P-T-t path and metamorphic evolution of Ribeira Belt based on textural reactions, thermobarometry and pseudosections

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Pseudosection analysis, combined with geothermobarometric data and petrographic observations of gneissic migmatites and granulites from the central area of Neoproterozoic Ribeira Belt, SE Brazil is used here in order to quantify the tectonometamorphic P-T evolution during prograde and retrograde metamorphism of the Braziliano Orogeny.

Results establish a prograde metamorphic trajectory from amphibolitic to metamorphic peak granulite facies at T=850±50ºC and P=8±1kbar, consistent with 30 to 40% dehydration-melting (involving significant melt loss) of the gneissic protoliths. After reaching peak metamorphic conditions, migmatites underwent cooling and decompression (ΔT=-200 to -350ºC and ΔP=-2 to -2.5kbar) to T~500ºC and P~5kbar; the retrograde P-T path was associated with water influx (increasing a_{H2O}), with replacement of the high grade garnet-plagioclase-K-feldspar paragenesis by biotite-quartz-sillimanite-muscovite.

Regional high grade conditions were sustained from ~570 to ~480Ma. The intrinsic long-term high-heat flux induced further dehydration and (~10 %) biotite-amphibole-garnet bearing, restite, re-melting at deeper crustal levels, giving rise to widespread development of granulites and associated aplititic intrusions. Thus, granulites can be envisaged as lower crust highly dehydrated restites. During this period, granulites were slowly (nearly isobarically) cooled with ΔT=-100 to -340ºC and ΔP=-0.1 to -1.8kbar; this tectonothermal regime ceased with the tectonic collapse of the orogenic belt, when granulites were rapidly cooled and decompressed (ΔT=-100 to -200ºC and ΔP=-1 to -3kbar) during exhumation (~470 Ma). Retrograde P-T evolution and hydration, induced replacement of early plagioclase-hyperstene-garnet granulite assemblages by biotite-k-feldspar-quartz simpletites, being consistent with a general P-T-t metamorphic path that comprised initial (long-term) isobaric cooling followed by decompression and cooling.

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