

火星環境下におけるクラスレートの安定性に対する日射の影響：火星大気メタンの示唆

Effects of solar insolation on the stability of clathrates on Mars: Implications for the Martian atmospheric methane

石丸 亮^{1*}, 小松吾郎², 松井孝典¹

Ryo Ishimaru^{1*}, Goro Komatsu², Takafumi Matsui¹

¹千葉工業大学, ²ダヌンツィオ大学

¹Chiba Institute of Technology, ²Universita d'Annunzio

Mars Express and ground based telescopes recently discovered CH₄ in the Martian atmosphere [Formisano et al., 2004; Mumma et al., 2009]. An expectation that it may have a biological origin brings renewed attention to Mars. The observed distribution of CH₄ is localized ones [e.g., Formisano et al., 2004; Mumma et al., 2009], which suggests existence of localized sources of CH₄ because the time required for global mixing in the Martian atmosphere is very short. CH₄ release from subsurface clathrates has been proposed as a plausible source of CH₄. Since the region where clathrates are stable exists in the subsurface Martian environment, CH₄ are expected to be stored as methane clathrates when CH₄ is delivered or produced in the subsurface. This is likely to occur because the origin of CH₄ on Mars could be subsurface biological or geochemical activities (volcanic or hydrothermal reactions such as serpentinization of basalt). Then, dissociation of such clathrates may release CH₄ into the atmosphere. Destabilization of clathrates is required for dissociation of clathrates. Here, we show the possibility that solar insolation induces the destabilization of subsurface clathrates. Clathrates are destabilized via temperature increase. If solar heating can increase the temperature in the area of subsurface clathrates, a resultant CH₄ release may contribute to the presence of CH₄ in the Martian atmosphere.