



## Maghreb-EU research staff exchange on geodynamic, geohazards and applied geology in Northwest Africa

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At the doorstep of Europe, the NW African plate boundary system is paradoxically the least understood segment of the Earth's global plate system. This largely reflects the intrinsic complexity of the present-day plate boundary, characterized by a diffuse geometry and several lithospheric domains accommodating the relative motion between Eurasia and Africa. IRSES-MEDYNA project was aimed at filling this gap fostering the transfer of knowledge through a 4-year program of research staff exchange, as has been an essential step forward that lay the foundations for a sustainable collaboration network on Integrated Earth Science studies between EU and Maghreb researchers working in NW Africa. IRSES-MEDYNA has been a very ambitious and successful exchange of staff program on Integrated Earth Sciences.

During this reporting period, IRSES MEDYNA concluded a total of exchange of 100 Experience Researchers (ERs), and 76 Early Stage Researchers (ESRs). The total duration of the exchanges was 481 month/person. In terms of person per months, about 35% of the secondment involved ERs, of which 40% involved female ERs. This percentage is greater than the average gender ratio in Earth Sciences. On the other hand, about of 70% of the secondment involved ESRs of which 60 % of involved female ESRs. IRSES MEDYNA was very successful in implementing gender equality in the transfer of knowledge during the IRSES MEDYNA project, despite the low percentage of female research staff in the field of Earth Sciences overall, and in the Maghreb countries, in particular. This unprecedented exchange of ERs and ESRs in Solid Earth Sciences involved staff from the Mediterranean EU institutions from Spain, France and Portugal, and 15 partner institutions from Morocco, Algeria, and Tunisia. ***The MEDYNA exchange of staff has initiated and strengthened a network of research cooperation and high-level training of researchers between EU and Maghreb. MEDYNA has been a key actor for the widening of ERA towards Mediterranean Partner Countries in the field of Integrated Solid Earth Sciences. IRSES-MEDYNA is now a landmark in the EU-Maghreb cooperation in the field of Integrated Solid Earth Sciences.***

The main objectives of the IRSES-MEDYNA project were: (i) to constrain the present-day kinematics and seismic hazards to better quantify and understand the present day kinematics and seismic hazard in NW Africa through multidisciplinary studies combining geodesy, morphotectonic and seismicity; (ii) to investigate the Landscape evolution and Palaeoclimate in order to Understand the



processes that have shaped the actual landscape and its recent evolution (Tertiary-Quaternary) in NW Africa, including the exhumation/denudation history, paleo- stress/strain field and basins evolution, and the reconstruction of extreme climate events at millennium scales; (iii) to better understand the deep mantle structures and mantle processes, in order to Constrain the composition, structure and dynamics of the shallower asthenospheric mantle and lithosphere combining complementary disciplines (seismology, petrophysics, volcanology, petrology, geochemistry, and geochronology), and observations at different temporal and spatial length-scales to unravel the tectonomagmatic evolution and deep processes responsible for the current topography, high heat flow, and gravity and geoid anomalies in many areas of NW Africa; and iv) to transfer this knowledge to applied geology and industrial applications of geomaterials, and increase the synergies among multidisciplinary studies to investigate the origin of key mineral economic resources in NW Africa, and investigate new use of natural geomaterials for societal and industrial applications.

The IRSES MEDYNA transdisciplinary and multidisciplinary investigations encompassed from deep lithospheric processes, mineral raw materials (phosphates, REE and base metals) to new technological applications of geomaterials. Among many research activities, IRSES MEDYNA scientists carried out the study of the seismicity of Algeria and the NW African Margin based on a new database of earthquake events, including historical and instrumental records. They have also investigated the morphological analysis and geochronological characterization of the Algerian Atlas (Algeria) and Rif (Morocco) mountain belts. The kinematics and timing of the major tectonic structures in northern Morocco, Algeria, and the Gibraltar arc, along with the exhumation history of the Rif-Tell Belt, have been investigated using geophysical, petro-structural studies and state-of-the-art thermochronology. The palaeoaltitude reconstructions in the region have been investigated using the calibration of sub-modern pollen data vs. altitude estimates. The geological records of the recurrence of extreme events, such as floods, storms or tsunamis, which have stressed the western Mediterranean basins during the last millennium, have been investigated in Tunisia and the western Mediterranean. The MEDYNA researchers carried out tectono-metamorphic and geochemical studies of exhumed mantle rocks, mantle xenoliths brought up by volcanism, and of the volcanism in Belt-Rif-Tell orogenic belt and the NW Africa forelands. These studies have provided an unprecedented view of the deep mantle processes occurring in NW African and the western Mediterranean. Detailed field, tectono-metamorphic, petrochronological studies of the peri-cratonic to meta-cratons in Morocco and Algeria, combined with satellite data, have provided key information to unravel the geological evolution and structure of these poorly known terranes. MEDYNA scientist carried out detailed studies of NW Africa basins that host the unique phosphate deposits and that extend from Morocco to Tunisia. MEDYNA researchers have investigated these basins with an integrated multidisciplinary approach including stratigraphy, sedimentology, mineralogy, and geochemistry. The industrial applications of geomaterials have investigated new geomaterials from Tunisia, Algeria, Spain, and France, in order to increase their benefit for industrial, health and medical applications.

The IRSES-MEDYNA project has been extremely successful in the dissemination of Solid Earth Sciences, particularly in Maghreb countries, organizing or sponsoring, for the first time, a large number of events such and the very successful knowledge exchange forum on [Resources Innovative Geology](#) involving key stakeholders from EU and Maghreb.

