Unique geological landscape of Hotokegaura,Shimokita peninsula,Aomori, Japan

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Introduction: Hotokegaura in Shimokita Peninsula, Aomori Prefecture is a famous sightseeing spot. It is a rock coast made of green tuff and has unique scenery of weathering and erosion of the rocks. In September 2016, The Shimokita Geopark was certified by the Japanese Geopark Network, and the Hotokegaura geosite is one of the highlights. However, there has been no study specifically on the formation of the rocky terrain of Hotokegaura. Guidebooks and pamphlets vaguely explain only referring to general theories such as wind, rain and wave erosion. Therefore, I conducted field survey, mineralogy, and laboratory experiments to understand formation mechanism of the Hotokegaura landscape. In the research, attention was paid to the formation process and formation factors of the rock tower (pinnacle) and the longitudinal striations (rill) carved on the pinnacle surfaces, which characterizes the Hotokegaura geosite.
Pinnacle: Pinnacles occur not only on the coast but also on the hillside slopes. Rock slopes between the pinnacles show concave profiles without joint. Flake weathering, by which the rock surfaces are peeled, is evident particularly at the foot of pinnacles, resulting in notches, and the foot of such hillside pinnacle are considered being gouged. I measured the occupancy of the peeled parts on the rock surfaces. It is suggested that the peel-weathering is controlled by infiltration of groundwater since peeling tends to be active along the boundaries between wet and dry parts. Laboratory weathering experiment showed that freezing and thawing well peeled surfaces of green tuff by a similar way to that in nature.
Rill: Rill has developed on the surface of pinnacles close to the ocean and cannot be seen on the surface of pinnacles away from the coastline. Therefore, it is presumed that not only rain but also seawater greatly influences the rill formation. In addition, the rill tends to develop preferring south faces to north faces of pinnacles. It was observed that sand accumulated on the bottom of the Rill. Based on the above observations, it is predicted that the consolidated green tuff was incised by water as its surface was disaggregated to be sand particles under the influence of seawater and weather. In laboratory, salt weathering experiments reproduced sand disaggregated from green tuff surfaces as seen in nature.
Summary: Field observation and laboratory experiments lead to the ideas that pinnacles are excavated from hillside slopes as their surfaces are peeled off due to a freezing and thawing process. Rill was probably formed so that green tuff surfaces are weathered into sand due to salt weathering, and the sand was washed by flowing water of wave and rain. Further observation is necessary to ensure whether the processes deduced by experiments are really ongoing in nature.

