



Dr. Jiejun Jing

JSPS Postdoctoral Fellow
Geodynamics Research Center

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Venue: Meeting Room #486

Science Research Bldg. 1, 4th floor.
Ehime Univ.

Keywords

1. Moon
2. Ilmenite
3. Sound Velocity

Ilmenite in the Moon

The last dregs of LMO after progressive solidification (~95%) would produce an ilmenite-rich layer, referred to ilmenite-bearing cumulates (IBC), located beneath the primary anorthositic crust. This dense and low-viscosity IBC are rich in radioactive elements (e.g., K, Th and U) and predicted to sink through the mantle to core-mantle boundary. Some studies suggest that this overturn may be inefficient and recently has been supported by gravity anomalies observed in the Procellarum KREEP Terrane (PKT), attributed to IBC remnants in the present-day mantle (Liang et al., 2024). However, the maximum density of 3.34 g.cm^{-3} estimated for the shallow mantle (<100 km depth) (Garcia et al., 2019) appears to contradict the possibility of widespread and substantial dense IBC vestiges in the nearside shallow mantle. It also remains uncertain to what extent the ilmenite abundance in IBC at shallow depths can be reconciled with the observed seismic and density profiles of the Moon. In addition, the presence of Fe-Ti-rich melts and/or ilmenite-bearing assemblages has been proposed to account for the low-velocity zone at the core-mantle boundary, but how much of the overturned ilmenite abundances can ultimately reach the CMB and how much might have been trapped within the lunar mantle? We measured the sound velocity of pure ilmenite at high-temperature, high-pressure conditions and discussed the fate and distribution of ilmenite in the Moon.

