

# High-resolution non-hydrostatic modeling of frontal features in the mouth of the Columbia River

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## Supplementary materials

1) Animation of the vertical vorticity field and the vertical profiles of salinity (video-1.mpg)

[https://youtu.be/ysL94V9\\_MsM](https://youtu.be/ysL94V9_MsM)

Caption: The left panel shows the evolution of the vertical vorticity field (color) and flow field (arrows). The upper-right and lower-right panels show the salinity profiles along the transects perpendicular and parallel to the North Jetty (white dashed lines in the left panel), respectively. The left panel shows that the fingers are initially inclined to the jetty and then turn clockwise into the direction perpendicular to the jetty. The vertical vorticity fluctuations are closely correlated with the vertical motions as demonstrated by the concurrent exhibition of the salinity profiles in the right panels. The internal hydraulic jump is maintained at  $y = -500$  m as shown the upper-right panel.

2) Animation of the iso-Q surface (video-2.mpg)

<https://youtu.be/-r5hVWWS-zw>

Caption: Iso-Q surfaces for  $Q = 2.0 \times 10^{-5}$  (yellow) and  $4.0 \times 10^{-5}$  (red). In the initial developing stage of the vortex, the horizontal rollers can be

observed and the major structures of the rollers align approximately parallel to the jetty. In the later time, the main orientation of the rollers starts to turn clock-wisely to the direction perpendicular to the jetty, consistent with the finger orientation.