Possible oceanic signals of the 18.6-year period modulation of tide-induced vertical mixing

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Bi-decadal variability is one of the prominent features of the decadal to multi-decadal ocean and climate variability in the North Pacific. This has received considerable attention, because this is seen in many societally important variables such as air temperature, precipitation, and even fishery resources. However, while several possible mechanisms underlying this variability have been proposed, it has not been fully understood. The 18.6-year nodal tidal cycle related to the precession of the moon’s ascending node is a possible one. It is known that the diurnal tides induce strong vertical mixing around steep topographies like sills in the Kuril Straits and the Aleutian Passes, and this strong mixing is thought to play important roles in water-mass modification. The 18.6-year cycle largely modulates the amplitudes of the major diurnal tidal constituents by 11% and 19% for K_1 and O_1, respectively. Thus, it is hypothesized that the modulation of mixing contributes to the bi-decadal variability in water-masses in the North Pacific and its marginal seas. Using the historical ocean observation data, I found various bi-decadal variations downstream of the strong mixing regions, which can be explained qualitatively by the modulation of vertical mixing, although it is difficult to prove whether those are really the 18.6-year period signals by using only the limited observation data.

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