Geophysical Research Abstracts, Vol. 7, 00990, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00990

Vp laboratory measurements, up to partial melting, of the pelitic lower crustal xenoliths from El Hoyazo (SE Spain)

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Successful interpretations of geophysical data require accurate measurements of physical properties of well characterized rock samples under experimental pressure-temperature conditions. This is particularly true for those rocks undergoing partial melting, where the presence of melt drastically attenuates and reduces seismic velocities.

The present study is focused on three lower crustal metapelitic xenoliths recovered from the Neogene dacites of El Hoyazo (SE Spain) where garnet + biotite + sillimanite + plagioclase + graphite $\pm$ cordierite parageneses coexists with widespread ryolitic melt as inclusions and interstitial glass (Cesare et al., 1997; Cesare, 2000). Since melt inclusions occur in all phases, Cesare et al. (1997) concluded that the assemblage developed during anatexis which occurred on a regional scale at 850-900˚C and $\sim$ 0.5 - 0.7 GPa. The melt was frozen-in during fast uplift so such samples are excellent candidates to investigate the recent seismic structure of the continental lower crust in the Alboràn Domain.

Measurements were carried out with the pulse transmission technique (Birch, 1961) in an internally heated gas apparatus (Paterson rig). For each sample three mutually orthogonal cores (x, y, z) were drilled parallel to the macroscopic fabric elements: x was parallel to lineation and z normal to foliation. Dealy time was calibrated using a sapphire single cristal cut parallel to [0001]. Measurements were conducted at pressures up to 0.5 GPa and temperatures up to 700˚C on 22 mm diameter cores and up to 950˚C on 15 mm diameter samples.

At room temperature Vp increased with pressure from 5.0 to 5.5-6.0 km/s along z and y and from 6.5 to 7.3 km/s along x, with small variations among the three samples. The behavior with temperature is anomalous. At the beginning velocities increase with increasing temperatures. This tendency was alread reported by Kern et al (1994) on mantle xenoliths from Siberia, where it was interpreted as due to the interstitial glass. During subsequent cooling velocities increased (normal behaviour).

In order to check the length variation with raising temperature, the sample was extracted at various temperatures and the length measured. This revealed that the length (and volume) reduction is a continuous process starting around 500-600˚C, which corresponds to the glass transition temperature (T_e) and is consistent with T_e measured on hydrous granitic melts (Dingwell, 1998). This length variation is sufficient to explain the positive dVp/dT during heating.

Melting occurs within the interval 930-950˚C at 0.5 GPa where the seismic signals abruptly attenuated. Such PT values are in good agreement with the anatexis conditions estimated by Cesare et al. (1997).

REFERENCES

Birch A. F., J. Geoph. Res., 66 (7): 2199-2224, 1961

Cesare B., Salvioli Mariani E. and Venturelli G., Mineral. Magaz. 61 (1): 15-27, 1997

Cesare B., Contr. Mineral. Petrol, 139 (3): 273-284, 2000

Dingwell D. B., Phys. Earth Planet. Int., 107 (1-3): 1-8, 1998

Kern H., Burlini L.and Ashchepkov I. V., Phys. Earth Planet. Int., 95 (3-4): 195-209, 1996