Sea cliffs and seabirds photo by TAZAWA Michihiro

3. Description

3a. Description of property

3a.1 Topography and geology

3a.2 Climate

3a.3 Sea ice

3a.4 The marine ecosystem under the sea ice around Shiretoko

3a.5 Plants

3a.6 Animals

3a.7 Utilization of natural resources

3b. Human history and development

3c. Form and date of most recent records of property

3d. Present state of conservation

3e. Policies and programs promoting the property

3a. Description of property

3a. 1 Topography and geology

The Shiretoko Peninsula is located in the northeastern tip of Hokkaido Island. The narrow peninsula is approximately 25 kilometers wide at its base and protrudes 70 kilometers out to the southern boundary of the Sea of Okhotsk. It is flanked by the Sea of Okhotsk on the west and the Nemuro Strait in the east. A group of volcanoes higher than 1,500 meters above sea level runs along the center of the peninsula including the highest peak Mt. Rausu (altitude 1,661m). Apart from some marine terraces, the peninsula is steep with little flat ground between the peaks and the coastline.

The Shiretoko Peninsula was formed by volcanic activities and uplift from the Pacific Plate subducting under the North American Plate (*e.g.* Goto *et al.*, 2000; Gouchi *et al.*, 1991; Funayama *et al.*, 1993) (Figure 3-1). At the beginning of tectonic activity there were submarine volcanoes, followed later by volcanic eruptions on land. From 8.6 million to two million years ago, submarine volcanic activities occurred and formed the hyaloclastite layer commonly seen along the coastline today. From two million to 250,000 years ago, while there were active submarine volcanic activities off the tip of the peninsula, volcanic activities also began on land at the base of the peninsula. Later, from 250,000 years ago to today, the area became a compressive stress field which resulted in the peninsula being folded and uplifted. In addition, volcanic activities continued along the anticlinal axis (the central area of the peninsula) (*e.g.* Goto *et al.*, 2000).

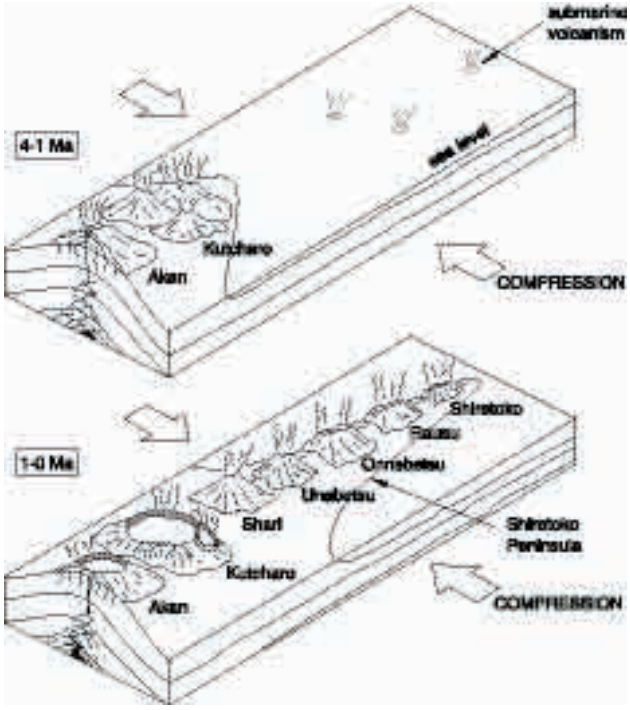

Figure 3-1 Schematic diagram showing the tectonic evolution in the Akan-Shiretoko area after 4 Ma. (after GOTO , FUNAYAMA, GOUCHI & ITAYA 2000)

Sea cliffs along the coast
photo by Ministry of the Environment

The Shiretoko Peninsula and the Kunashiri and Etorofu islands are formed in an echelon structure. This is due to a unique geological condition of the echelon folding caused by the oblique subduction of the Pacific Plate resulting in the margin of the North American Plate adjacent to the Kuril trench migrating westwards (Kimura *et al.*, 1986).

Mt. Iou (altitude 1,562 m) is famous worldwide for erupting large amounts of highly pure molten sulfur. There have been at least four eruptions since the 1800s and the volcano is still active. In the eruption of 1936, the mountain kept erupting molten sulfur for eight months. The amount of sulfur produced at the time was approximately 200,000 tons which exceeded the level of annual domestic production (Katsui *et al.*, 1982). A volcano ejecting large amounts of molten sulfur is extremely rare globally (Goto *et al.*, 1999) and the phenomenon gained worldwide attention (Watanabe, 1940). The detailed information and photographs recorded at the time (Watanabe and Shimotomai, 1937) are precious scientific data. Molten sulfur also spewed from the explosion crater on the mountainside in the eruptions of 1857-1858, 1876 and 1889-1890. Fumarole activity still continues and spews volcanic gas and hot water today.

The contrasting coastlines on the east and west sides of the peninsula were formed by a combination of volcanic activities and marine erosion. On the coast facing the Sea of Okhotsk, the deposits of ejecta from more than one million years ago are eroded by waves as well as sea ice which resulted in the development of sea cliffs. Especially around Utoro, there are spectacular sea cliffs ranging from 60 meters to 120 meters in height consisting of andesite lava from the eruption of Mt. Rausu 80,000 years ago. In contrast, the coastline on the Nemuro Strait side is smooth. Along this coast, there are curious rock formations that are the result of differential erosion of the hyaloclastite layer (Goto *et al.*, 1990; Goto and Gouchi, 1991; Katsui *et al.*, 1985; Shari town and Rausu town, 1999).

Sulfer from Mt. Iou photo by Shiretoko Museum

As described above, the diverse landscape of the Shiretoko Peninsula has been developed by various geomorphologic processes such as tectonic movement, volcanic activity and marine erosion. Furthermore, these landscapes have been preserved undamaged, with human activity only very minor.

3a. 2 Climate

The climate at the elongated Shiretoko Peninsula has two distinct characteristics due to topographical and geographical conditions. One is the strong influence of maritime conditions since the Shiretoko Peninsula borders two seas, the Sea of Okhotsk and the Nemuro Strait. The other characteristic is the large regional difference in factors such as temperature and precipitation between the eastern and western parts of the peninsula. This is due to the fact that the precipitous Shiretoko mountain range of 1,000 meter class are situated along the center of the Shiretoko Peninsula dividing it into the eastern and western section (Shari town and Rausu town, 1999).

The Rausu side which faces the Nemuro Strait receives high precipitation (annual precipitation: 1,600mm) as the humid southeastern winds form the Pacific blow towards the Shiretoko mountain range in summer and low temperatures are frequent due to the development of sea fog (the average maximum temperature for August 1998 was 18.9°C). In winter, there is relatively heavy snowfall but the weather tends to be mild with the influence of the maritime climate of the North Pacific (the average minimum temperature for February 1998 was −10.9°C) (Matsumoto, 1985; Shari town and Rausu town, 1999; Rausu town, 2001).

On the other hand, the Utoro side which faces the Sea of Okhotsk has higher temperatures (the average maximum temperature for August 1998 was 21.8°C) with little precipitation in summer (annual precipitation of Shari town is 813mm) because of the foehn phenomenon caused by the winds blowing down from the Shiretoko mountain range and of the effects of the Soya Current, which is the only warm current in the Sea of Okhotsk (Matsumoto, 1985; Shari town and Rausu town, 1999). Temperatures are low in winter due to the cold northwestern winds from the Sea of Okhotsk. In addition, the sea ice which covers the coastal waters reflects the sunshine (the "albedo effect") and intercepts the heat radiating from the sea water to the atmosphere, thereby further lowering the temperature (the average minimum temperature for February 1998 was −16.1°C) (Aota, 1993; Rausu town, 2001) (Figure 3-2).