Session: T23. The Formation and Deformation of the Mediterranean Basins, Continental Margins and Arcs

Title**: Initiation of the post-Oligocene subduction phase in the Western Mediterranean**

[invited]

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The present-day western Mediterranean basin developed as a back-arc basin due to roll-back of the Apennine-Calabria-Kabylia slab since the Oligocene. It opened following break-off of the Alpine Tethys slab beneath the Alps, which resulted from slow subduction during a ~60Myr period.

After slab break-off, continuing convergence of Adria and Europe caused subduction to the SE to resume beneath the central Alps. The response appears to have been different along the Corsica-Sardinia-Balearic margin, where some tectonic reconstructions indicate that subduction polarity changed at this time.

Here we investigate what may have caused these different responses using (2D) geodynamic models of the lithosphere and upper mantle. Slab break-off is taken to result from subduction of a passive margin while far field convergence persists. Consistent with studies of reduced dynamic topography and elevated surface heat flow above mature subduction zones, a low viscosity back-arc mantle and mantle wedge is included in the models. The rheology is elastic-viscous-plastic and is controlled by temperature and stress. Plastic strain weakening facilitates the development of new shear zones.

We investigate the role of rheology and density distribution, of geometric assumptions, of the suction by the torn slab and of the far field convergence rate.

We find that a subduction flip occurs only if the mantle wedge has been preconditioned with a viscosity that is at least one order of magnitude lower than that of lithospheric mantle. The amount of subduction before break-off thus needs to be substantial enough to hydrate the wedge. In the western Mediterranean this condition is fulfilled by the ~60Myr subduction period prior to Oligocene break-off.

Another requirement for a subduction polarity reversal is that the lithosphere that is to be subducted needs to be gravitationally sufficiently unstable. This was not so for the Alps, which is why convergence continued in the same direction. East of Iberia, the Mesozoic Ligurian ocean was however very unstable by 35Ma, so that a subduction flip was physically possible here.