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A new seismic tomography of the Gulf of Corinth (Aigion, Greece) using the 3D sensitivity kernels.

S. Gautier (1), G. Nolet (2), J. Virieux (3)

(1) Laboratoire de Tectonophysique, UMR 5568 Université de Montpellier 2, Place Eugene Bataillon CC 049, Montpellier, 34095 France , (2) Department of Geosciences, University of Princeton, 320 Guyot Hall, Princeton, NJ 08544 United States, (3) Géosciences Azur, UMR 6526 Université de Nice-Sophia Antipolis, Rue A. Einstein, Valbonne, 06560 France (Contact Email: gautier@dstu.univ-montp2.fr)

The Gulf of Corinth (Greece) is a continental rift, which has long been recognised as one of the most active region in Europe. Despite a large amount of recent tectonic, geodetic and seismic observations, the rifting process in this region remains an open question. We focus our study in the western part of the Gulf (Aigion area) where a six-month-long dense passive seismological experiment took place in 2002 in the framework of the 3F-Corinth project. The dataset comprises of 451 local events with 9236 P- and 7523 S- first-arrival times. Ray-theoretical tomographic results highlight a complex velocity model and a low-dip surface that may accommodate the deformation. In this study, we aim to improve the resolution of the mid-crust images by using finite-frequency sensitive kernels. We expect that a more accurate velocity model will provide additional constraints on the rifting process. For the starting model we use the 3D seismic model derived earlier from ray theory. The proposed seismic tool uses (1) the graph theory and an additional bending to estimate accurately both rays and travel-times between source/receiver and diffraction points and (2) the paraxial theory to estimate the amplitude along theses rays. Both travel-time and amplitude estimations are required to compute the sensitivity kernels, and this is the first time the finite-frequency method is used with a 3D starting model. We invert both the velocity model as well as earthquake locations using the finite-frequency-sensitivity kernels - which look like distorted versions of the well-known 'banana-doughnut' kernels, and the LSQR iterative solver. We compare the finite-frequency tomography with previous tomographic results to assess the improvement of the images and to analyze the influence of finite-frequency effects at a very small scale in a heterogeneous velocity

structure.