Experimental re-examination of the phase transition quartz-coesite – The reaction in presence of H_2O and at anhydrous conditions

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The quartz-coesite phase transition has been studied extensively because of its outstanding significance in petrology (cf. Hemmingway *et al*., 1998). Despite a nominally anhydrous composition, the two SiO_2 polymorphs may contain small amounts of H_2O (e.g. Lathe *et al* 2005). Most experimental studies were conducted in presence of H_2O (e.g. Mirwald & Massonne, 1980; Bohlen and Boettcher, 1982). Contrasting results obtained by anhydrous experiments (Walter *et al*., 2002) gave rise to a re-examination.

The study was performed with a piston cylinder apparatus (400-1100°C, up to 3.5GPa) using pure synthetic SiO_2 as starting material. The phase transition was monitored by differential pressure analysis (DPA) and was controlled by additional quench experiments

The „wet" data (400-900°C) confirm previous studies in general reveal, however, a pronounced inflection at 2.7GPa/600°C. (boundary <600°C: P[GPa] = 2.19 + 0.00072*T[°C]; boundary >600°C: P = 2.11 + 0.00096*T). Preliminary data of the anhydrous experiments (700-1100°C) suggest a significantly different P-T course of the transition boundary (P[GPa] = 2.7 + 0.00025*T[°C]). The different P-T location of the "wet" and "dry" boundary indicates that H_2O incorporation in these phases has a considerable effect on their P-T stability. The observed inflection at 2.7GPa/600°C is attributed to a PVT anomaly of H_2O as similarly found for the nominally anhydrous reaction albite = jadeite + quartz (Mirwald 2005a) and for the brucite dehydration boundary (Mirwald, 2005b).

While in „wet" experiments the sample material was wetted by breathing into the filled capsule, in dry experiments the capsules were heated to 1000°C for 5- 12 hours before welding.

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Interrogating a paleo-cratonic margin – The Peruvian Cordillera Oriental batholiths

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Batholiths of the Eastern Cordillera of Peru exhibit profound variations in chemistry and timing of emplacement from north to south. As products of long-lived, craton-peripheral, intrusive flare-ups, these plutons mark tectonic boundaries between the Western Gondwana and variable Proterozoic to Paleozoic crustal domains accreted during the final assembly and the ultimate break-up of Pangea.

A striking geochemical relationship exists between three principal plutonic belts: 1) Mississippian to Pennsylvanian, metaluminous, hornblende and magnetite bearing, I-type granitoids are restricted to the segment north of 10°S, and display calc-alkaline evolutionary trends with elevated LILE/HFSE ratios and Nb-Ta anomalies characteristic of subduction zones; 2) Permian to Early Triassic, peraluminous, S-type, mica and ilmenite rich granitoids of the east-central Peru (10-14°S), are characterized by restricted bimodal compositional range, moderate Fe enrichments, low LILE/HFSE values which are associated with transitional, post-orogenic (within-plate) suites; 3) Late Triassic, initially Caledonian I-type monzogranitoids of the southern Cordillera de Carabaya terminate as peralkaline, SiO_2-undersaturated nepheline syenites (Allincapac Gr.) emplaced contemporaneously with eruption Mitu Gr. basanites. The Allincapac Gr. Intrusives and lavas display extreme Fe enrichments, steep REE profiles, and overall low LILE/HFSE ratios. Combined Sr-Nd-Pb-Hf isotope systematics from all three intrusive provinces however lack variation, and suggest uniformly large degrees of assimilation of the Proterozoic Amazonian basement. In addition to the systematic change in the plutonic chemistry, the U-Pb and $^{39}Ar/^{40}Ar$ chronometries reveal a general younging-southward trend from 345 to 188 Ma with the exception of the 310-275 Ma magmatic lull.

Our preliminary geodynamic model envisions, initially orthogonal, eastward subduction of the paleo-Pacific crust below the Western Amazonia during Carboniferous, which was terminated by accretion of a buoyant segment of oceanic crust. This scenario explains the sudden termination of arc-related magmatism in Pennsylvanian as well as uplift and eventual relaxation of the cratonic margin which in turn might have facilitated emplacement of the central Permo-Triassic granites. Simultaneously, a change in conversion angle to southeast during Permian induced development of trans-tensional, ensialic basins and subsequent back-arc extension along the inherited suture between the Gondwanan craton and the Neoproterozoic Arequipa-Antofalla terrane. The southernmost Carabaya plutons seem to reflect a phase of incipient rifting and re-accretion of the Arequipa terrane.