P140-002 **Room: 304** **Time: May 18 11:00-11:15**

Sublimation impact for the temporal change of albedo dichotomy on Iapetus.

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Iapetus, Saturn's third largest moon, synchronously orbits Saturn at an average distance of $3.6*10^6$ km with a period of 79.3 Earth days. From a mean density of 1.08 g/cm^3 and spectral observations from spacecraft and ground telescopes, it is inferred that Iapetus has large volume fraction of H_2O ice. Remarkable characteristic of Iapetus is that there is an extreme albedo contrast between the leading (~4 %) and trailing hemispheres (~60 %) like a Yin-Yang symbol. Although concrete origin of the albedo dichotomy is still unknown, two hypotheses have been proposed, which are external and internal origin. Key approach to clarify the origin of the dichotomy is to investigate the detail distri-bution of the dark material. Craters on Iapetus have a characteristic distribution of the dark material, that is, equator-facing wall and floor of craters exhibit darker. This trend can be interpreted as it is because the pure bright ice has sublimed from the equator-facing wall where the insolation energy is larger, and the albedo has decreased. Cassini spacecraft has observed the surface temperature using mid-infrared wavelength, and the temperature on a dark region in daytime is about 130 K in maximum. The saturated vapor pressure of the H_2O ice in 130 K is about $1.2*10^{-10}$ Pas, thus the sublimation of the H_2O ice can be occurred if the atmospheric pressure of Iapetus has similar to or less than the pressure on the terrestrial Moon (10^{-12} hPa). Another characteristic of the albedo dichotomy is the clarity of the edges of the dark region. If the dark material precipitated on the surface from external sources, distribution of the dark material should be more gradual. Therefore, the sublimation of bright ice and resultant albedo change must have an impact for current distribution of surface albedo on Iapetus. In other words, the volume fraction of dark material and ice in each region should have changed with time, and the albedo distribution when the dark material originally precipitated should have been different from the current state. It is important to note that the original distribution of the dark material on the surface is required to clarify the origin of the albedo dichotomy.

In this work, we evaluate the effect of icy sublimation and simulate the temporal change of surface albedo, and we try to reconstruct an original distribution of the dark material on Iapetus.

We assume the surface state that the dark material and bright ice is mixed uniformly with certain volume fraction. According to the position of Iapetus on its orbit around Saturn, the insolation energy on Iapetus' surface can be calculated and radiative equilibrium temperature and its surface distribution are derived by Stefan-Boltzmann's law. Based on the experimental data about the saturated vapor pressure of H_2O ice, we evaluate the sublimation rate of ice from the surface (inversely, the dark material remains there). Finally, we calculate the evolution of the distribution of surface albedo during 4.0 Gyr. As a result, the distribution of surface albedo changed dramatically. We assume that dark materials accumulated on the concentric pattern around the apex as an initial state, which implies that synchronously rotating Iapetus swept the dark material existed around the Iapetus' orbit. After 4.0 Gyr, the resultant surface albedo has mainly three notable points. First, the albedo in the leading hemisphere has significantly decreased to near the lower bound value. Second, albedo distribution has been elongated along the equator. Third, the edge of the low albedo region became clear. Putting together above results, resultant distribution of surface albedo is very similar to the current state. Therefore, it can be concluded that the sublimation of ice greatly influences present albedo distribution on Iapetus.