# NVP melt/magma viscosity: insight on Mercury lava flows

F.VETERE[1], S. ROSSI1, D. MORGAVI1, O. NAMUR2, D. PERUGINI1, P. MANCINELLI[1], C. PAUSELLI[1] AND M. LUSTRINO[3]

[1]Dep. of Physics and Geology, University of Perugia, piazza Università 1, 06123 Perugia, Italy, francesco.vetere@unipg.it, stefano.rossi1@studenti.unipg.it, daniele.morgavi@unipg.it, diego.perugini@unipg.it, paolo.mancinelli@unipg.it, cristina.pauselli@unipg.it.

2 Institut für Mineralogie, Leibniz Universität Hannover, Callinstraβe 3, 30167 Hannover, Germany o.namur@mineralogie.uni-hannover.de

3 Dip. Scienze della Terra, Sapienza Università di Roma michele.lustrino@uniroma1.it

We report viscosity measurements of synthetic silicate melts as analogue for the magma erupted at the surface of Mercury. Mercurian surface magma composition has been calculated using the most recent data from MESSENGER XRS data (Namur et al., 2016). We focused on the northern hemisphere (Northern Volcanic Province, NVP, the largest lava flow on Mercury and possibly in the Solar System) for which the spatial resolution of MESSENGER measurements is high and individual maps of Mg/Si, Ca/Si, Al/Si and S/Si were combined. The high $Na_2O$ content (~7 wt.%) of the experimental starting material strongly reduces its viscosity. Concentric cylinder apparatus equipped with an Anton Paar RheolabQC viscometer head was used to carry out high temperature viscosity measurements at the Department of Physics and Geology (PVRG_lab), University of Perugia (Perugia, Italy). The zero pressure viscosity change induced by crystallization was measured in the 1463-1229 °C temperature range by using different shear rate (from 0.1 to 5 $s^{-1}$). Results showed an increase in effective viscosity from 4 to ~$10^4$ Pa*s with decreasing T. The liquidus in the nominally dry NVP is placed at 1308 °C, but an abrupt viscosity increase is recorded only at 1247 °C, continuing to 1229 °C where the crystallinity increases up to 30 vol%. Interestingly, melt viscosity remains nearly unvaried (changing from 4 to 16 Pa*s) in the temperature range 1463-1327 °C. These very low viscosity values explain the extreme fluidity of Mercurian lava and their ability to cover long distances as shown by satellite data.

Namur, O., Collinet, M., Charlier, B., Grove, T.L., Holtz, F., McCammon, C., 2016. Melting processes and mantle sources of lavas on Mercury. Earth and planetary science letters, 439, 117-128.