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Strain transients in the Gulf of Corinth (Greece)

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The Gulf of Corinth (Greece) is one of the most seismic regions in Europe, producing some earthquakes of magnitude greater than 5.8 in the last 35 years, 1 to 1.5 cm/yr of north-south extension, and frequent seismic swarms. This structure is a 110 km long, N110E oriented graben bounded by systems of very recent normal faults. This zone thus provides an ideal site for investigating in situ the physics of earthquake sources and for developing efficient seismic hazard reduction procedures. The Corinth Rift Laboratory (CRL) project is concentrated in the western part of the rift, around the city of Aigion, where instrumental seismicity and strain rate is highest. The CRL Network is made up about fifteen seismic stations as well as tiltmeters, strainmeters or GPS
in order to study the local seismicity, and to observe and model the short and long term mechanics of the normal fault system. The instrumental seismicity in the Aigion zone clearly shows a strong concentration of small earthquakes between 5 and 10 km. In order to study slow transient deformation, two borehole strainmeters have been installed in the Gulf (Trizonia, Monasteraki). The strainmeter installed in the Trizonia island is continuously recording the horizontal strain at 150m depth with a resolution better than 10-9. The dominant signal is the earth and sea tidal effects (few 10-7 strain), this one is modulated by the mechanical effects of the free oscillations of the Gulf with periods between 8 and 40 min. The barometric pressure fluctuations acts in combination with the mean sea level variation at longer periods and both effects are not independant. The comparison between the strain data and the two forcing signals (sea-level, barometric pressure) shows clearly a non zero phase delay
of the sea-level. The analysis of time correlations between the signals in differents frequency range exhibits that the sea level delay and the strainmeter/sea-level coupling coefficient are increasing with period (about 1/10 of a period for 10-40 hrs period range). This analysis allows us to estimate a transfert function for each forcing signal but the physical interpretation
of the sea-level function is difficult. As the strainmeter is at 150m depth, below the shoreline, a sea water percolation on land would increase the effect of sea level fluctuation, and be more efficient at longer periods. This interpretation and the study of the mechanical effects on strainmeter allow us to accurate the sea level admittance and to remove the water effect from the strain data. This residual signals are studied in order to find slow transient signatures, especially during the reported seismic swarms.