ISC2018, Québec City

Geochemical proxies and hiatuses in contourites of the Gulf of Cadiz

Z. Smillie[1], D. Stow[1], F. Sierro[2], F. Jiménez-Espejo[3], E. Ducassou[4], M. Alonso Garcia[5], J. Buckman[1]

1 Institute of Petroleum Engineering – Heriot-Watt University, Edinburgh, EH14 4AS, UK
2 Department of Geology, University of Salamanca, 37008 Salamanca, Spain
3 University of Granada, s/n, 18010 Granada, Spain
5 Instituto Português do Mar e da Atmosfera, 1749-077 Lisboa, Portugal
4 Université de Bordeaux, CS 50023, 33615 Pessac Cedex, France
**e-mail: z.smillie@hw.ac.uk*

Regional unconformities are common and significant features of contourite depositional systems worldwide. They are caused by accelerated bottom currents that erode and winnow the seafloor or prevent deposition from occurring. Such episodes of increased bottom current activity may be linked with major tectonic and/or climatic events, as well as to changes in flow pathways and sedimentation patterns. In the Gulf of Cadiz, hiatuses are recorded at all six sites, under the influence of the Mediterranean Outflow Water, that were drilled during IODP Expedition 399. They are expressed either by a marked gap in sedimentation, or as a much condensed succession.
The two most significant hiatuses in the sedimentary record after the Miocene–Pliocene boundary unconformity, are the late Pliocene Discontinuity (LPD, 3–3.2 Ma) and the early Quaternary Discontinuity (EQD, 2–2.4 Ma).
We evaluated the nature of changes in the patterns of sedimentation, elemental distribution and microfauna across both these hiatuses. At sites U1387 and U1391, there is extensive development of fine dolomite crystals within the sediment, at the expense of both biogenic and lithogenic components. This is combined with framboidal pyrite formation and an extensive network of iron-sulphide filled *Trichichnus* trace fossil filaments.
The original composition of the contourite around the hiatuses may have been overprinted by the carbonate authigenesis. However, the distribution of grain size and stable heavy minerals remain largely unaffected. The LPD and EQD at the sites of investigation are associated with significant increase in current velocities as evident from the high Zr % and Zr/Al ratio and the increase in main grain size. Foraminiferal analyses showed marked changes in the deep-water oxygenation status from the late Pliocene towards the early Quaternary. This is particularly evident at site U1387 where the LPD and EQD hiatuses run together as one longer hiatus of around 1 My duration. Our results suggest that the dolomitisation along the unconformity surface is linked with fluid seepage from depth. These fluids encountered a partially calcite-cemented baffle to flow, which was originally due to incipient hardground formation at the seafloor, and this provided the calcite template for replacement by dolomite.

Acknowledgements
The authors are grateful to Daphne Jackson and Natural Environment Research Council (NERC, UK) for the continuing fund to support this research.