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The Impact of Mediterranean Outflow Water on the Pliocene Gulf of Cadiz (IODP Expedition 339, Sites U1387 and U1389)

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The opening and closing of ocean gateways play an important role amongst climate forcing mechanisms: surface and deep-water circulation are altered, and hence global heat transport. An important component of North Atlantic circulation patterns is the warm and saline Mediterranean Outflow Water (MOW) that enters the North Atlantic via the Gibraltar Strait. Its onset and early history after the opening of the Gibraltar Strait are poorly constrained and its impact on oceanography and climate in the Pliocene are largely unexplored. The scientific objectives of FWF-project P25831-N29 aim to improve our knowledge about the early phase of MOW. Research focuses on Sites U1387 (upper Miocene-lower Pliocene; ~5.8-3.8 Myrs) and U1389 (middle-upper Pliocene; ~3.7-2.8) drilled during IODP Expedition 339 in the northern Gulf of Cádiz.

The studied interval at IODP Site U1387C contains a sequence of lithological units that reflects the closure and re-opening of the Gibraltar gateway and the onset of MOW (upper Miocene: hemipelagic deposits; lower Pliocene: turbidites, debrites, contourites). A low-resolution analysis of benthic foraminifera assigns distinct assemblages to each of these lithofacies. The analysis of a larger number of samples in the near future will give more detailed information about a) bottom water oxygenation, export productivity and MOW (hemipelagic deposits, contourites) on an orbital time scale, and b) the origin of the displaced deposits (turbidites, debrites).

At IODP Site U1389E, preliminary results from high-resolution TOC, $CaCO_3$ and S analyses reveal distinct cyclic patterns in well recovered intervals potentially related to precessional forcing. XRF- and micropaleontological analyses are planned for the near future to identify the source of the organic matter and the $CaCO_3$. The development of MOW will be addressed by a combination of XRF-scanning and $\delta^{18}O$ and Mg/Ca of benthic foraminifera.