MADAM experiment: Seismotectonic characterisation of a microplate in formation

The Gulf of Corinth separating continental Greece from Peloponnese constitutes a tectonic structure in a very rapid NS extension with a velocity of the order of 1.5 cm/y, and with a continuous and sometimes destructive seismicity. The Corinth Rift Laboratory (CRL, <u>https://nfo.crlab.eu</u>) realised a continuous geophysical survey of this area through a seismological network (e.g. Pacchiani & Lyon-Caen, 2010; Sokos et al., 2012; Godano et al., 2014; Lambotte et al., 2014), a geodetic network (e.g., Briole et al., 2000; Avallone et al., 2004) and observations by radar interferometry (Elias, 2013). While the structure and dynamics of the Corinth Rift are beginning to be well understood through efforts over the last 20 years in the frame of CRL, its connection with the surrounding regional tectonic structures remains unclear.

To investigate this connection, we initiated in 2015 a seismotectonic study of the western region of the Gulf of Corinth, north of the Patras Gulf, supposed to form a block or microplate named IAB for Island Akarnanian Block (Pérouse et al., 2017). The unresolved question is how the important deformation observed in the Gulf of Corinth is distributed to the west and connects with the Ionian subduction/collision through the IAB microplate (Figure).



Figure : Tectonic map of western Greece. KSF : Katouna-Stamna Fault. From Pérouse (2013).

The region from the Gulf of Patras to the Amvrakikos Gulf to the north presents a system of NS sinistral strike-slip faults, the Katouna - Stamna Fault (KSF), and EW normal faults joining to the north the boundary between the Apulian plate and the Eurasian plate, and to the south forming a graben occupied by Lake Trichonis. However, the seismicity recorded by the Greek national network shows discrepancies with the mapped faults at surface.

Then, we are conducting a survey between the Amvrakikos Gulf and the Gulf of Patras since the fall of 2015 with the installation of a temporary seismological network of about 16 stations recording continuously. This network should be maintained until at least spring 2018. Measurements of surface deformation by GNSS are also carried out in the same area. On the one hand, there are permanent points which we have installed and those maintained by the University of Patras, and, on the other hand, regular measurements of points materialized by pillars belonging to the Greek reference geodetic network.

In addition, Greek colleagues carry out studies by radar interferometry techniques (InSAR) completing and densifying measurements of the surface deformation.

The work of this PhD thesis is the exploitation of the seismological data collected through the MADAM temporary network which will be combined with the data of the permanent seismological network of CRL and of the stations maintained by the University of Patras and by the National Observatory of Athens (NOA). The objectives are to realize a precise location of the recorded seismic events, the determination of the focal mechanisms, and the determination of 1D and 3D tomography models. Depending on the progress of the work, it may be possible to envisage a further exploitation of the data by, for example, the analysis of the teleseismic signals or the noise for structural studies.

It will also be necessary to process and exploit the GNSS data that are carried out in this zone since 2010. Other measurements will probably be carried out during the thesis.

The final objective of the thesis is to propose a seismotectonic model (characterization of seismic activity, 3D fault geometry, deformation rate, tectonic model) that best integrates all observations and the regional geodynamic framework.

The thesis is under the supervision of Alexis Rigo, CNRS researcher, PI of the MADAM experiment, and will take place within the Geodynamics, Sismology and Geodesy team of the Geological Laboratory (http://www.geologie.ens.fr/spiplabocnrs/) of École Normale Supérieure (ENS) at Paris, with strong collaborations with the Seismological Laboratory of the University of Patras and the National Observatory of Athens.

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