**IDENTIFICATION AND CHARACTERIZATION OF WATER MASSES WITHIN THE COLUMBIA RIVER PLUME USING BOTH TRADITIONAL AND NOVEL STATISTICAL ANALYSES: DOES FUNCTIONAL DATA ANALYSIS IMPROVE WATER MASS CLASSIFICATION?**

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In the northern California Current System (nCCS), intermittent seasonal upwelling/downwelling and the Columbia River plume (CRP) create oceanographic structure that enhance phytoplankton growth and form fronts that aggregate prey for marine predators. Water mass classification and detection of fronts provide useful information for resource management and marine spatial planning. Traditionally, water mass classification methods (k-means, fuzzy c-means, or hierarchical clustering) use optically-derived biological and chemical properties from a few wavelengths to derive unique types. Previous bio-optical description of the CRP and surrounding waters relied on satellite-derived ocean color at coarse spatial and spectral resolution. Although data from sensors (e.g., MODIS) are useful for evaluating mesoscale to global-scale (100s – 1000s of km) processes, they are generally insufficient for evaluating finer-scale (1-10 km) ecologically relevant patterns in coastal and estuarine ecosystems. We conducted low-altitude aerial surveys of SST and hyperspectral ocean color along east-west transects spanning continental shelf and slope waters off southern Washington and northern Oregon. These data were used to characterize water masses associated with the nCCS in three steps: 1) along-transect gradients in SST and ocean color to identify and characterize water mass types associated with, and independent from the CRP using k-means clustering, 2) functional Principal Components Analysis (fPCA) to evaluate water masses clustered using spectral shape, and 3) traditional and novel statistical analyses to determine the benefits of including spectral shape when classifying water masses. fPCA identified water masses with unique spectral shapes, but the results were difficult to interpret, indicating that SST is integral in classification.

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