Planetary cores: chemistry and its consequences

Dr Jac van Driel, Dr Haiyang Luo and Prof Lidunka Vočadlo

Department of Earth Sciences, University College London, United Kingdom

The state and dynamics of Earth's core controls a wide range of processes from the generation of Earth's magnetic field to mantle convection. Furthermore, the evolution of planetary cores is thought to be a key component in establishing the habitability of planets more broadly.

A 'true' realisation of the state and evolution of any planetary core requires results from a wide range of scientific disciplines from geodynamics to mineralogy, seismology to mineral physics. Moreover, huge advances have been made in the understanding of other planetary bodies, such as Mars through the recent INSIGHT mission.

Fundamental to all properties of planetary cores, is chemistry, and in turn how variations in chemistry leads to changes in the high pressure-temperature behaviour of core materials. For example, the inclusion of light elements into predominately siderophile iron rich compositions, have been shown to alter properties such as seismic wave speeds as well as influence melting and crystallisation behaviour. Additionally, differing chemistries will likely control the kinematics solid state properties such as atomic diffusion, dislocation propagation, and grain growth.

This session explores fundamental properties of planetary cores, through the lens of chemical composition and the second order consequences that arise from its variability. Topics include, but are not restricted to, atomistic simulations, experimental minerology, microstructural analysis of minerals, geodynamics, and seismology.