject of the spectral identification of gypsum. The coincidence of the presence of these two effects on close regions is at least intriguing, but further studies are necessary to identify the nature of this correlation.

Method and analysis: in order to suppress instrumental features, all data have been divided by a reference spectrum as described in [8].

The determination of the water vapor content from the OMEGA data has been derived by the study of the 2.7 μ m band depth [1,2].

Particular attention has been given to possible contaminating factors of this band. For example: the North polar cap presents a central blue/black region, which seems to be correlated with the maps of small grains of H₂O ice at the surface, obtained by OMEGA for L_s=93° and L_s=107° [9]. This suggests that, in this case, our determination of H₂O is probably contaminated by the spectrum of these small icy grains (with a typical size of about 100 microns), which exhibits a small local maximum exactly at 2.6 μ m. This effect disappears at L_s=115°, because small grains have sublimated. Even the gypsum spectrum presents some features that may contaminate our measurement, but the variability of the water vapor detection from different orbits covering this region proves that the 2.5 μ m sulphate band does not influence our measurements.

All data have been resampled at the spatial resolution of 0.1°x0.1° to take into account the superimposition of the orbits. Data have been divided for seasonal periods defined as, L_s equal to:

Fig 1) 93°-100°, Fig 2) 101°-105°, Fig 3) 106°-110°, Fig 4) 111°-115°, Fig 5) 116°-120°

Discussion: in the corresponding figures it is possible to observe a variability of the water vapor content reaching a maximum during L_s=101°-105° of ~80 μ -ppt which disappears at L_s=116°-120°.

At the present state of the art, it is not possible to determine if it exists a daily variation of the water vapor, due to a lack of coverage. We can only suppose a seasonal variation, knowing that the OMEGA observations are in general taken at 14:00 o'clock local time.

Concerning the possible correlation with gypsum, we do not have enough information to provide a definite answer. Still the presence of a water vapor variability and doubly-hydrated sulphate is an intriguing situation.

References:

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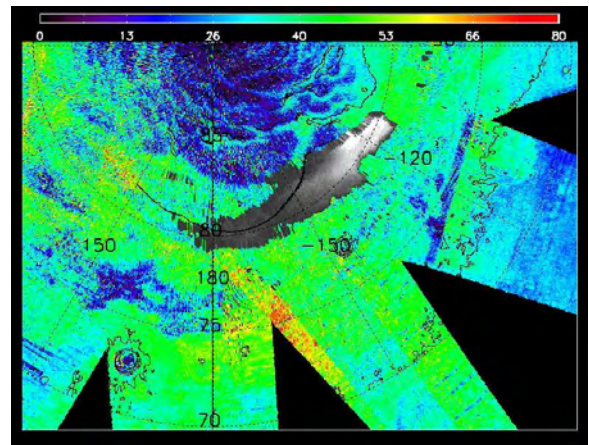


Fig1: water vapor content for the north polar region during L_s=93°-101°, a maximum of ~80 μ _ppt is identified at 190E, 75N. Gray scale represents the gypsum region.

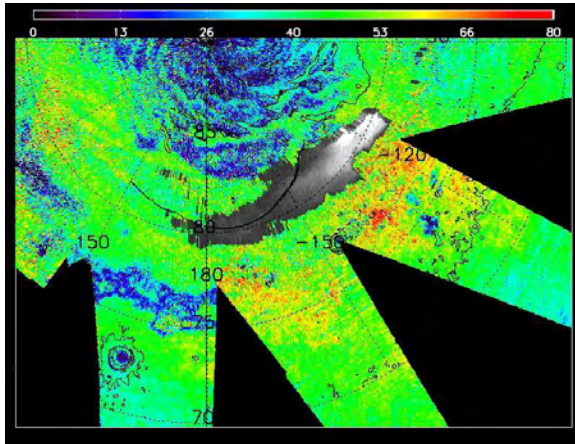


Fig 2: water vapor content for the North Polar Region during Ls=101°-105°, a maximum of ~80 μ -ppt is identified at 240E, 80N. Gray scale represents the gypsum region.

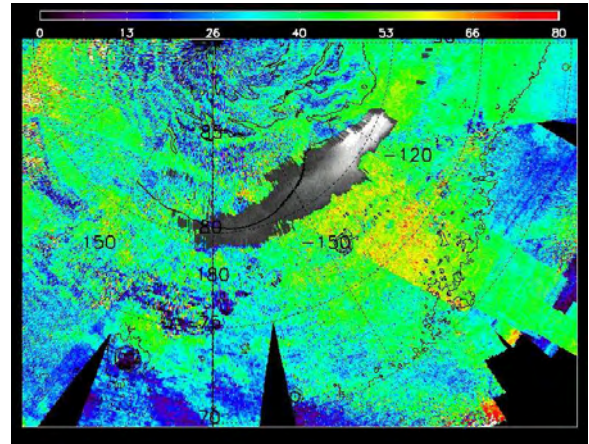


Fig4: water vapor content for the North Polar Region during Ls=111°-115°, a maximum of ~65 μ -ppt is identified at 260E, 80N. Gray scale represents the gypsum region.

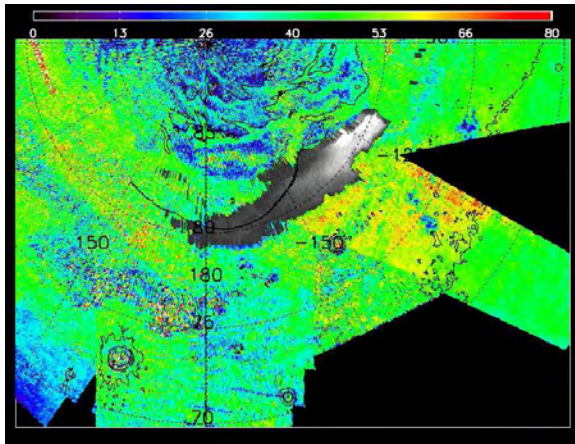


Fig3: water vapor content for the North Polar Region during Ls=106°-110°, a maximum of ~70 μ -ppt is identified at 250E, 80N. Gray scale represents the gypsum region.

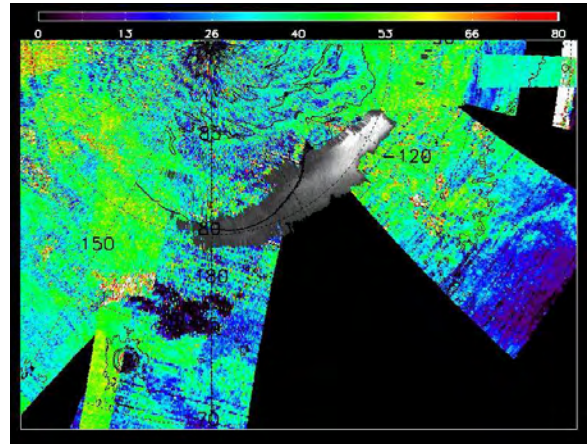


Fig 5: water vapor content for the North Polar Region during Ls=116°-120°, maximum has disappeared. Gray scale represents the gypsum region.