Geophysical Research Abstracts, Vol. 7, 05232, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05232

Impact of dirty inclusions on salt flow: insights from natural and modelling examples

E. Costa (1), S. Lugli (2), C. Cavozzi(1) and N. Doglioni (1)

(1) Dipartimento di Scienze della Terra, Università di Parma, Italy

(2) Dipartimento di Scienze della Terra, Università di Modena, Italy

Salt represents a peculiar “soft sediment”, which interacts very easily with water becoming weaker. Salt is extremely sensitive to gravity loading and flows by spreading even under its own load. On the other hand, salt does not suffer compaction and is almost completely impermeable. Salt is also very sensitive to the applied stress having almost no yield strength and flowing even at surface conditions.

All the above mentioned and well known characteristics make salt interesting but a sort of special “soft sediment” to investigate.

Salt is often “dirty”, because may contain various proportions of frictional insoluble materials having different physical and mechanical properties. These inclusions form either residual deposits or welding surfaces by salt dissolution or salt flow, respectively.

Welding surfaces may be due to the passive sagging of the salt cover , normal faulting or rollover synclines, tied or not to the former. In all the cases the welding surfaces are due to salt flow and mark hiatuses lasting, at minimum, the time of the salt deposition or more. They play a very important role in petroleum geology because allow hydrocarbon migration from rocks below the salt to the cover rocks. The physical, petrographical and mechanical properties of these residual rocks are, thus, important to describe and investigate.

In the Crotone Basin (north-eastern Calabria, Italy) many diapirs of Messinian halite contain various amount of clayey and silty sediments inter-layered at various levels, sometimes forming bands of microscopic lozenges lengthened in the direction of salt flow. The mean proportion of inclusions within salt is of about 25% (data by Syndial

(Eni) hydro dissolution plant, Belvedere di Spinello). The exotic material is likely supported and transported by the flowing salt until a yield ratio of exotics versus salt thickness is reached. When this yield ratio is overcome the exotics are left behind by the flowing salt and the little salt still permeating the residual deposits is then removed by dissolution. It is also likely that the exotics close to the bottom and top of the salt layer are more easily left behind by the flowing salt.

In the same area of emerged salt diapirs, residual deposits form chaotic complex characterized by a silty and marly matrix including prismatic gypsum crystals, sandstone blocks, microfossils, marls, gypsarenites, anhydrite and gypsum nodules.

This study investigates: a) the impact of dirty inclusions on salt flow; b) the deformation structures within the inclusions; c) the characteristics of residual rocks and welding surfaces by means of field, petrographic and mechanical analyses as well as by physical modelling.