UNIVERSITÀ DEGLI STUDI DI TORINO

I@UNITO – Visiting Scientists

Scientific area	Scientific responsible	Host Department	Type of activity	Start of mobility	Language
Area 5	Corrado CIGOLINI	Scienze della Terra (Earth Sciences)	Research	February-March 2017	English
Type of fellowship	Junior (less than 40 years old) 3 months fellowship				
Title of the research project	Petrology and geochemistry of key volcanic systems at convergent plate boundaries				
Description of the research project	Subduction of upper crust into the mantle is one of the main processes in the evolution of the planet Earth. It is able to recycle back into the mantle upper crustal rocks, determining mantle anomalies at a global scale. Subduction of oceanic crust occurs by i) sinking of the crust into the upper mantle, ii) inducing variable temperature and pressure gradients within the subducted crust; iii) transfer of upper crustal material, either as fluids or/and as melts, into the mantle wedge, iv) mantle wedge chemical and mechanical modification (metasomatism) by material released from the subducted crust, v) melting of the upper mantle and generation of "hybrid" magmatism, showing evidence of mantle and upper crust geochemical signatures, vi) possible exhumation of crustal fragments. The study of this complex series of events can be conveniently investigated through a multidisciplinary approach that integrates petrological, geochemical and geophysical aspects of the subduction process as a whole. Particular emphasis will be given to the understanding of magma storage and magma chamber processes at key volcanoes [i.e., Stromboli, Vesuvius, Asosan (Japan) and Miravalles (Costa Rica)]. Fine thermobarometry is a valued tool to better understand magma chamber geometries and their behaviour under dynamic conditions. Since most of the current standard geobarometers (and to lesser extent geothermometers) have a large degree of uncertainties, it is preferred to use a grid of selected reactions to constrain the P-T estimates of erupted materials. Selected reactions may thus be studied by applying standard equilibrium thermodynamics which take into account the coexistence of mineral phases with melts (either melt inclusions and/or interstitial glasses) together with fluid phases. Thus, P-T regimes for the base of magma chambers can be calculated by assessing equilibrium between the cores of phenocrystic phases and coexisting primitive melts (hydrous and anhydrous). Additional information for the lower part of the chamber can be obtained by analyzing "cumulitic nodules" preserved in basaltic lavas and/or ejecta. In turn, thermobarometric estimates for the upper part of magma reservoirs can be obtained by considering the equilibrium of phenocristic rims with coexisting groundmass melts. These methods were successfully applied to infer the shape and extension of Stromboli magma chamber. Integration of petrological, geochemical and geophysical data will lead to a better understanding of magma production, ascent, storage as well as the eruption dynamics.				

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Profile Description	A junior visiting scientist with a well consolidated experience in igneous petrology, geochemistry and volcanology. The successful candidate will be involved in laboratory activities and theoretical work focused in modelling magmatic systems. He/she will have the possibility of exchanging ideas and experiences with other scientists operating in this field of research.
Research objectives	Collecting additional petrochemical and geochemical data on key volcanoes. Integrating volcanological and geophysical data to better understand eruption dynamics. Arriving to produce several publications resulting from the undertaken research activities.
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