The flows law of solid nitrogen and methane, and their application to the relaxation model of crater on Triton

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The space probe Vayager 2 revealed that there were few craters on Triton's surface. On the other hand solid nitrogen and methane were discovered on the surface of Triton by the infrared spectroscopy on the ground. It is considered that the rheology of solid nitrogen and methane has much influence on the formation and relaxation process of crater on Triton. The rheological properties of solid nitrogen and methane were measured by conducting the uniaxial compression test at very low temperature. This result suggested that solid nitrogen and methane were behaved as ductile material at the surface temperature of Triton (38 K). In this study the flow law of solid nitrogen and methane were applied to the relaxation process of crater on Triton.

We estimated the relaxation time of crater on Triton by using the flow law of solid nitrogen and methane. This estimation suggested that the relaxation time of 100 m-diameter crater was less than 1 year and these materials could not keep the crater structures on Triton. This result can qualitatively explain that there are few craters on Triton surface. However there are some fresh craters on Triton. In order to keep the crater structures we need to assume that the subsurface made of water ice exists under the surface made of solid nitrogen and methane. When we assumed that the surface structure of Triton is uniform, it is considered that the thickness of surface layer made of solid nitrogen and methane is smaller than the depth of the fresh minimum crater. It is inferred that the crater distribution on Triton become constraint condition for its surface structure.