Geophysical Research Abstracts
Vol. 19, EGU2017-17341, 2017
EGU General Assembly 2017

Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE) - an amphibious drilling proposal

Rachel Flecker and the IMMAGE Team
University of Bristol, School of Geographical Sciences, Bristol, United Kingdom (r.flecker@bristol.ac.uk)

Today Mediterranean seawater flows out through the Gibraltar Straits, forming a saline plume at intermediate depths in the Atlantic. The plume's sedimentary record of distinctive, contouritic deposits has recently been recovered during IODP Leg 339 in the Gulf of Cadiz documenting a Mediterranean contribution to Atlantic thermohaline circulation since the Pliocene. However, before the Pliocene, the conduit for Mediterranean-Atlantic exchange is unclear. Gibraltar may have already been open, but two additional marine corridors also existed through northern Morocco and southern Spain. The restriction and closure of these Miocene connections resulted in extreme salinity fluctuations in the Mediterranean, leading to the precipitation of thick evaporites. This event is known as the Messinian Salinity Crisis (MSC) and recovering a complete record of the MSC is the target of current IODP drilling proposals (e.g. DREAM). Understanding both the causes of high-amplitude salinity change in the Mediterranean and its global consequences for thermohaline circulation in the Atlantic is dependent on recovering a complete record of Mediterranean-Atlantic exchange before, during and after the MSC. This key objective of the IMMAGE drilling proposal requires core recovery on-shore at the mouths of the Betic and Rifian corridors which are now exposed on land, as well as offshore, in the Alborán Sea and on the Atlantic continental margin. Consequently to meet this objective, an amphibious drilling strategy is necessary, involving both IODP and ICDP targets. In addition to allowing us to reconstruct Mediterranean-Atlantic exchange during high amplitude salinity fluctuations and identify the conduit through which exchange occurred, the sediments recovered from IMMAGE drilling will also provide us with a unique and explicit test for ocean physics hypotheses describing the location, size and velocity of overflow plumes under conditions where the density contrast between the two water bodies is up to two orders of magnitude higher than today.