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Last millennium gravity reworking processes in the western Gulf of Corinth: correlations with historical seismicity and indication of earthquake clusters

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The western tip of the Corinth Rift is considered as the most active within this major extensional structure, as evidenced by: seismicity, GPS kinematics, and INSAR data (Bernard et al., 2006). Within the frame of a multidisciplinary project dedicated to seismic hazards assessment for this region, two offshore surveys - high resolution seismic reflection and gravity coring - were conducted in this area. They were dedicated to the Late Quaternary sedimentary fill as the latter was expected to record both long term deformation (Beckers et al., 2015) and sedimentary "events" related to major earthquakes and/or tsunamis. Seismic reflection imaging displays the time and geographical distributions of large submarine landslides (MTDs) during the last 100 kyr. Based on a morpho-sedimentary map and the active fault pattern, up to 2 m-long cores were selected to detect and characterize the possible impact of historical events.
The chronological control is based on AMS 14C dating and four detailed 210Pb and 137Cs profiles. Sedimentation (components, sources, transport and settling mechanisms) was analysed through textural, chemical, and mineralogical parameters. Turbidites could be clearly separated from the hemipelagic deposits. Our attempt to correlate identified sedimentary "events" with historical data greatly benefited from a recently elaborated catalog (Albini et al., 2014) with precisely re-located epicentral areas. Cable breaks were also taken into account. Attenuation models (Papazachos & Papaioannou's, 1997) were used to discuss paleo-intensities vs. distance form epicentral areas.
From the whole set of cores, the following results may be underlined:
- the correlations between cores from the different sites are not complete, including for a few neighbouring sites belonging to the same morpho-sedimentary unit; we relate these discrepancies to the complex bottom morphology and/or to bottom currents responsible for local erosion;
- for several well-documented earthquakes and tsunamis, we could not find a clearly recorded sedimentary impact;
- non earthquake-triggered MTDs (as the 1963 event) produced specific layers identical to the major earthquakes impacts.
At the difference, for a few cores from the deep axial floor, several sandy or silty turbidites permit to establish correlations: i) between coring sites, ii) with earthquakes which stroke two different areas, respectively east and west of the concerned part of the Gulf. Furthermore, the sedimentary events show a particular time distribution for the last 600 yr:
- two intervals with short recurrences: a recent one (∼1900 AD-Present or ∼1750 AD-Present) and an older one (∼1550 AD-1700 AD or ∼1450 AD-1800 AD); these time distributions differ from each coring site;
- a long "quiet" period (150 to 200 yr).
From these results, we tentatively consider this sedimentary record as an indicator of a migration of seismogenic faulting activity.
Ref.: Albini, P., et al., 2014. Techn. Rep. I.N.G.V. Roma.
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