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The dispersal and mixing processes within the plume of the Changjiang River estuary: influences of the M_2, S_2, K_1, and O_1 tidal constituents in the flood and dry seasons

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An improved COHERENS model is used to study the dispersal and mixing processes within the plume of the Changjiang River estuary under the forces driven by M_2, S_2, K_1, and O_1 tidal constituents in the flood and dry seasons, respectively. The Changjiang River estuary with its bathymetry is divided into the orthogonal curvilinear grids (149×69). (i) The Changjiang River plume spreads southeastwardly in the form of jet flow, or circular bulge, or fresh water tongue, which depends on the Changjiang river discharge and tidal regime. (ii) There is a two-layer structure along the longitudinal section within the Changjiang River plume: the upper buoyant plume and the lower vertical homogeneous layer. The thickness of the upper buoyant plume is smaller in the flood season than that in the dry season, larger during the spring tide than that during the neap tide, and smaller at the maximum flood tide than that at the maximum ebb tide. (iii) The salinity stratification within the Changjiang River plume seems to be controlled by tidal mixing, and estuarine circulation resulting from interaction between the Changjiang river discharge and tides. The salinity stratification is stronger in the flood season than that in the dry season, weaker during the spring tide than that during the neap tide, and stronger at the maximum flood tide than that at the maximum ebb tide. They display seasonal/ fortnightly/ tidal variability patterns of stratification within the Changjiang River plume.

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