

The Pacific Decadal Oscillation and North Pacific regime shifts during the last 2900 years

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We generated 8-year-resolution records of paleotemperatures using UK37 and the abundance of anchovy and sardine scales in Beppu Bay, Kyushu Island, Japan. Beppu Bay is a small silled basin filled with oxygen-deficient bottom water. Because of oxygen deficient environment, organic matter and fish scales are well preserved in sediments, and bioturbation is limited. Fourteen piston and gravity cores were retrieved at the center of the basin. Correlation of cores was conducted using sand and silt seams (event layers), and the age-depth model was created by wiggle-matching of forty-two AMS radiocarbon dates from bivalve mollusk shells and excess Pb-210 and Cs-137 concentrations. The sedimentation rates were 230-300 cm/ky. UK37 record showed both centennial-scale and multi-decadal variations. Multi-decadal variation, having a significant periodicity at 50-70 years that is typical in the Pacific Decadal Oscillation in the 20th century, is superimposed on centennial-scale variation. The amplitude of the multi-decadal oscillation varied on a multi-centennial scale. The ratio of anchovy to the sum of anchovy and sardine was synchronous with multi-decadal oscillation in SST. Anchovy was more abundant in warmer periods, while sardine was more abundant in cooler periods. This relationship is the same as that was seen in the regime shifts in the 20th century. This is the first evidence showing that North Pacific regime shifts were operated prior to the 20th century.

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