A New Melting Parameterization for Geodynamic Modelling

ANTONIO MANJÓN-CABEZA CÓRDOBA[1]*, MAXIM D. BALLMER[1]

[1]Inst. Geophys., ETH Zürich, antonio.manjon@erdw.ethz.ch

Despite the increase of geodynamical studies that consider melting in the mantle, the accurate modelling of this process remains challenging. Thermodynamic models provide a near to complete description of the physical and compositional characteristics of rocks but currently they are limited in P-T space and very expensive computationally. On the other hand, simple parameterizations are less demanding but, to date, they provide only limited information concerning composition, and fail to describe some processes in a proper way, such as fractional melting.

Here, we present a new melting parameterization for decompression paths in the mantle. We based our polynomials on the thermodynamic relations for isentropic decompression predicted by the pMELTS algorithm [1] and calibrated it with high pressure experiments. The main input parameters are the temperature, pressure, critical porosity and initial pressure of melt extraction. As a key advantage compared to previous parameterizations, we consider the effects on productivity of melt extraction and changes in major oxides composition. In addition, this method provides some compositional information in the form of weight percent of oxides. Furthermore, our parameterization can be easily calibrated for different peridotitic compositions.

Finally, we show the first results of the predictions of mantle melting using this parameterization within fully-coupled geodynamic models of upper-mantle convection computed with CITCOM [2].

[1] Ghiorso, Hirschmann, Reiners & Kress (2002), *Geochemistry, Geophysics, Geosystems* **3**(5), 1525-2027.

[2] Moresi & Solomatov (1995), *Physics of Fluids* **7**(9), 2154-2162