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Source Rupture Processes of Mw $\sim$ 6.7 Kytheria Earthquake of January 8, 2006 and Synthesis of International EGELADOS and COLUMBOS Projects: Active Tectonics of the Aegean Sea

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Active tectonic processes along the African-Eurasian collision zone are associated with catastrophic events including earthquakes, major volcanic eruptions, and tsunamis. Understanding how these processes can affect the eastern Mediterranean is of increasing scientific and public interest. There are currently many proposed models for the deformation styles and active tectonics of the Aegean – Anatolian plate. The most recent observations of GPS velocity field vectors also confirms that western Anatolia moves to the W-SW direction with counter-clockwise rotation around a pole in the Sinai.

There have been rather interesting moderate sized earthquakes in the Sı ğacı k Bay, Gökova Gulf, Crete-Santorini-Amorgos and the Kytheria regions in recent years. An intermediate depth ($\sim$ h = 60 km) earthquake (Mw 6.7) of 8 January 2006 occurred close to the small Aegean island of Kythera at the western part of the Hellenic trench. The earthquake was strongly felt in nearby regions and slight damage was observed in the village Mitata of Kythera Island where other historical events were also reported. We have used teleseismic long-period and broad-band body waveforms (P- and SH-) to invert for the focal mechanism and the slip distribution of the faulting. A simple double-couple mechanism was adequate to model the details of body-waveforms where clear depth phases of P and SH were quite helpful to distinguish the nodal planes. Minimum misfit solution from the teleseismic body-waves was constrained to be a reverse faulting mechanism with considerable amount of strike-slip motion (NP1

strike=65, dip=60, rake=108; NP2 strike= 212, dip= 35, rake=62; Mo = 1.056 x 10^{19} Nm). The source time function is rather simple and about 10 to 12 sec. We have further obtained rupture properties and slip histrories on the fault-plane by carefully analysing details of broad-band records. The inversion of teleseismic waveforms revealed that the seismic moment was released in two main slip patches on the fault propagating upwards with a velocity of $\sim$ Vr=3.2 km/sec. Rupture area and maximum displacement at the centroid to be $\sim$Dmax=120 cm and $\sim$S=576 km^2, respectively. The overall mechanism is in agreement with known regional stress field where compression is confirmed to be NW-SE along with the trend of the Hellenic trench at intermediate depths. We are studying the further details of this event by analysing near-field waveforms collected during EGELADOS experiment and will be suplemented with the observed near-field strong motion records. Furhermore, the uncorrected maximum accelerations of the nearest stations are reported to be 0.13g on the island of Kythira and 0.14g on Agios Nikolaos, and of 0.05g and on Crete Island.

We have also studied the source mechanisms and rupture histories of Gulf of Gökova and Sı ğacı k Bay earthquakes along with their aftershocks and those occurred in surrounding regions of Izmir in order to better understand the active deformation of these regions and they will be discussed in details at this session. During 17–31 October 2005 there have been 839 earthquakes (M$>$2.4) occurred in the Sı ğacı k Gulf as reported by Kandilli Observatory. Distribution of epicenters of recent earthquakes are concentrated in southern part of the Gülbahçe Fault bordering the east of the Karaburun peninsula (İzmir, W.Turkey). Inversion results indicate that NE-SW oriented right-lateral strike-slip faulting and uniform rupture propagation on the fault plane are observed dominantly in a good agreement with the regional geology and morphotectonic structure of the Sı ğacı k Bay region.

The EGELADOS project is a passive seismic experiment in the Hellenic Subduction Zone. Its aim is to investigate earthquake activity and Earth's structure along the forearc and in the island arc of the Hellenic subduction zone. Using seismic waveforms from a dense, temporary network of broad-band ocean-bottom and land seismographs deployed on the Peloponnes peninsula, the South-Aegean Sea and western Turkey, we will perform a detailed investigation into the elastic and anelastic properties of the Hellenic subduction zone. The combined interpretation of EGELADOS and COLUMBOS data-sets of multichannel seismic, gravity and magnetic profiles as well as seismological and tiltmeter data could help us with unraveling the impact of tectonic and magmatic processes on the seafloor and adjacent islands. This research could represent a significant step towards an improved risk assessment for the Santorini-Columbos volcanic complex and, consequently, for the residents of the central Aegean region.