

Geomorphological evolution of Hashirikotan barrier spits resulting from seismotectonics along the southern Kuril Trench

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An active barrier system is developed in the Nemuro Bay area along the Okhotsk Sea in eastern Hokkaido, Japan. This presently rare feature consists of a lagoon (the Furen-ko lagoon), a flood tidal delta, a barrier, and a tidal inlet that opens into the outer sea of Nemuro Bay and the Sea of Okhotsk. The Hashirikotan barrier spits are active in the northeastern part of the Furen-ko lagoon, and five spit branches (BS1~BS5) can be observed clearly. Using geomorphological, sedimentological, and ground-penetrating radar methods, we analyzed Holocene sediments near the Furen-ko lowland. We dated them using radiocarbon and tephrochronological methods. The Furen-ko barrier system has been established since 5.5 ka. BS1, the youngest spit was formed after the 17th century, and BS2 was caused by the last seismic uplift in the 17th century. BS3 was uplifted in the 12~13th century, and BS4 was caused by seismic uplift in the 9th century. These great earthquakes (Mw8.5~9.1) have occurred at an approximate 500-year interval along the southern Kuril subduction zone. Coastal areas were raised by 1~2 m during or just after the earthquakes due to postseismic displacement. Conversely, land subsidence has been ongoing at a rate of about 1.0 mm/year since the 17th century. We conclude that the geomorphological evolution of the Furen-ko barrier system has been controlled by the seismotectonics along the Kuril subduction zone.

Keywords: geomorphological evolution, Hashirikotan barrier spit, seismotectonics, southern Kuril trench, eastern Hokkaido, northern Japan