



Investigations On The Source Of Fluids At Eastern Mediterranean Mud Volcanoes Using Stable Chlorine Isotopes

A. Dählmann, S. Hagedoorn and G. J. de Lange

Utrecht University, Faculty of Geosciences, Geochemistry; A.Daehlmann@geo.uu.nl

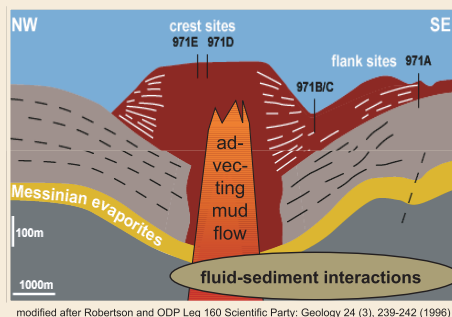
Stable isotopic signatures of the fluids in tectonically active areas hold information on the fluid source (composition, p , T) and fluid-rock interactions. In this study, we present $\delta^{37}\text{Cl}$ data from pore fluids of two mud volcanoes of the Olimpi Mud Volcano Field sampled during ODP Leg 160.

In the Mediterranean, where thick layers of Messinian evaporites underlay the sediment cover, the isotopic composition of the source (i.e. the endmember composition of the fluid) is mainly determined by the dissolution of evaporites and relicts of ancient brines, respectively. Additional influence comes from fluid-sediment interactions at depth and transport phenomena that alter the initial signature.

$\delta^{37}\text{Cl}$ data combined with Cl concentrations allow a clear distinction between the most relevant processes. Additionally, recent studies on the $\delta^{18}\text{O}$ and δD signatures have attributed the Cl depletion to clay mineral dehydration (Dählmann and De Lange 2003).

Method:
Chlorine isotopes are measured at Utrecht University after Eggenkamp (1994). The average error is 0.1 ‰, which is smaller than the symbol size.

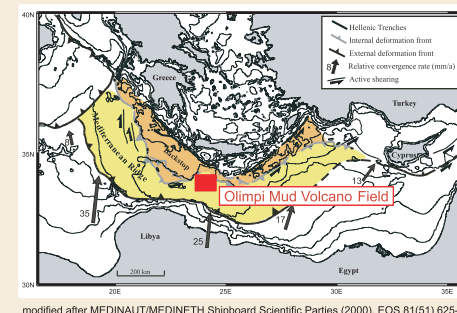
References:
Dählmann, A. and de Lange, G.J. (2003). Fluid-sediment interactions at Eastern Mediterranean mud volcanoes: a stable isotope study from ODP Leg 160. EPSL, 212(3-4): 377-391.
Eggenkamp, H.G. (1994). The geochemistry of chlorine isotopes. PhD Thesis, Utrecht University, Utrecht, 150 pp.



Numerous active mud volcanoes are situated along the Mediterranean Ridge as seafloor manifestations of fluid seepage, related to the subduction of the African underneath the Eurasian plate. Like other seep structures, they can be considered as windows to the fluid source and therefore provide valuable insight to processes occurring within the basal sediments.

The questions to be solved are:
What is the source of the high / low chlorinity fluid?

Is it a primary brine, i.e. evaporated seawater, or a secondary brine, i.e. dissolved evaporite?
Is it due to gas hydrate dissolution, ion membrane filtration, or clay mineral dehydration?



Stable chlorine isotopes are particularly valuable tracers in the marine environment, because Cl is ubiquitously present and the isotopic signature is mainly depending on source values (possibly built up at higher p , T) and transport phenomena (diffusion and ion membrane filtration).

