

Buoyant Melting Instabilities during Magma Ocean Solidification

*犬飼 敦^{1,2}、ハーネルンド ジョン^{1,2}

*Atsushi Inugai^{1,2}, John Hernlund^{1,2}

1. 東京科学大学、2. 地球生命研究所

1. Institute of Science Tokyo, 2. Earth-Life Science Institute

Understanding the process of crystal-melt segregation is essential for studying the magma ocean differentiation. As crystallization proceeds, the enrichment of Fe in the liquid phase creates a gravitationally unstable mantle, which may trigger mantle convection before the solidification is complete (e.g., Ballmer et al. 2017). While such convection can induce remelting through decompression, its scale and impact remain poorly understood. Specifically, if the melt is less dense than crystals, the buoyancy of produced melt could drive further upwelling and melting. This positive feedback is known as “Buoyant melting instability” or “MMUb feedback” (e.g., Hernlund et al. 2008; Ogawa 2018). In this study, we investigated the extent of remelting during magma ocean solidification using two-phase flow model. Our results indicate that approximately 10% of the mantle region could undergo remelting due to this instability.

キーワード：マグマオーシャン、初期地球

Keywords: Magma Ocean, early Earth