Petrochemical characterization of the basalts and rhyolites erupted along the central axis of the Main Ethiopian rift

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In continental domain rift zones are the sites of the most extensive magma production. The opening of continental rifts and their consequent oceanization are accompanied by the intrusion and emission of magmas. The relationship between the timing and style of the rift opening and the type of magma associated is still not fully understood. The Main Ethiopian Rift (MER) represents one of the most active continental rifts in which the volcanic activity has produced basaltic flows from fissural eruptions and rhyolitic central volcanoes. In order to characterize the products cropping out within the northern and central branches of the MER, we have carried out an extensive sampling of lava flows, monogenetic scoria cones and obsidianaceous central edifices (Fantale, Kone, Boseti). On the collected samples major and trace elements analysis and mineralogical and petrographic observations have been performed. Preliminary data confirm a close relationship between geochemical composition and the morphology of the volcanic edifices and structures. In particular, central edifices present a rather homogeneous rhyolitic compositions, whereas recent fissural activity is dominated by basaltic lava fields. These two distinct types of products occur along en-echelon tectonic segments, located within the central portion of each branch of the rift. Branches are joined by transitional areas, in which monogenetic scoria cones with the most primitive compositions crop out. The chemical data have been used to model the features of the magma sources and the processes affecting magmas during their ascent towards the surface.

Metal mobility in hydrothermal fluids: experimental investigations

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Hydrothermal fluids are crucial in the formation of ore deposits, as they are the main transport medium leading to the selective concentration of elements in the Earth's crust and, among others, metals of economic interest. Fluid inclusions in minerals do not just enable us to probe natural fluids from depth, but also provide an opportunity to investigate fluids in high P/T experiments [1]. With the development of LA-ICP-MS techniques it has become possible to analyze major, minor and trace element concentrations in fluid inclusions [2].

Thus, synthetic fluid inclusion studies are an ideal tool to study metal transport and partitioning in hydrothermal fluids and to provide key data necessary for the quantification of transport properties. Partly due to difficulties in producing decent sized synthetic fluid inclusions at low temperatures, previous studies were mostly focused on conditions above. By combining the two current methods of host mineral pretreatment (thermal cracking [1] and HF etching [3]), we are able to synthesize fluid inclusions in quartz with a size in excess of 20 μm at T down to at least 400 °C. This gives us the opportunity to study the conditions and processes responsible for the mobility of metals at low temperatures. Experiments are conducted in cold seal pressure vessels at T=400-600 °C and P up to 200 MPa with the aim to unravel the transport and partitioning of metals occurring in porphyry copper deposits.

We have been implementing a new technique to analyze fluid inclusions by LA-ICP-MS, which is based the combination of a femtosecond laser with a heating-freezing cell and a sectorfield ICP-MS. During the ablation with a fs-laser the inclusion remains frozen until entirely evaporated, resulting in a considerably longer signal analysis time. This allows reducing the analytical error on the analyzed element concentrations.

Results for Au and Mo solubility in fluids of varying composition obtained at different P and T will be presented. Preliminary data indicate that solubilities of Mo are higher than expected if extrapolated from high T data of [4].

[1] Sterner & Bodnar (1984), *GCA* 48, 2659-2668. [2] Günther *et al*.. (1998), *J Anal Atom Spectrom* 13, 263-270. [3] Li & Audetat (2009), *Am Mineral* 94, 367-371. [4] Zhang, Audetat & Dolejs (2012), *GCA* 77, 175-185.

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