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Modeling and observational studies on the Changjiang River plume

by

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Abstract

Extension of the river plume throws significant impacts on both the physical and biological processes in the adjacent seas, for example the Changjiang River estuary and Pearl River estuary. In my presentation, I will introduce our recent years' works on the Changjiang River plume, including modeling and field works. Our model studies indicated that the tide plays a key role in modulating the Changjiang plume extension, especially in the regions around and close to the river mouth. Model studies excluding the tide could result in severe artifacts for simulating the plume extension, which, however, may have not been fully recognized in the past.

a) We found a substantial tide-induced lateral circulation that flows landward in the southern outlet of the Changjiang river mouth (i.e. the South Passage) and seaward in the northern outlet (i.e. the North Channel), which makes the North Channel to be the major outlet to discharge the Changjiang runoff, although the other two outlets are as wide as the North Channel. This is important for the initial stage of plume extension.

b) Tidal modulation could be an important factor that drives the well-known northeastward offshore Changjiang plume extension in summer. This finding could complete our understandings on the formation mechanism for this important phenomenon, and can explain some observational results that cannot be explained by wind or other forcings. c) We discussed the extension of Changjiang plume along the Subei Coast, which is on the left of the river mouth, and such kind of extension seems to violate the effects of Coriolis forcing. It was found that the tidal mixing and tideinduced residual currents both affect the plume extension along the Subei Coast, but their roles are just opposite. Tidal mixing produces a strong horizontal density gradient between the Changjiang estuary waters and the Subei coastal waters, thus prevents the plume to extend up-shelf along the Subei Coast. While the progressive tide from the East China Sea generates northward-flowing residual currents along the Subei Coast, pushing a small portion of the Changjiang dilute water to extend along the Subei Coast. This mechanism could partly explain the formation of the Subei lowsalinity water. d) Realistic simulation on the Changjiang plume was conducted to discuss the plume response to the forcings of wind, runoff, and tide, based on EOF analysis.

I would also introduce our field work in 2012 that measured the Min-Zhe coastal current (MZCC). In winter seasons, the Changjiang plume extends along the Min-Zhe Coast, forming the MZCC. Based on a phase-averaging method to remove the tidal current, we have quantified its volume transport. This could be the first time, to the best of our knowledge.

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Time: 2:00pm

Venue: Room 1003, IENV (Lift 4)

~ All are welcome ~~