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3D geodynamic modeling of slab detachment

V.C. Manea (1,2), M. Manea (1), L. Ferrari (1)

(1) Computational Geodynamics Laboratory, Geosciences Center, UNAM, Campus Juriquilla, Mexico, (2) Seismological Laboratory, Caltech, Pasadena, Ca, USA

Geologic history and plate reconstructions indicate that subduction of an oceanic plate may cease when a spreading ridges arrives at the trench. In some cases seismic tomography show gaps of high velocity bodies suggesting that the slab broke off shortly before subduction ended. To date this process has been investigated only by 2D numerical simulations, which are not able to study the lateral propagations of the detachment in time and space. Here we present results of 3D numerical simulation of slab detachment, where the oceanic plate stops to subduct due to the arrival of the buoyant crust of the spreading center at the trench. The model tries to reproduce the evolution of the interaction of the Pacific-North America-Magdalena triple point in late Tertiary times. The modeling results show a fast (3-4 m.y.) lateral progression of the detachment even in the area where the plate still experience subduction. These results resemble the subduction history of central Mexico where the Neogene geologic record suggest that the trace of the detachment is expressed by a short (2-3 m.y.), eastward-migrating pulse of mafic volcanism that took place from ca. 11.5 to ca. 5 Ma to the North of the present Trans-Mexican Volcanic Belt.