Maghreb-EU research staff exchange on Geodynamic, Geohazards and Applied Geology in Northwest Africa

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. **MEDYNA**is aimed at filling this gap fostering the transfer of knowledge through a 4 year program of research staff exchange as an essential step forward to lay the foundations for a sustainable collaboration network on Integrated Earth Science studies between EU-Maghreb researchers working in NW Africa. **MEDYNA** is an ambitious exchange scheme on Integrated Earth Sciences that involves the exchange of over 100 ESR/ERS (485 months) between 4 Mediterranean EU beneficiary institutions from Spain, France and Portugal, and 15 MPC partner institutions from Morocco, Algeria and Tunisia. MEDYNA is reinforcing networks for long-term, joint research projects and high-level training of researchers between EU and Maghreb staff and is sparking synergies to become a sustainable and key initiative for widening ERA towards MPCs in the field of Integrated Earth Sciences.

The main objectives of the IRSES-MEDYNA project are: (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 mantel processes, in order to Constrain the composition, structure and dynamic 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.

During the first 24 months of the IRSES MEDYNA project, beneficiaries and participant have carried out a total of 180 secondments involving 65 Experience Researchers (25% female) and 39

FP7-Marie Curie Action funded under Grant Agreement PIRSES-GA-2013-612572

Early Stage Researchers (51% females), constituting a very dynamic a highly multi- and trans-disciplinary network of researchers for the study of the Solid Earth on Geodynamic, Geohazards and Applied geology in NW Africa.

Among many other research activities, IRSES MEDYNA scientists carried out high-resolution Global Positioning System (GPS) survey of northern Morocco. They have also investigated: (i) the morphological analysis and geochronological characterization of the Algerian Atlas (Algeria) and Rif (Morocco) mountain belts; (ii) the seismicity of Algeria based on the available database of earthquake events, including historical and instrumental records; (iii) the kinematics and timing of the major tectonic structures in northern Morocco, Algeria and along the Gibraltar arc; Exhumation history of the Rif-Tell Belt; (iv) the exhumation history of the Rif chain in Northern Morocco through low temperature thermochronological and structural geology approaches; (v) the Neogene or "post-nappe" basins within the whole Rif chain in order to depict vertical movements.; (vi) the palaeoaltitude reconstructions in N. Morocco using calibration of sub-modern pollen data vs. altitude estimates; (vii) the recurrence of extreme events such as floods, storms or tsunamis that have stressed the western Mediterranean basins during the last millennium; (viii) mantle rocks brought to the surface by tectonics (peridotite massifs such as the Beni Bousera in the Rif mountains in northern Morocco, and Collo in northern Algeria), and volcanism (xenoliths from the Hoggar swell, southern Algeria, and the Middle Atlas, Morocco) convey valuable information on mantle processes, notably those involved in lithospheric thinning; (ix) the nature and origin of different Neogene volcanic activity in North Africa and their geodynamics context.

To better understand the genesis of the unique phosphate deposits from northern Africa that extend from Morocco to Tunisia and represent most part of the world reserve on phosphorus, IRSES MEDYNA scientist carried out detailed studies of the main and subsidiary basins with an integrated multidisciplinary approach including stratigraphy, sedimentology, mineralogy and geochemistry. In terms of industrial applications of geomaterials research activities were aimed at characterizing new geomaterials from Tunisia, Algeria, Spain and France, and increasing their added- value for industrial, health and medical applications. Among new geomaterials investigated were clays and quartz (siliceous) sands.

FP7-Marie Curie Action funded under Grant Agreement PIRSES-GA-2013-612572