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Venue: Zoom

A link will be sent @grc-all within 30 minutes before the beginning of the seminar.

Sound velocity measurements at mantle geotherm temperatures: results, problems and perspectives

P- and S-wave velocities are unique tools we have to explore the bulk chemical composition and structure of the inaccessible deep Earth. Laboratory measurements of sound velocities of high-P minerals therefore provide crucial information on the deep mantle via comparisons with observed seismic velocities. Correct interpretation of seismic data is however subject to the number of high pressure and high temperature experimental measurements on the relevant minerals. Recent developments on ultrasonic interferometry techniques in the multi-anvil apparatus have permitted to carry out such measurements at pressures of about ~30 GPa, which is equivalent to the uppermost lower mantle pressure conditions. In terms of temperature however, data are still few, due to the difficulty to carry out such measurements at simultaneous high pressure and corresponding mantle geotherm temperature.

Here I will present our attempts at measuring sound velocities at high temperatures up to ~2000 K, on MgSiO_3 majorite, $(\text{Mg}_{0.9}\text{Fe}_{0.1})_2\text{SiO}_4$ ringwoodite and pyrolite aggregates. Some experimental difficulties encountered upon high-T heating, such as pressure dropping, weakening of the acoustic signals and crystal grain growth will be presented and discussed with regards to improving such measurements in the future. In light of the available data, the T-dependences of sound velocities will be discussed relative to modelling of sound velocity of mantle mineralogical assemblages at geotherms temperatures.

Keywords: 1. Ultrasonic measurement
2. High pressure
3. Mantle composition