Formation of water-bearing 2D-defects: An intended case study on xenoliths from the Letseng mine

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Mantle convection and resulting plate tectonics on Earth are strongly influenced by water exchange between mantle and surface. The water in Earth's mantle was thought to reside and move only through point defects in nominally anhydrous minerals (NAMS) such as olivine, pyroxene and garnet. Recent studies by Sommer *et al.* [1] show that water in NAMS is also located in microscale halos around nanoscale 2D-defects like grain boundaries and cracks. They suggest that a considerable amount of mantle-water is stored around these defects. Grain boundaries and cracks in NAMS would therefore play a crucial role for the dynamic planetary water cycle and associated processes in Earth's mantle. Samples for the study will be collected from the Letseng Diamond Mine in northern Lesotho. The mine comprises two economic interesting pipes which consist of Group 1 kimberlite. The pipes have been emplaced in the Cretaceous (~90 Ma), penetrating Jurassic Drakensberg basalts in the vicinity of the southern border of the Kaapvaal Craton [2, 3]. The kimberlites contain numerous mantle and lower crustal xenoliths, including for example garnet-bearing gneisses and granulites, granular lherzolites and harzburgites, as well as megacrysts of olivine and garnet [3]. Samples from Letseng are therefore ideal for case studies on water-bearing grain boundaries and cracks in NAMS of Earth's mantle. Aim of the study is to demonstrate that a considerable amount of mantle-water is embedded around 2D-defects in NAMS. Objectives are therefore to point out the formation of cracks and grain-boundaries as well as the volatile transfer and the physico-chemical properties in and around those defects. Thus, a series of measurements using FT-IR and Nano Sims must be undertaken on samples from mantle xenoliths. To visualise the results we plan to provide 2D-plots and 3D-models of cracks and grain boundaries.

[1] Sommer *et al.* (2008) *Miner Petrol* **94**, 1-8. [2] Field *et al.* (2008) *Ore Geology Reviews* **34**, 33-75. [3] Hopp *et al.* (2008) *Lithos* **106**, 351–364.

Late Mesozoic subduction-induced gold metallogenesis along the eastern Asian and northern Californian margins: Efficacy of oceanic versus continental lithospheric underflow

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During latest Jurassic-Cretaceous subduction of paleo-Pacific lithospheric plates, numerous gold deposits formed in the Dabie-Sulu belt of east-central China + its east-Asian extensions, and in the Klamath Mountains + Sierra Nevada Foothills of northern California. Earlier stages of transpression and continental collision at ~305-210 Ma generated a high pressure-ultrahigh pressure (HP-UHP) orogen in eastern Asia, but failed to produce widespread felsic magmatism or abundant gold deposits. Similarly, mainly transform slip involving minor transtension-transpression resulted in the stranding of oceanic terranes in northern California over the interval ~380-160 Ma, but produced only modest granitoid magmas and few important concentrations of gold. In both continental margin realms, nearly orthogonal Cretaceous subduction of oceanic-crust-capped lithosphere resulted in sustained underflow that, reaching magmagenic depths, gave rise to subduction-zone fluids and voluminous intermediate and felsic arc magmas. Ascent of these plutons into the brittle upper crust released CO_2 ± S-bearing aqueous fluids and/or devolatilized the adjacent heated, contact-metamorphosed wall rocks. Hydrothermal fluids transported Au to geochemical sites of abruptly contrasting composition (e.g., serpentinites), precipitating the gold. In marked contrast, where sialic crust was subducted to magmagenic depths, only minor production of granitoid melts occurred (e.g., Late Paleozoic Appalachians, Permo-Triassic east-central China, and Cenozoic Himalayas + Alps), and few coeval ore deposits formed. Mobilization of precious metal-bearing fluids in arc environments apparently requires the long-continued descent of oceanic lithosphere.