Seismotectonic analysis of the 2014 seismic swarm at the Western Corinth Gulf (Greece)

Anna Serpetsidaki¹, Efthimios Sokos¹, Sophie Lambotte², Pascal Bernard³, and Helene Lyon-Caen⁴
¹Seismological Laboratory, University of Patras, Patras, Greece (annaserp@upatras.gr, esokos@upatras.gr)
²Ecole et Observatoire des Sciences de la Terre, CNRS, Strasbourg, France (sophie.lambotte@unistra.fr)
³Institut de Physique du Globe de Paris, CNRS, Paris, France (bernard@ipgp.fr)
⁴Laboratoire de Géologie, Ecole Normale Supérieure, CNRS, Paris, France (helene.lyon-caen@ens.fr)

The Corinth Rift (Greece) is one of the most seismically active regions in Europe and has been studied extensively during the past decades. It is characterized by normal faulting and extension rates between 6 and 15 mm yr⁻¹ in an approximately N10°E direction. The seismicity of the area is continuously monitored by the stations of the Corinth Rift Laboratory Network (CRL Net). The availability of a dense permanent seismological network allows the extensive analysis of the seismic swarms which occur frequently. In this study, the September 2014 swarm located at the western part of the Corinth Gulf is analyzed. Initially, more than 4000 automatically located events, of a two month period, were relocated using the HYPODD algorithm, incorporating both catalogue and cross-correlation differential traveltimes. Consequently, the initial seismic cloud was separated into several smaller, densely concentrated clusters. Double difference relocation was also applied to 707 manually located events in order to investigate the Vp/Vs ratio variation, due to its sensitivity in pore fluids. The swarm's parameters such as seismicity distribution and moment tensors were combined with the seismotectonic data of the area. The results indicate an initial activation of the Psathopyrgos normal fault; afterwards the seismicity extended both towards East and West, while most events occurred at the western part of the study area. The seismicity distribution revealed a main activation of the North – dipping faults. The seismicity migration with respect to pore pressure changes due to fluid movements was investigated through diffusivity calculations. The diffusivity value was found to be 4.5m²s⁻¹, which is consistent with results of previous studies in the area. The results of the investigation of the fault- zone hydraulic behavior provide evidence for the fluid – triggered earthquake swarms and the related rock physical properties.