

Gas seepage in the Northern Adriatic Sea

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In the Northern Adriatic Sea, the occurrence of gas seepage has been widely documented. However, the origin of seeping gas was not clearly constrained. Geophysical data with different scale of resolution, i.e. multichannel seismic profiles, CHIRP and morpho-bathymetry data collected in 2009 and 2014 by OGS reveal that several the gas-enriched fluid vents are deeply rooted. In fact, the entire Plio-Quaternary succession is characterized by widespread seismic anomalies represented by wipe-out zones and interpreted as gas chimneys. They commonly root at the base of the Pliocene sequence but also within the Paleogene succession, where they appear to be associated to deep-seated, Mesozoic-to-Paleogene faults. These chimneys originate and terminate at different stratigraphic levels; they also commonly reach the seafloor, where rock outcrops interpreted as authigenic carbonate deposits have been recognized. In places, gas is then capable to escape in the water column as shown by numerous gas flares.

On going studies are addressed to:

1. re-examining the structural setting of the study area, in order to verify a possible structural control on chimney distribution and gas migration;
2. performing geochemical analysis on gas which have been sampled in some key emission points;
3. a quantitative analysis of some selected boreholes well logs (made available through the public VidePi database (www.videpi.com)) aimed to estimate the amount of gas present in sediments.

This work presents the preliminary results regarding the latter aspect of our research.

In a first instance, for each selected borehole the geophysical logs have been digitized. This procedure consists in a manual picking of curves, in a set system of reference. Static corrections for vertical offset are made at this stage. Logs are then divided by type and converted in common scales, amplifications and units. Every log is resampled in order to cut high frequencies not useful in the comparison with seismic data.

Estimation of gas requires a petrophysical characterization of sediments, but unfortunately the available wells are not sufficient for our investigations. For this reason, we are presently trying to establish empirical relationships between the available logs. All information available from wells and results from literature are used to fit cross-plots, and related chi-square tests are performed. Some correlations among our petrophysical logs and common trends in the investigated area have been already found, but our work is still in progress.

This analysis will hopefully provide a petrophysical characterization of the study area and will be used to estimate density, velocity and porosity profiles.

Next step will consist in an ad hoc processing of seismic data, applying a True Amplitude Recovery and keeping the amplitude information unaffected, which is the first request in our analysis.

References:

- Deep-sourced gas seepage and methane-derived carbonates in the Northern Adriatic Sea, Donda et al., 2015;
Sound velocity and related properties of marine sediments, Hamilton et al., 1982;
Archie's law - a reappraisal, Glover, 2016.