to 1300°C and pressures of 10 kb to 25 kb within the upper mantle. The phlogopite-rich 'kelyphitic' material rimming garnets in eclogite xenoliths from kimberlite is considered to have formed in the region of the lower crust by the action of alkalies and volatiles associated with the hydrous phase of kimberlite emplacement.

(Preliminary Abstract)

E10

COARSE AND VEINED PERIDOTITES FROM N. TANZANIA TUFF CONES

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Lherzolite, harzburgite and wehrlite blocks from two Neogene tuff-rings in the Tanzania rift valley comprise olivine (mg.93), enstatite, Cr-diopside ($Ca_{44}Mg_{52}Fe_4$, $Cr_2O_3$2.3., TiO_2,0.12) and chromite (MgO 13.1, Cr_2O_3 59.4 wt%); texture is coarse though strain and evidence of grain-boundary migration is common. Some blocks are cut by planar or anastomising veins of combinations of olivine (mg.82), Ti-diopside ($Ca_{47}Mg_{45}Fe_8$, $Cr_2O_3$0.06, TiO_2 1.04%), Tiphlogopite ($TiO_2$4.18, Na_2O 1.14, mg.83) Tipargasitic hornblende (TiO_2 3.5., $Al_2O_3$10.3, mg.80) and magnesian ilmenite (mg 0 13.1%). Compared with non-veined peridotite, in peridotite adjacent to veins the olivine is more Fe-rich (mg.86 - .89) and cpx (being replaced by pargasitic hornblende) contains more Fe, Ti and Ca; the replacing amphibole contains less Ti, Fe, Al, K, and Ca, but more Mg and Cr, than vein amphibole. Bulk analysis of one vein resembles ugandite. Some non-veined peridotites also contain metasomatic mica and amphiboles and it appears some parts of the mantle below the Rift Valley are metasomatised and enriched in LIL-elements.

E11

DEPLETED MANTLE ROCKS AND METASOMATICALLY ALTERED PERIDOTITE INCLUSIONS IN TERTIARY BASALTS FROM THE HESSIAN DEPRESSION (NW-GERMANY)

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During Miocene basaltic magmas ranging from quartz tholeiites to melilite containing olivine nephelinites have been generated in the area north of the Vogelsberg volcanoe. They are exposed in about 2000 partly eroded necks, flows and beds of pyroclastics. About 73 percent of the basaltic coverage consists of alkali olivine basalts, about 12 percent of nepheline basanites and limburgites and 9 percent of olivine nephelinites. The majority of the latter species but less than 40 percent of the alkali olivine basalts contain spinel lherzolite and spinel harzburgite inclusions. At a few localities upper mantle rocks (spinel lherzolites, spinel harzburgites, griquaite and websterite) and xenoliths from the lower crust (granulites, pyriclasites etc) occur in pyroclastics.

The average modal composition of 30 equigranular lherzolite and harzburgite xenoliths is : 74 vol% olivine, 10 vol% orthopyroxene, 7 vol% clinopyroxene and 1-2 vol% spinel. Estimates of temperature of equilibration according the the Wells geothermometer range from 870 to 1110°C for these samples. Spinels with 40 mol.% $MgCr_2O_4$ are stable up to about 30 kb at 1100°C (O'Neill, 1981). The abundant peridotites are depleted in numerous elements relative to the primary upper mantle composition. The primary upper mantle composition has been estimated by Wedepohl (1981) after redistribution of the compatible elements from the earth's crust into a 200 km mantle layer and of the incompatible and volatile elements into a 900 km mantle layer. Because of their abundance the depleted equigranular spinel peridotites are expected to represent large volumes of the upper mantle down to about 100 km depth.

Distinct indications of a metasomatic imprint on certain spinel lherzolites have been observed in several xenoliths from pyroclastics of our area. They are deformed into a fine grained recrystallized groundmass and coarse relicts of olivine and orthopyroxene. These so called porphyroclastic spinel lherzolites usually contain a few percent phlogopite. Their fine grained groundmass has been equilibrated at temperatures from 800 to 1000°C (Wells geothermometer). Crustal granulite xenoliths from the same area have been equilibrated at temperatures from 800 to 900°C and indicate an origin from layers close to the Moho (32 km depth). Some coarse orthopyroxenes of porphyroclastic lherzolites contain exsolved clinopyroxene lamellae. Taking their bulk opx + cpx composition as the primary opx composition two stages of equilibration can be discriminated. The difference in temperature between the two stages ranges from 80 to 200°C (Sachtleben and Seck, 1981, opx-thermometer). Reequilibration is assumed to be due to diapiric uprise of mantle material. Phlogopite has been formed during or after reequilibration of the groundmass of porphyroclastic peridotites probably from metasomatic fluids.

E12

ULTRAMAFIC XENOLITHS FROM LAKE BULLEN MERRI AND MT. LEURA, S.E. AUSTRALIA, AND THEIR BEARING ON THE EVOLUTION OF THE CONTINENTAL UPPER MANTLE

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Some 48 ultramafic xenoliths from two neighbouring locations within the Newer Volcanics of Victoria, Australia have been investigated in terms of petrography, mineral chemistry and partly for bulk rock chemistry.

The xenoliths include lherzolites with and without hydrous phases (such as amphibole and phlogopite), wehrlites, pyroxenites, and hornblendites, and include cumulates and composite xenoliths.

Mineral chemistry provides evidence for equilibrium crystallization for individual nodules over a small range of depths (app. 45 km) but a range of temperature. Anhydrous assemblages yield temperatures of 1015 - 1065 C, phlogopite bearing assemblages yield 975 -1025 C and amphibole bearing assemblages yield temperatures of 820 - 1010 C with most in the 925 -975 C range.

Among the harzburgites and lherzolites there is a wide variation of MgO, CaO, Al_2O_3, and compatible elements, which can be modelled as an early partial melting event, giving rise to various degrees of depletion.

Amphiboles in lherzolites are developed independently and postdate the partial melting event, as a response to near-isochemical metamorphic reaction, consequent on addition of water. Possibly Na and K, but no Ti were mobile components during the hydration event. The relationships of incompatible elements to the partial melting event and the hydration remain uncertain.

The metasomatic (hydration) events predate but are not precursor conditions for production of basanite. Metasomatism is present in the uppermost mantle above the LVZ, but this is most probably not the region of formation of the alkaline magmas. The emplacement and passage of alkaline magmas through the lithosphere/upper mantle may be the cause of local metasomatism and of hydration.

Wehrlites, pyroxenites, some lherzolites and hornblendites are regarded as precipitates from magmas fractionating and/or crystallizing at mantle depths. Observable wallrock-reaction is extremely restricted (about 1 cm) as evidenced by composite xenoliths.

A liquidus phase diagram for a hydrous basanite provides constraints on precipitation at high pressures and offers an internally consistent model for the genesis of the wehrlite, pyroxenite and hornblendite suite.

E13

NATURE OF THE CONTINENTAL MANTLE BELOW THE GERONIMO VOLCANIC FIELD ARIZONA, U.S.A.

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Trace element and isotopic analysis of hydrous and anhydrous peridotites and their host lavas, from the Geronimo volcanic field Arizona, U.S.A., have helped compile a chronology of enrichment and depletion events in the mantle. Host lavas have low $^{87}Sr/^{86}Sr$ = 0.70289 - 0.70327 and uniformly high $^{143}Nd/^{144}Nd$ = 0.513021 - 0.513037. The time-integrated light REE depleted character of the basaltic source region requires some form