



## **Integrated stratigraphy and chronology of Messinian evaporites from the Levant basin in the deep eastern Mediterranean**

Aaron Meilijson (1,2), Josh Steinberg (3), Frits Hilgen (4), Or Bialik (5), Peter Illner (6), Nicolas Waldmann (5), Yizhaq Makovsky (1,5)

(1) The Hatter Department of Marine Technologies, Charney School of Marine Sciences, University of Haifa, Israel (Aaron.Meilijson@colorado.EDU; yizhaq@univ.haifa.ac.il), (2) Institute of Arctic and Alpine Research, University of Colorado Boulder, Boulder, USA (Aaron.Meilijson@colorado.EDU), (3) Ratio Oil Exploration, Tel Aviv, Israel (josh@ratioil.com), (4) Faculty of Geosciences, Utrecht University, Utrecht, the Netherlands (F.J.Hilgen@uu.nl), (5) The Dr. Moses Strauss Department of Marine Geosciences, Charney School of Marine Sciences, University of Haifa, Haifa, Israel (obialik@campus.haifa.ac.il; nwaldmann@univ.haifa.ac.il; yizhaq@univ.haifa.ac.il), (6) Institute for Mineralogy and Geochemistry, Karlsruhe University, Karlsruhe, Germany (peter.illner@kit.edu)

The Messinian salinity crisis (MSC) is perceived as an environmental crisis governed by climatic and tectonic controls, affecting global oceans salinity and shaping the Mediterranean's bio-chemical composition. The elaborate and ongoing study of the Mediterranean MSC is mainly focused on marginal and intermediate sections from which material was previously available. This relatively proximal data is also coupled with offshore seismic data and several wells which have penetrated the deep-basin Messinian salt in its uppermost parts, for producing stratigraphic models and hypotheses related to the distal occurrence of the MSC. These offshore assumptions could only be tested by drilling in the deep Mediterranean Sea. In this work we investigate these fascinating deposits from previously inaccessible domains in the deepest realms of the Mediterranean, and correlate this data with the much more abundant and elaborate findings reported from the marginal and intermediate depositional environments.

Here we provide for the first time high resolution sedimentological, faunal and geochemical data from the entire massive Messinian evaporite section of the deep Eastern Mediterranean basin. We have analyzed an extensive set of well cuttings while correlating results to well logs and seismic data, and constructed a chronostratigraphic model based on biostratigraphy and astrochronology. We present a detailed account of the pre- and evaporitic Messinian as it occurred in the deep Levant basin, identifying paleo life in the form of diatoms, foraminifera and ostracods within different parts of the section.

Our results indicate that salt was deposited during the complete 640 kyr-long MSC, rather than limited to the 50 kyr (stage 2) MSC acme. Moreover, the deep-basin was barren of eukaryotic life throughout most of this duration, at least in the Levant. Thus brine formation, salt precipitation and faunal extinction took place in a non-desiccated basin, having a restricted but often open connection with the Atlantic Ocean, substantially altering our understanding of the mechanisms governing salt deposition during the MSC.