AGES AND PROCESSES AS REPORTED BY ISOTOPES OF KIMBERLITE DERIVED LOW TEMPERATURE LHERZOLITES

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Until today age estimations of cratonic upper mantle rocks have been restricted to model ages, whereby diamond inclusions from South Africa showed Sm/Nd model ages of about 3,2-3,3 Ga (Richardson (1984)) giving an idea of the age of the South African Craton. Beside these estimations still many scientists beliefe inter mineral age informations (older than eruption) of mantle lherzolites to be wiped out by a supposed chemical equilibration. Deviating features of low temperature garnet lherzolites (LTGL), which do not show isotopic equilibrium were interpreted as influenced by late meta-somatism or contamination. In recent times analyses of the Re/Os isotopic system (Walker (1989)) show Archean (2-3 Ga) depletion ages for both, the South African and the Sibirian Craton as well and help us to accept and understand time informations which were already obtained by the Sm/Nd isotope sytem on these rocks.

In addition to data we presented in the last years on ultra clean mineral separates of LTGL rocks from Kimberley Floors South Africa (Günther & Jagoutz, 1994), we found similar results in an amphibole bearing LTGL from Jagersfontein (table 1), which strongly improve some of the main aspects we reported in 1991. As one can see in fig. 1 the results from Kimberley Floors showed on one hand preserved Sm/Nd Archean ages between clinopyroxenes and the orthopyroxenes (2.65 - 2.85 Ga) on the other hand we could find isotopic disequilibria between garnet and the pyroxenes. The sample from Jagersfontein (Jag 1) confirms the same tendency. The slope between the pyroxenes is Archean (2.9 Ga), whereas the garnets show - in spite of a much higher Sm/Nd ratio - a much younger age of around 300 Ma (eruption corrected). The pyroxene´s model ages, which of course own a much higher uncertanty than inter mineral ages of the different mineral separates, also display the same tendency (1.5 -2.4 Ga). The amphibole lies close to the clinopyroxene its model age is also Archean (2.2 Ga).

Mineral	Sm (ppm)	Nd (ppm)	147 Sm/144 Nd	143/144Nd	143/144Nd-90ma
CPX	10.57	67.63	0.09449	0.51187	0.51181
OPX	0.036	0.211	0.10315	0.51203	0.51197
Amphibole	12.33	86.27	0.08641	0.51189	0.51184
Garnet	2.95	3.507	0.50854	0.51299	0.51269

Table1: Sm and Nd icontents and sotopes of sample Jag 1, Jagersfontein, South Africa.

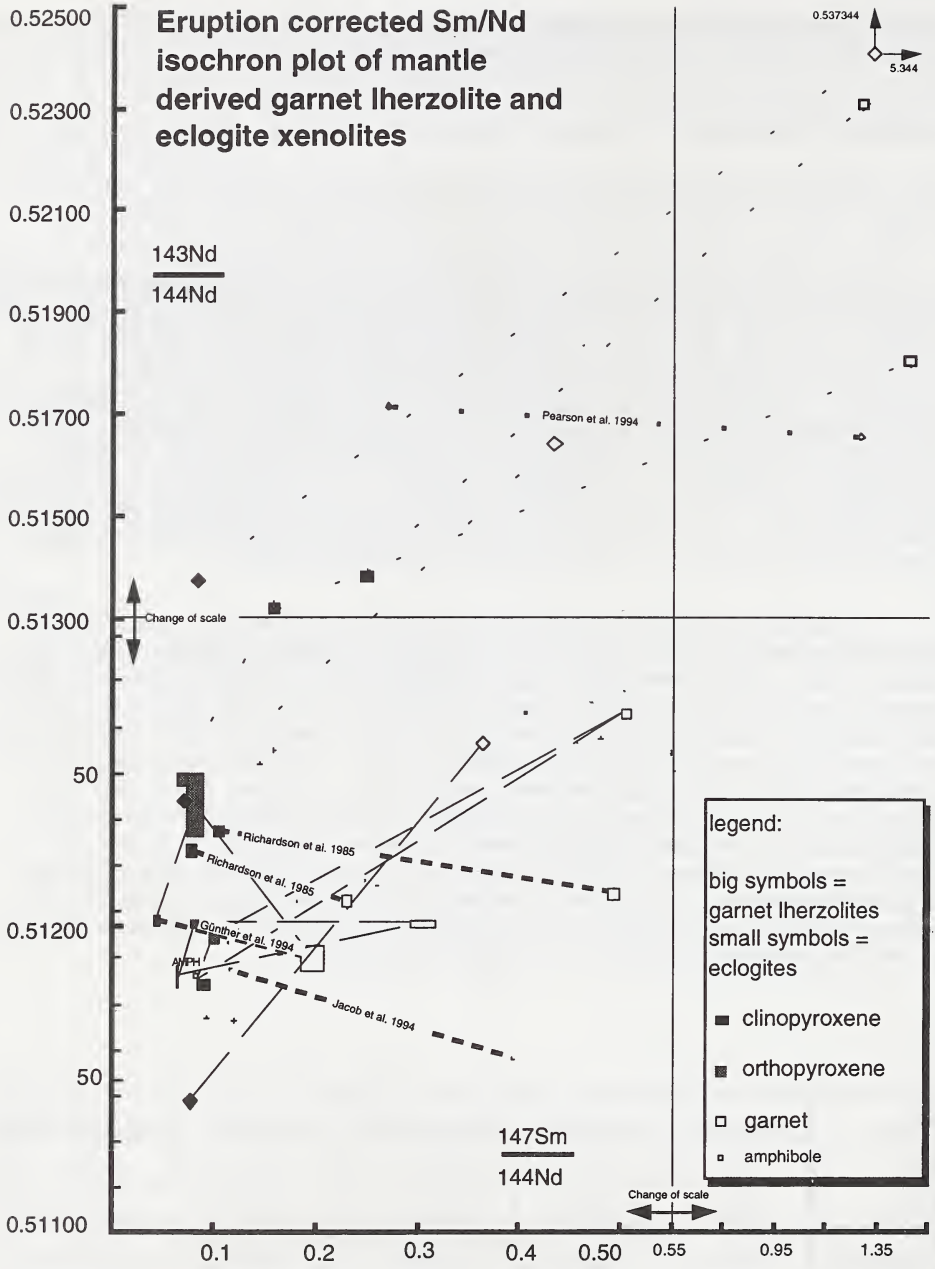

Fig. 1: Sm, Nd isochron plot compiled from literature. Watch the change of scale. The dotted tielines which cross it show not the real slopes of isochrones. They only connect different mineral separates of one sample.

This implies that the event which braught in the amphibol into this rock (metasomatic process) was happening in the Archean. Also Winterburn (1992) found an Archean model age of about 1.3 Ga on a Jagersfontein edenite. An early metasomatosis was also demanded by Günther & Jagoutz (1991) where we postulated the garnets of two Kimberley LTGL samples to be the late prograde reaction products from amphibole & spinel. We think that most of the "confused" Sm/Nd isotope data of garnet, not only from LTGL rocks, but also from many eclogitic xenoliths (see fig.1), could be explained by inhereted isotopes of a precursor and an uncompleted reequilibration during or after the mineral reaction. This model is able to explain even "future chrones" between pyroxenes and garnets. The position of garnet in Jag 1 can not be explained this way, because it seems to contain too radiogenic Nd. It seems to be more likely that it represents an old phase which was influenced isotopically by incomplete equilibration.

In our ongoing work we try to find similar results in kimberlite derived LTGL rocks from Sibiria (Udachnaya and Mirny). Literature data about these rocks have been obtained in the last few years (Zhuravlev (1991), Pearson (1994)). The studied rocks originate from the Udachnaya and Mirny pipes. Only in one sample results of two pyroxenes were reported by Zhuravlev (sample A 246). The slope between these pyroxenes is also Archean, showing an age of 1.7 Ga, similar like between pyroxenes from the South African Craton. The ages between the pyroxenes and the garnets of this sample exceed the eruption by 550 to 600 Ma, thus also showing that Zhuravlev found inter mineral ages in his samples which were older than eruption, thus proving the possibillity of preserved old inter mineral ages in LTGL rocks.

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