

The water budget of a coastal lagoon and its relation to a previous mega tsunami

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Five coastal lagoons, opening a few times per year to the Pacific Ocean, are located on the southeastern coast of Hokkaido, Japan. The opening to the ocean is produced by incising the sand bar from the overflow and discharge of lagoon water at the lowest site of the sand bar. The overflow results from an increase of the lagoon water level basically by snowmelt or rainfall river runoffs. The ecosystems of the lagoon and the back marsh are made up by climate conditions and water and material cycles between the lagoons and their drainage basins, and between the lagoons and the ocean. In order to understand the water-cycle system in the lagoons, the water budget of Oikamanai Lagoon, one of the five lagoons, was estimated by establishing a bathymetric map of high accuracy (0.2m depth interval), and by monitoring the meteorology, lagoon water level and river stage. The estimate of the water budget under closed condition of the lagoon revealed that the groundwater output to the ocean through the gravelly confined aquifer below the sand bar is balanced by river water input. The location of the gravelly confined aquifer is restricted to near the sea level along the sand bar about 2000 m long. This suggests that the whole sand bar was broken at a stroke by a previous mega tsunami (probably Keicho-Sanriku Tsunami in 1611) and then was again reconstructed. Here, the heat budget and hydrodynamics of the lagoon are also discussed.

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