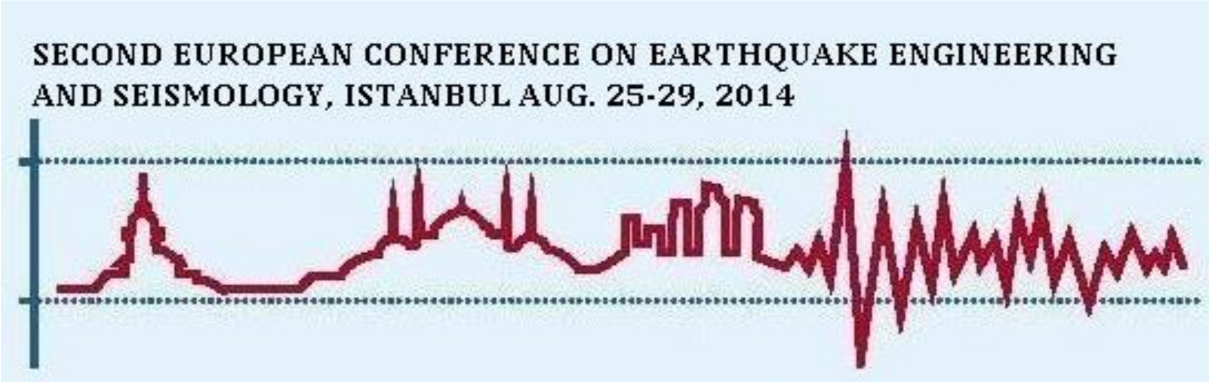

1
2

THE SOURCE AND SURROUNDİNG AREA OF THE GREAT 365 AD EARTHQUAKE İN THE WESTERN HELLENİC ARC: NEW İNSİGHTS ON SEİSMOTECTONİC AND SEİSMİCİTY PROPERTİES

1

Eleftheria PAPADIMITRIOU[1], Vassilios KARAKOSTAS[2], Filippos VALLIANATOS[3], Georgios DRAKATOS[4] and Konstantinos MAKROPOULOS[5]

1
2

The recent giant subduction earthquakes associated with unprecedented devastation, due mainly to the accompanying unusually large tsunamis, bring to the foreground the demand of exhaustive investigations of subduction zones seismotectonic and seismicity properties. Historical information suggests that the interval between great earthquakes is irregular, not necessarily following the convergence rate–slip relation postulated by plate motions. Identification of the resulted hazard from such events requires some knowledge of the long–term history of subduction zones. The target of the present study is the southwestern part of the Hellenic Arc, near the Island of Crete, where an M8.3 occurred in 365 AD, generating a tsunami that affected almost the entire eastern Mediterranean region (Papazachos and Papazachou, 2003; Papadimitriou and Karakostas, 2008). Although the historical record in our study area goes back to 2500 years BP, there is not historical record for repetition of this great subduction earthquake. The anticipation for such repetition is partly due to incomplete knowledge about past seismicity as well as lack of understanding of the long term behavior of subduction zones. Historically documented and instrumental period earthquakes along this portion of the Hellenic Arc broke much smaller segments (~50 km) of the plate boundary. Even though the history of smaller events appears incomplete, the occurrence of the 365 earthquake emphasizes the fact that segments of the trench are capable to break simultaneously. The Hellenic Arc which consists the most prominent feature of the eastern Mediterranean area controlling the active deformation in the Aegean and surrounding areas, which is adequately explained by a geodynamic model that has been proposed on the basis of the available reliable fault plane solutions (Papazachos et al., 1998).
A recurrence model for the maximum expected earthquake in the Hellenic subduction zone seems to be unrealistic for the moment, since this great earthquake belongs to a super cycle and information on its predecessors is completely unknown. One approach for the improvement of the related hazard consists of delineating as much accurately as possible the seismotectonic properties and seismicity patterns based on the accumulation of more observational data. Exploitation is firstly made of all available historical information, on the strong earthquakes that took place either on the coupled portion of the descending slab or at intermediate depths. Then, relocation of the seismicity is performed, which along with new focal mechanisms provide an improved analysis of the seismotectonic characteristics, the associated stress field and the geometry of the interplate coupled zone. The epicentral distribution of relocated events is employed to delineate the shape of the convergence front. Investigation of the geometry and state of stress of the subducted slab is

[1] Prof., Geophysics Department, Aristotle University of Thessaloniki, Thessaloniki, ritsa@geo.auth.gr
[2] Assoc. Prof., Geophysics Department, Aristotle University of Thessaloniki, Thessaloniki, vkarak@geo.auth.gr
[3] Prof., Laboratory of Geophysics and Seismology, Technological Educational Institution of Crete, Chania, fvallian@chania.teicrete.gr
[4] Res. Director, Geodynamic Institute, National Observatory of Athens, Athens, g.drakat@noa.gr
[5] Prof., Department of Geophysics and Geothermy, National Kapodistrian University of Athens, Athens, kmacrop@geol.uoa.gr

accomplished by cross sections of seismicity along with fault plane solutions, oriented in the direction of convergence.

It has been shown that the shape of the oceanic downgoing slab in the region, exhibits lateral variations in the dip (Papazachos et al., 2000), interpreted as segmentation of the downgoing slab bounded by tears or by continuous flexure of the slab. An attempt is made to define the depth extent of the seismogenic interplate contact from the maximum depth of the shallow thrust earthquakes and the depth of transition between downdip compression and tension. The latter is evidenced by intermediate depth earthquakes, the source mechanisms of which testify the slab–pull motion (e.g. the 2006 Kyhtira Mw6.7 earthquake, Nikolintaga et al., 2008). The subducted plate exhibits variations in the dip angle where the stress regime is tensional (Papazachos et al., 2000). The seismicity patterns in these depths are engaged to shed more light in the identification of the active portions of the slab. Taking into consideration the average dip of the subducted slab, the maximum seismogenic width is reevaluated and discussed, along with the aseismic upper part.

1

This research has been co-funded by the European Union (European Social Fund) and Greek national resources under the framework of the "THALES Program: SEISMO FEAR HELLARC" project of the "Education & Lifelong Learning" Operational Programme.

1

2

REFERENCES

1

Nikolintaga, I, Karakostas, V, Papadimitriou, E and Vallianatos, F (2008) "The 2006 Kythira (Greece), Mw6.7 slab–pull event: tectonic implications and the geometry of the Hellenic Wadati–Benioff zone", *Annals of Geophysics*, 51(5/6): 823–837

Papadimitriou, EE and Karakostas, VG (2008) "Rupture model of the great AD 365 Crete earthquake in the southwestern part of the Hellenic Arc", *Acta Geophysica*, 56(2), 293–312

Papazachos, BC and Papazachou, CB (2003) The earthquakes of Greece, Ziti publ., Thessaloniki, Greece.

Papazachos, BC, Papadimitriou, EE, Kiratzi, AA, Papazachos, CB and Louvari, EK (1998) "Fault plane solutions in the Aegean and the surrounding area and their tectonic implications", *Bolletino di Geofisica Teorica ed Applicata*, 39, 199–218

Papazachos, B, Karakostas, V, Papazachos, C and Scordilis, E (2000) "The geometry of the Wadati – Benioff zone and lithospheric kinematics in the Hellenic arc", *Tectonophysics*, 319: 275–300