UN COVERING THE MEDITERRANEAN SALT GIANT

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About 6 million years ago the Mediterranean Sea became an enormous saline basin where more than one million cubic kilometres of salt (6% of the dissolved oceanic salt) accumulated on the seafloor locally exceeding a thickness of 3 km in the deep basins. This extreme, but geologically brief event (640 ka, 5.97 – 5.33 Ma), changed the chemistry of the global ocean and had a permanent impact on both the terrestrial and marine ecosystems of a huge area surrounding the Mediterranean. Increasing Mediterranean salinity was driven by tectonic restriction of exchange with the Atlantic Ocean and modulated by the impact of climatic precession on surface water salinity. The role of eustatic sea level change in generating the huge volumes of salts remains contentious.

The first scenario ever put forth to explain the formation of the MSC was generated following the first scientific drilling expedition in the Mediterranean Sea, the Deep Sea Drilling Project (DSDP) Leg 13 in 1970. It envisaged an almost desiccated deep Mediterranean basin with a dramatic ≈1.5 km drop in sea level. This resulted in the incision of deep river canyons on the continental margins, the deposition of thick evaporites on the Mediterranean abyssal plains, and a catastrophic flooding event when the Mediterranean-Atlantic connection was re-established through the Gibraltar Strait. This initial hypothesis has been challenged and refined over the years and many different scenarios now populate the scientific literature, illustrating a lack of fundamental understanding, especially for the deepest offshore domains. In spite of 43 years of multi-disciplinary research conducted on the MSC (generating over 1800 peer review papers), the processes, timing, causes, chronology and consequence at local and planetary scale are still not yet fully understood, and the MSC event remains one of the longest-living controversies in Earth Science.

The understanding of the Mediterranean salt giant bears a scientific relevance that goes beyond the local geological evolution. Salt-bearing sedimentary basins, preserving kilometer-thick evaporite layers, or 'salt giants', are frontiers for a diverse range of challenging research. Most salt giants in the geological record are old (e.g. Permian Zechstein salt or the Mesozoic salts in the Atlantic) and have typically experienced intense deformation. They are commonly the focus of applied research by the petroleum industry because of the sealing capacity of salt rock, the recurrent association with structural traps for hydrocarbon fluids, and perturbations to in situ stresses associated with salt bodies. Besides the industrial interest, salt giants are the sedimentary expression of extreme environmental events of global relevance, often resulting from a combination of deep earth- system dynamics (e.g. mantle convection and the initiation of continental break-up) and climatic forcing (evaporation-precipitation budget at the regional scale). Salt deposition impacts the structural, chemical and biological evolution of the sedimentary basins in which it accumulates, and affects global ocean salinity. Because of the variety of chemical environments, salt giants have the potential to harbor an unprecedented diversity of microbial life with exceptional metabolic activity. Finally, quantitative understanding

of salt dynamics and associated fluid flow is fundamental to the assessment of submarine geohazards, and exploration or production risks.

Despite their global occurrence and general importance within the global Earth system, there is currently no complete stratigraphic record through an undeformed salt giant. Similarly, there is a significant lack of knowledge about the factors controlling salt giants deposition, their early evolution, the evolution through time of the oceanic gateways that control salt deposition, and the impact that thick salt deposition exerts on the isostatic response of continental margins and on sub-salt formations. COST Action CA CA15103, *Uncovering the Mediterranean salt giant* (MEDSALT) (http://www.cost.eu/COST_Actions/ca/CA15103) aims to create a new flexible scientific network that will address the causes, timing, emplacement mechanisms, and consequences at local and planetary scale of the Miocene salt layer in the Mediterranean basin, and promote e new phase of scientific drilling in the Mediterranean Sea. While addressing its the scientific objectives the network will promote the participation of young talents and next generation leaders in science and technology. This lecture results from the work in progress of a large group of scientists participating in the MEDSALT COST Action.

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EDUCATION
Laurea, Milano, Earth Sciences, 1984
MS, College Station TX, Geological Oceanography, 1988
Doctorate, Milano, Earth Sciences, 1991

PROFESSIONAL BACKGROUND
Research Assistant, Ocean Drilling Program, College Station, TX, from 1986 to 1988;
Researcher at OGS - Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, from 1991 to 2004;
ICREA (Istitució Catalana de Recerca i Estudis Avançats) Research Professor at Departament d'Estratigrafia, Paleontologia i Geociències Marines, Universitat de Barcelona, from 2004 to 2012;
Senior Researcher at OGS - Istituto Nazionale di Oceanografia e di Geofisica Sperimentale since 2012.

RESEARCH INTERESTS
Geology and geophysics of continental margins, with special focus on polar depositional systems and marine sedimentary expression of de-glaciations;
Submarine geological hazards;
Geological setting and distribution of natural gas hydrates in the marine environment;
Distribution of Messinian evaporites in the Mediterranean basin.

Principal investigator and participant in several research projects funded at a national level in Italy and Spain, by the EC, and by industry;
Coordinator of COST Action CA15103 (Uncovering the Mediterranean Salt Giant), 2016-2019, and principal proponent of International Ocean Discovery Program (IODP) Multi-Platform Drilling Proposal *Uncovering a Salt Giant.*

TEACHING

Associate Professor of Fluids in Marine Sediments, Master of Oceanography and Management of the Marine Environment, University of Barcelona, Faculty of Geology from 2007 to 2010;
Contract Professor of Marine Geology, University of Trieste, Department of Mathematics and Geosciences, from 2012.

CO-ORDINATION AND MANAGEMENT OF RESEARCH STRUCTURES AND ACTIVITIES

Member of the Scientific Board of MARUM, University of Bremen, Germany, since 2006;
Since 2013, delegate of MIUR (Italian Ministry of Education, University and Research) Management Board of CIESM (The Mediterranean Scientific Committee), in the
Management Board of JPI Oceans, and in the Western Mediterranean Dialogue Forum (5+5) Research and Innovation;
Member of the EGU Committee on Education from 2003 to 2014.

PUBLICATION RECORD

102 scientific articles published and cited in SCOPUS. Hirsch index (H = 29). Total citations: 2393.