**Japan Geoscience Union Meeting 2010**
(May 23-28 2010 at Makuhari, Chiba, Japan)

PPS004-P12 会場:コンベンションホール 時間: 5月25日17:15-18:45

# 鉄炭酸塩の磁鉄鉱への熱分解と火星磁気異常

# Thermal decomposition of Iron carbonate as a paleomagnetic precursor: Source for Martian magnetic anomaly?

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Orbiter near-infrared spectral mapping revealed the presence of magnesium carbonate and phyllosilicate-bearing rocks in Nili Fossae region on Mars, where is a dichotomy boundary. Near the region, the ground-based infrared spectroscopic telescopes discovered the strong release of methane and water vapor simultaneously in northern summer in 2003 and near the vernal equinox in 2006. These observations lead us to speculate the presence of subsurface serpentinization reaction of Fischer-Tropsch type formation of methane and hydrogen from carbonate and water catalyzed by a variety of transition metal-bearing minerals, producing magnetite. Such serpentinization-related magnetites are generally coarsely grained within altered basalt and gabbroic matrix and can only acquire an unstable and weak remanence, generating no magnetic anomaly. However, we can find a strong dipole-like positive magnetic anomaly near Nili Fossae local area, implying the presence of intense and stable remanence. Therefore, understanding the co-existence of surface carbonate, methane and intense remanence would provide strong constraints on Mar's thermal history and on the formation of carbonate and methane. A geochemical modeling for Mars predicts iron carbonate formation during subsurface aqueous hydrothermal alteration with the interaction of atmospheric carbon dioxides during Noachian. It appears that thermal decomposition of iron carbonate siderite (FeCO3) generates fine-grained magnetite. This fine-grained magnetite shows a strong remanence, being a candidate mineral for Martian magnetic anomaly. Here, we testify this hypothesis from the viewpoint of rock magnetism through heating experiments. Our laboratory heating experiments reveal that siderite decomposed at 803K into magnetite and carbon dioxides, showing a very intense chemical remanence up to 24 A/m under external field of 20 microTesla, much higher than normal basalts of ~4A/m. Although this intense remanence may account for the anomaly, the shape of the alternating-field (AF) demagnetization curve was sigmoidal and the mean destructive field was nearly 10mT. This means that the coarse-grained magnetites are the carrier of the chemical remanence, and that such remanence may not survive large changes in temperature and magnetic field over billions of years. In this presentation, we will show the results of a systematic experiment to verify the hypothesis.