Geodynamic implications of new U-Pb zircon ages for the Kamanjab Inlier (NW-Namibia)

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The Huab Metamorphic Complex (HMC) and Fransfontein Granitoid suite (FFG) are part of the Kamanjab Inlier (KI) in NW-Namibia. It is a poorly known pre-Pan African basement complex and, together with the Epupa complex (EC) further NW and the Grootfontein complex (GC) further E, marks the SW-margin of the Congo craton in N-Namibia. New LA-ICPMS U-Pb zircon ages frame FFG emplacement to 1.88-1.83Ga and protolith ages for HMC orthogneisses to 1.86-1.83Ga. These ages are roughly 100 m. y. older than protolith ages from the northern EC close to the Angolan border and roughly 100 m. y. younger than the GC. The southern EC in the Hoanib area is the only known Archean basement in Namibia, but shows eNd (1.83Ga) of -10.9 to -6.5 compared to those of the northern EC (-2 to 4.2), FFG (-5.9 to 1.2) and HMC (-2.3 to 2.3). Our study supports earlier speculations that the southern EC is an exotic terrane within the Namibian basement complexes. In contrast, the KI is comparable to the northern EC and GC and geochemical data indicate an active continental margin setting. This points to an event of Paleoproterozoic crustal growth at the SW border of the Congo Craton starting in the present E gradually moving towards the present NW.

The garnet-spinel transition in fertile and depleted mantle: Experimental data, thermodynamic calculations and implications for magmatic processes

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With increasing depths in the Earth's mantle, the aluminous phase in the upper mantle changes from plagioclase to spinel to garnet. The transition from spinel lherzolite to garnet lherzolite could potentially influence the characteristics of some kinds of basalts, particularly mid-ocean ridge basalts (MORB), since this transition is thought to occur at about the same depths at which MORB may originate. Several studies have investigated the transition from garnet lherzolite to spinel lherzolite in simple systems (e.g. CaO-MgO-Al_2O_3-SiO_2) (e.g. [1-3]) but, due to experimental problems associated with slow reaction rates, few studies have tried to experimentally investigate the garnet-spinel transition in more complex and depleted composition (e.g. [4-5]). Here we set out to investigate phase relations from fertile to depleted mantle compositions using a new set of thermodynamic data and free energy minimization techniques [6]. We show that the stability fields of garnet and spinel in upper mantle lithosphere critically depend on the bulk composition of the peridotite. In fertile bulk compositions, the transition from spinel to garnet-bearing rocks is relatively sharp but in depleted bulk compositions there is a large pressure-temperature field where garnet and spinel coexist. We will show that the garnet-in reaction in depleted peridotite occurs in much greater depths than in fertile lherzolite. Furthermore, the results in depleted compositions may also be of relevance for the diamond exploration industry as the calculated Cr-rich spinel and garnet compositions may be used to quantitativly estimate pressures of origin and therefore evaluate the so-called diamond potential of mineral concentrates [7].

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