

Supplementary Material

U/Pb dating of geodic calcite: new insights on Western Europe major tectonic events and associated diagenetic fluids

Céline Pisapia^{1,2,*a}, **Pierre Deschamps**¹, **Anne Battani**^{2,b}, **Stéphane Buschaert**^{2,c}, **Abel Guihou**¹, **Bruno Hamelin**¹ & **Jacques Brulhet**²

¹ *CEREGE, Aix-Marseille Université-CNRS-IRD, Europôle Méditerranéen de l'Arbois, 13545 Aix-en-Provence, France*

² *Andra, 1-7 rue Jean Monnet, 92290 Châtenay Malabry, France*

*^a Corresponding author/Present adress:

Institut de Physique du Globe de Paris, 1 rue Jussieu, 75238 Paris Cedex 05, France

Tel : +33 (0)1 83 95 75 95 – Fax : +33 (0)1 83 95 77 05

e-mail: celine.pisapia@gmail.com

^b Present address: IFPEN, 1-4 Av. de Bois-Préau, 92852 Rueil-Malmaison Cedex, France

^c Present address: BRGM, 151 Bd Stalingrad, 69626 Villeurbanne, France

Abbreviated title: U-Pb dating of diagenetic events

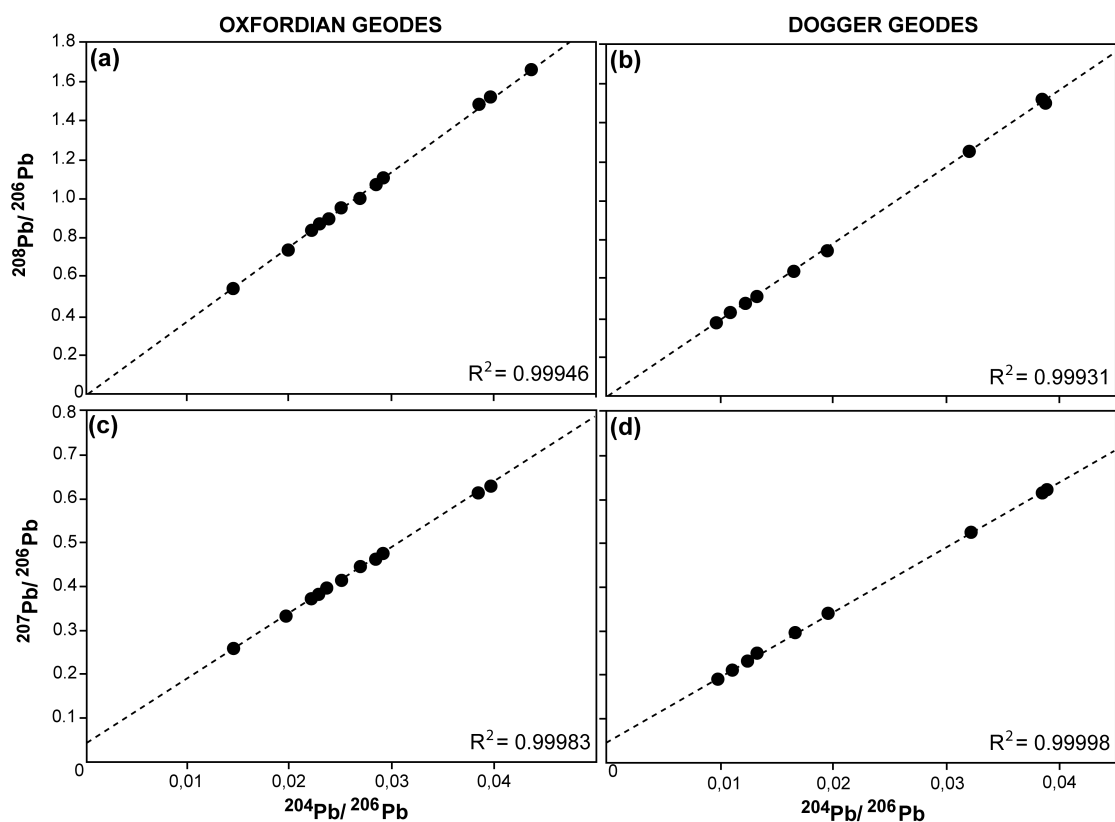


Figure S1: $^{208}\text{Pb}/^{206}\text{Pb}$ vs $^{204}\text{Pb}/^{206}\text{Pb}$ (a, b) and $^{207}\text{Pb}/^{206}\text{Pb}$ vs $^{204}\text{Pb}/^{206}\text{Pb}$ (c, d) diagrams for Oxfordian and Dogger geodic calcites. All data taken into account for age calculations were aligned in both diagrams.

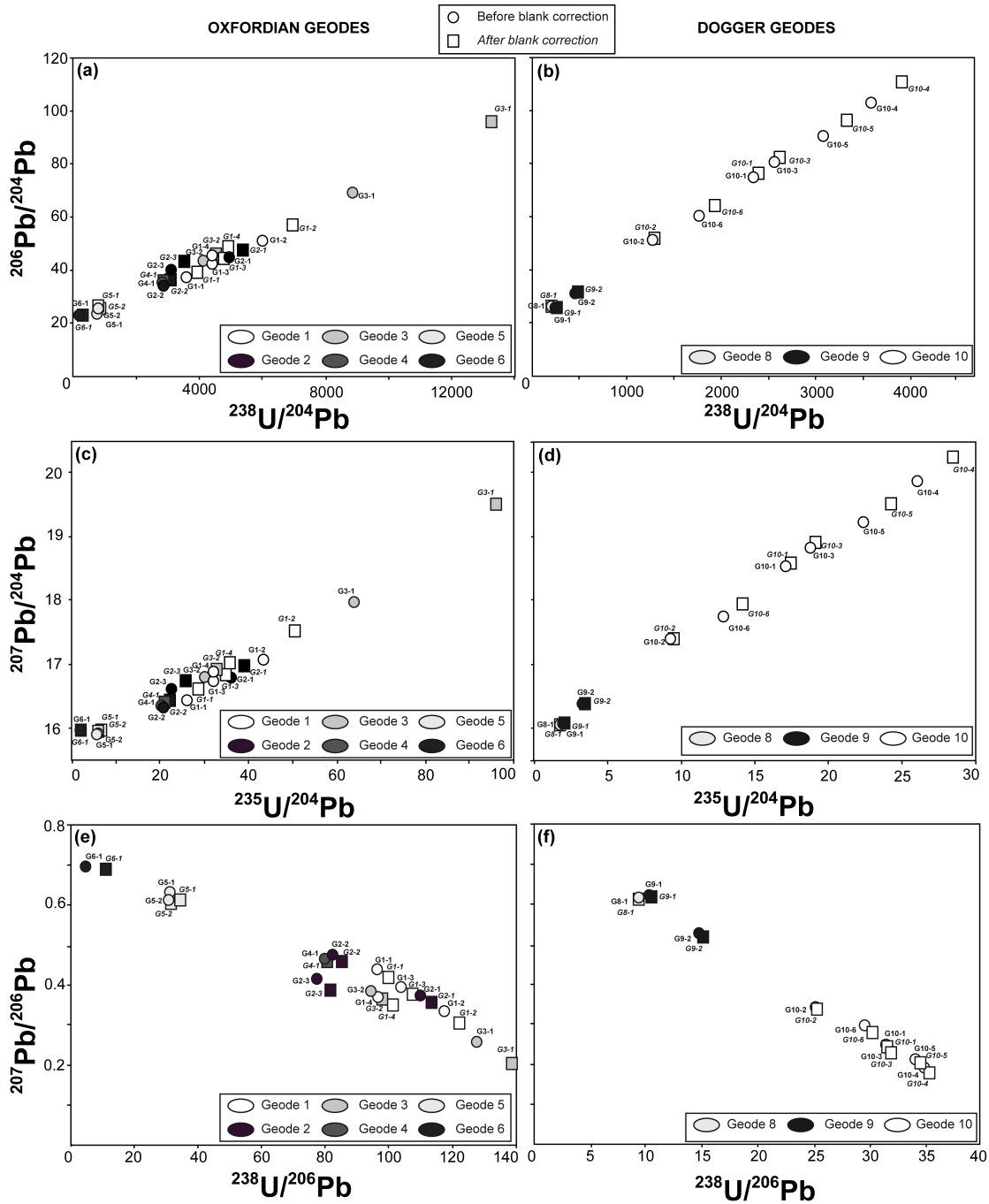


Figure S2: Effect of blank correction on U and Pb isotopic compositions of geodic calcites for Oxfordian (a, c, e) and Dogger (b, d, f) samples. All data before (dots) and after (squares) blank correction are drawn in ^{238}U - ^{206}Pb (a, b), ^{235}U - ^{207}Pb (c, d) and Tera-Wasserburg concordia (e, f) diagrams for Oxfordian and Dogger samples, respectively. Calculated ages for all cases are available in Table S1.

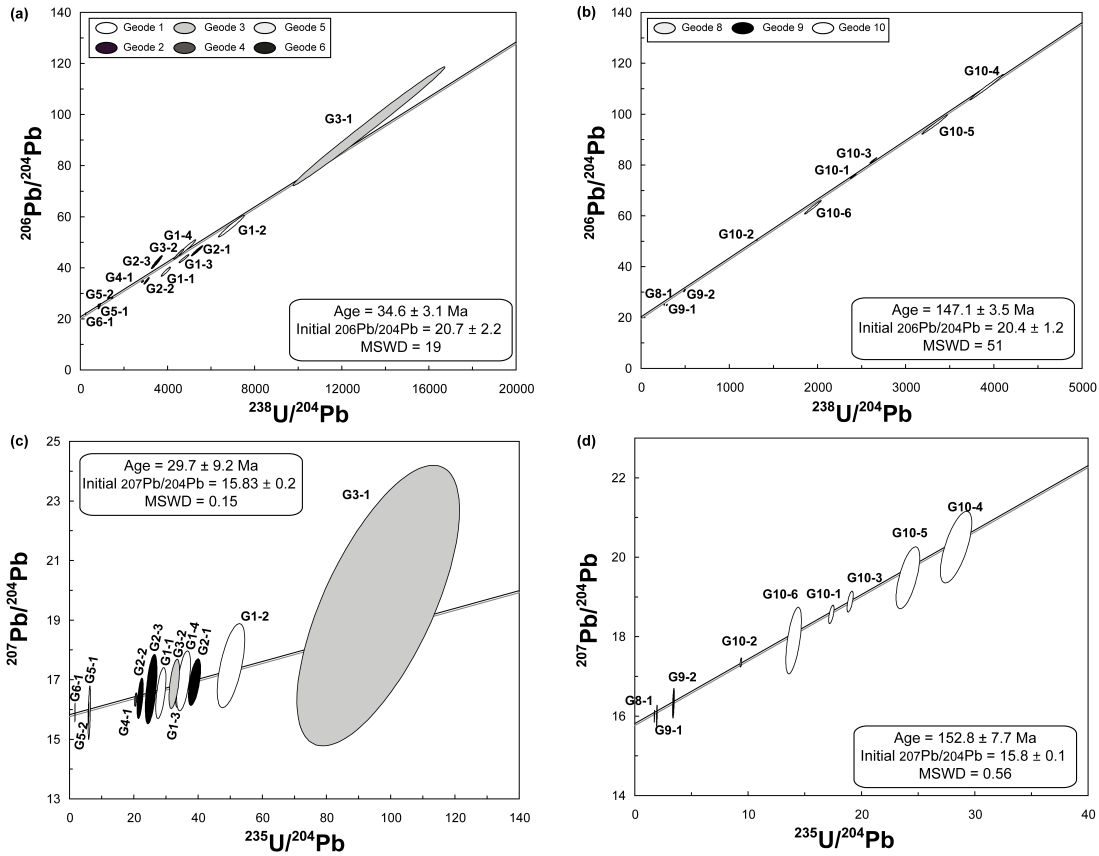


Figure S3: ^{238}U - ^{206}Pb and ^{235}U - ^{207}Pb isochrones for Oxfordian (a, c) and Dogger (b, d) geodic calcites. Initial $^{206}\text{Pb}/^{204}\text{Pb}$ and $^{207}\text{Pb}/^{204}\text{Pb}$ ratios and MSWD are specified. These values are consistent with the calculated ages from Tera-Wasserburg diagrams for both Oxfordian and Dogger samples.

Table S1: Ages and initial Pb isotopic compositions Calculated from data before and after correction from Pb blanks using Isoplot 3.0 software for ^{238}U -series, ^{235}U -series and Tera-Wasserburg concordia diagrams for both Oxfordian and Dogger geodes. All ages are consistent within each other. Pb blank correction mainly influenced error propagations and MSWD estimations highlighting the non-negligible impact of individual analytical error on MSWD calculation.

| | | OXFORDIAN GEODES | DOGGER GEODES |
|--------------------------------------|---|--------------------------|---------------------------|
| Before blank correction | | | |
| ^{238}U - ^{206}Pb | Age (Ma) | 33.5 ± 3.1 (MSWD = 5651) | 146.6 ± 3.6 (MSWD = 1097) |
| | Initial $^{206}\text{Pb}/^{204}\text{Pb}$ | 21.1 ± 2.0 | 20.4 ± 1.2 |
| ^{235}U - ^{207}Pb | Age (Ma) | 32.5 ± 4.1 (MSWD = 884) | 147.2 ± 6.4 (MSWD = 387) |
| | Initial $^{207}\text{Pb}/^{204}\text{Pb}$ | 15.73 ± 0.13 | 15.82 ± 0.11 |
| Tera-Wasserburg Concordia | Age (Ma) | 32.4 ± 2.8 (MSWD = 5772) | 147.3 ± 3.8 (MSWD = 1302) |
| After blank correction* | | | |
| ^{238}U - ^{206}Pb | Age (Ma) | 34.6 ± 3.1 (MSWD = 19) | 147.1 ± 3.5 (MSWD = 51) |
| | Initial $^{206}\text{Pb}/^{204}\text{Pb}$ | 20.7 ± 2.2 | 20.4 ± 1.2 |
| ^{235}U - ^{207}Pb | Age (Ma) | 29.7 ± 9.2 (MSWD = 0.15) | 152.8 ± 7.7 (MSWD = 0.56) |
| | Initial $^{207}\text{Pb}/^{204}\text{Pb}$ | 15.83 ± 0.2 | 15.8 ± 0.1 |
| Tera-Wasserburg Concordia | Age (Ma) | 33.5 ± 2.8 (MSWD = 23) | 147.8 ± 3.8 (MSWD = 41) |

*: Data reduction technique from Schmitz and Schoene (2007)