Eos Trans. AGU, 87(52), Fall Meet. Suppl., *2006.*

Topographic and Bathymetric Effects on the Seismic Response of the Nice Bay Region, France

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The eastern part of the French Mediterranean coast represents a moderate but sustained seismogenic region. This area comprises both the Alpine Arc and the Liguria See geological provinces. In the last half century, destructive earthquakes with intensities ranging between VII and IX have been experienced several times. Among them, the biggest earthquake registered in France during the XX century in 1963 of magnitude Ml=6.0. Nice, one of the biggest cities in France lies in this region, between the see and the Maritime Alps Mountains which reach about 600 m of altitude in only 10 km from the coast. Such an abrupt morphology of the Earth's surface goes under the see and describes scarped depressions in the bathymetry becoming deep quickly. As a consequence, we have relief of about 1200 m in a small region of about 400 km^2.

To assess the effect on the seismic response of both the Earth's surface and its interaction with the see water, we performed numerical simulations for different earthquakes scenarios in the Nice region by applying a partly-staggered finite-difference approach. Comparisons with semi-analytical solutions in heterogeneous media containing a superficial water layer validate our numerical approach. Peak-velocities and accelerations maps were determined as a function of the dominant frequencies of source spectrum. Continental wavefield scattering is induced by topography for frequencies higher than ~0.8 Hz. Trapped waves in the water column acts as a sustained energy supplier which affects the see bottom and inland ground-motion.