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Imaging of salt-tectonic related structures – a comparison of velocity model building techniques

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Velocity model determination during seismic data processing is crucial for any kind of depth imaging. Tomography procedures are often used to determine these models. On this poster we compare two different approaches of grid tomography: prestack stereotomography and NIP-wave tomography on a data example from the Eastern Mediterranean. Whereas NIP-wave tomography is based on CRS stack attributes and thus on the underlying hyperbolic second-order traveltime approximation prestack Stereotomography describes traveltimes by local slopes (i.e. linearly) in the prestack data domain.

The data example from the central Levantine Basin/ Eastern Mediterranean covers the so called Messinian Evaporites. The depth migrated sections show a sequence of six evaporite layers with a maximum height of about 1.5km and an overburden of Pliocene-Quaternary sediments of about 0.5km height. Four internal salt layers are seismically transparent and two layers show subparallel reflections. The reason for these intra evaporites reflections could be changing evaporite fazies or interbedded clastic sediments. During the precipitation of the evaporites during the Messinian sealevel lowstand all six evaporite layers were already folded by lateral creeping. The obtained velocity models reveal that the reconstruction of high velocity contrasts (top of the Messinian Evaporites) is limited due to the smooth description of the velocity distribution. The lateral resolution of velocities in prestack Stereotomography appears to be slightly better than in NIP-wave tomography which might be related to the local approximation of traveltimes.

The obtained results will be used for an Integrated Ocean Drilling Project (IODP) proposal for drilling the Messinian Evaporites.