Geobarometric constraints to low-P evolution of lithospheric mantle

G. BORGHINI[1]*, P. FUMAGALLI[2] AND E. RAMPONE[1]

[1]Dipartimento per lo Studio del Territorio e delle sue Risorse, Università di Genova, Corso Europa 26, 16132 Genova, Italy (*correspondence: giulio.borghini@unige.it)
[2]Dipartimento di Scienze della Terra, Università di Milano, via Botticelli 23, 20133 Milano, Italy

During tectonic exhumation at extensional settings (mid ocean ridge and passive continental margin), mantle peridotites can recrystallize from spinel- to plagioclase-facies conditions [1, 2]. This subsolidus decompressional evolution is documented in peridotites from orogenic and ophiolitic massifs. Recent subsolidus experiments on fertile and depleted lherzolites in the Na_2O-CaO-FeO-MgO-Al_2O_3-SiO_2-Cr_2O_3-TiO_2 system, at P=0.27-1.0 GPa, T=900-1200°C have evidenced systematic mineral compositional variations within the plagioclase facies [3]. Experimental results indicate that Ca-Na partitioning between plagioclase and clinopyroxene strictly depends on P; in particular, plagioclase records a marked anorthite content increase (An=59-83) within a rather narrow range of P. Remarkably, plagioclase composition is similar in both fertile and depleted lherzolites, which have quite different bulk X_{Cr} but comparable bulk Na_2O/CaO ratios. This indicate that the composition of plagioclase does not depend on bulk X_{Cr} and reasonably can be used as a marker of recrystallization pressure in ultramafic rocks with fixed Na_2O/CaO ratios. In order to constrain the P-T slope of plagioclase An-isopleths, and make them applicable to natural occurrences, a new set of piston cilynder experiments on fertile lherzolite have been performed between 0.5-0.8 GPa, 1050-1150°C. Experimental results are then applied to plagioclase-facies recrystallized peridotites. We consider as case study the peridotites and associated pyroxenites from Northern Apennine (External Liguride ophiolitic Unit, Italy). They show textural evidence of plagioclase-facies re-equilibration and systematic compositional changes in minerals [4], consistent with experimental results. Detailed microstructural and mineral chemistry investigations have revealed An-reverse zoning in plagioclase of both peridotites and pyroxenites (An=57-80 and An=62-84 respectively), likely related to different stages of low P re-equilibration. Here we show that An content in plagioclase represents a potential geobarometer to reconstruct the subsolidus decompressional evolution of lithospheric mantle at extensional settings.

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Space - time variability of ^{210}Pb fluxes in the Arabian Sea

D.V. BOROLE

National Institute of Oceanography, Dona Paula, Goa – 403004. India (dnyan@nio.org)

Time series samples of settling sediment particles were collected during 1986-'87 from three stations in a east to west transect along 15°N and one station at 10°N during 1993-'94 from ~1000m (shallow) and ~3000m (deep) waters of the Arabian Sea.[1] The traps deployed at these four locations provide unique environmental settings to examine the application of ^{210}Pb as a tracer for water column transport as the magnitude of the particle flux is laterally variable at these locations. The objectives of these studies are to measure the settling fluxes of ^{210}Pb, to understand their spatial and seasonal variation and their relation to the water column scavenging processes.

The ^{210}Pb concentration is in the range of 10 - 600 (dpm g^{-1}) and the corresponding fluxes are 0.2 - 0.4 (dpm.cm^{-2} y^{-1}) in the shallow and 0.4 - 0.7 (dpm.cm^{-2} y^{-1}) n the deep traps. The ^{210}Pb concentration as well as the fluxes showed more pronounced seasonal variation than the spatial as well as the vertical variation.

The overall geochemical mass balance scenario of ^{210}Pb in water, settling particles and underneath sediment revealed a large advective export of ^{210}Pb to the continental margins and its subsequent enhanced deposition fluxes indicative of 'boundary scavenging' mechanism.[2, 3].

The ^{210}Pb Flux (F) / ^{210}Pb production (P) ratio – (F/P) and organic Carbon (C_{org}) as a proxy for C_{org} content prediction concept [4] pose basic question of applicability for Arabian Sea water column features.

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