

2010 Ocean Sciences Meeting

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Dynamics of *Myrionecta Rubra* blooms in the Columbia River estuary

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Massive red blooms develop in late Summer each year in the main channels of the Columbia River estuary. These blooms are identified with very high concentrations of *Myrionecta rubra*, a mixotrophic planktonic ciliate that acts as an autotroph in the estuary by utilizing cryptophyte-derived chloroplasts. Observational studies have revealed that while the red blooms occur in the strongly tidally driven and rapidly flushed main channels of the estuary, the source region for the chloroplasts is a shallow recirculating region along the northern edge of the estuary called Ilwaco Harbor (in Baker Bay). The duration of *Myrionecta rubra* blooms (over 30 days) well exceeds the flushing time in the estuary (0.5-5 days). So particle based modeling of the transport, mixing and motility of *Myrionecta rubra* and the related cryptophyte was performed to determine possible mechanisms by which the ciliates could both attain their food source from the shallow peripheral regions and form and sustain the intense blooms in the rapidly flushed main channels. Lagrangian particle tracking was performed based on output from a very high resolution three-dimensional finite element model simulation specifying the physical circulation in the Columbia River estuary for July through August 2009. This period coincided with extensive observations of *Myrionecta rubra* and other biological parameters in the Baker Bay region. It is found that vertical mixing, directed vertical migration and adequate resupply of cryptophytes from the bay all potentially contribute to sustaining a significant population of *Myrionecta rubra* in the main estuarine channels.

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