Reduced fO2 Recorded in the Metasomatized Peridotite Xenoliths from the Sub-Arc mantle below Southernmost South America

1. Location and geological settings

![Image of geological setting](After Kilian and Stern, 2002)

2. Photographs of xenoliths

- C-type peridotite
- F-type peridotite
- Websterite

3. Early metasomatism and formation of pargasitic amphiboles

At least two stages of metasomatism are recognized. Early stage produced pargasitic amphibole which was later melted. The melt retains the composition of low-T tipargasitic amphibole and contains olivine, pyroxenes, spinel and plagioclase. The compositions of minerals are not homogeneous within the melt. Minute grains of crystals in melt are from plagioclase and amphiboles. The melt is not homogeneous within the melt. Minute grains of crystals in melt are from plagioclase and amphiboles.

4. Compositions of spinels in C- and F-type xenoliths from Cerro del Fraile

![Graph of spinel compositions](C-type spinel composition graph)

5. Calibration of Fe* in spinel and fO2

![Graph of Fe* calibration](Fe* calibration graph)

6. Later metasomatism and reduction of fO2

- F-type peridotites show relatively low fO2 (~ 4.7 wt%) and Na2O (~ 0.8 wt%) in clinopyroxene, low Mg in olivine rich sediments overlying the subducted slab that have been fused and incorporated into adakitic melt.

7. Conclusions

1. Peridotite xenoliths from Cerro del Fraile show at least two stages of metasomatism. Early stage formed pargasitic amphibole and later stage metasomatism formed F-type peridotites.

2. The F-type peridotites contain high Al2O3 (~ 54 wt%) in spinel, high Al2O3 (~ 47 wt%) and Na2O (~ 0.8 wt%) in clinopyroxene, and low Mg in clinopyroxene (Fo80.84). Orthopyroxene (Mg/Mg+Fe2+) in clinopyroxene (~ 0.88) and low Cr in spinel (Cr2O3) (~ 0.13). They have low equilibration temperature of 900 °C. Increased AI and lowering of Mg in minerals are consistent with their extensive reactions with adakitic melt.

3. The F-type samples show relatively low fO2 (AFMq-0.9 to -1.1) compared to samples from other subarc mantles. We suggest that the lowering of fO2 during the metasomatism is most likely related to organic-rich sediments overlying the subducted slab that have been fused and incorporated into adakitic melt.