Geophysical Research Abstracts
Vol. 14, EGU2012-9957, 2012
EGU General Assembly 2012

Polarization analysis of non-volcanic tremor at Guerrero subduction zone (Mexico)

M. Palo (1,2) and P. Capuano (1)

(1) University of Salerno, Dpt. of Physics, Salerno, Italy (pcapuano@unisa.it), (2) Freie Universität Berlin, Institute of Geologiscal Sciences, Malteserstr. 74 - 100 12249 Berlin (mpalo@unisa.it)

Since its first observation occurred about ten years ago in Japan, non-volcanis tremor (NVT) has been observed in many areas worldwide. NVT is generally associated with fluid movements in the lithosphere and, together with the slow-slip events, are considered a key factor to understand the stress state and stress transfer in tectonic frameworks, especially in subduction zones.
Here, we analyze the polarization properties of the NVTs recorded at Guerrero subduction segment of the Cocos plate (Mexico). The Guerrero subduction segment represents a very important case study for its seismic gap. Indeed, there is an absence of large earthquakes in this part of the subducting plate for the last hundred years, and this segment is expected to be able to originate an earthquake of magnitude 8. NVT at Guerrero is a long-duration, low-amplitude, nonimpulsive seismic radiation with most energy concentrated in the frequency range 1–8 Hz. These events have been located at a depth of 20-50 km mainly in correspondence of the tip of the mantle wedge [Payero et al., 2008; Kostoglodov et al., 2010].
Data-set is composed of one year (2006) long continuous seismic recordings of five three-component broad-band stations belonging to the seismic network installed during MASE experiment (available on IRIS website).
We apply the Kanasewich algorithm to the continuous seismic recordings. This algorithm performs the diagonalization of the covariance matrix constructed using the three ground motion components and provides three parameters describing the polarization properties: the azimuth and dip angles constrain the direction of oscillation in a Cartesian reference frame, whereas the rectilinearity indicates if the oscillation is circular, elliptical or linear.
We find that the NVT events can be detected looking at the time pattern of the polarization parameters. In detail, during NVT the dispersion of all the parameters decreases, the dip angle focuses on high values (indicating shallow oscillations) and the rectilinearity increases. On this basis, we detect 28 NVT events and distinguish two classes of polarization solutions. The first class is characterized by azimuth values different among the stations and pointing towards a common epicenter. This suggests the existence of Rayleigh waves in the NVT wavefield, and provides a powerful and very efficacious method to localize the source of these events based on a single station technique, despite of their low energy. The other class displays azimuths almost parallel among the stations. In addition, some NVT events show a time evolution of the azimuths, which suggests a migration of the source.