

CO-OSCILLATION OF A FJORD BASIN'S CIRCULATION  
WITH DECADE-LONG OCEANOGRAPHIC, HYDROLOGIC,  
AND CLIMATIC REGIMES: PUGET SOUND 1916-'87

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ABSTRACT

Oceanographic, hydrologic, and climatic data collected during 1916-'87 in Puget Sound's Main Basin (~200 m x 5 km x 100 km) and approaches oscillate at low frequency between two regimes (I, II). The oscillation accounts for a large fraction of the interannual variability (41-75%) and the zero crossings between regimes span approximately a decade. Correlations amongst the observations indicate that the regimes may be characterized as follows: I, maximum inflow from the entrance sill (~66 m) to mid-depth within the Basin (~100 m) accompanied by below normal Pacific coastal and Basin temperatures and Pacific coastal sea level, above normal snow depth and runoff at higher elevation in the Cascade mountains, and increased frequency of local southerly winds over the Basin; II, maximum inflow toward bottom in the Basin accompanied by above normal coastal and Basin temperatures and coastal sea level, below normal snow depth and runoff, and increased frequency of local northerly winds.

The transition between regimes is accompanied by substantial changes in the horizontal pressure and density fields between the Pacific coast and the mixing zones leading to the Basin, as well as within the Basin itself. Physical reasoning using the Estuarine Richardson Number characterizing the mixing processes in the Basin's approaches led to the hypothesis that density changes between the two regimes cause the alternation of the Basin's flow patterns.

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