



Effect of mesoscale eddies on the transport of low-salinity water from the Bay of Bengal into the Arabian Sea during winter

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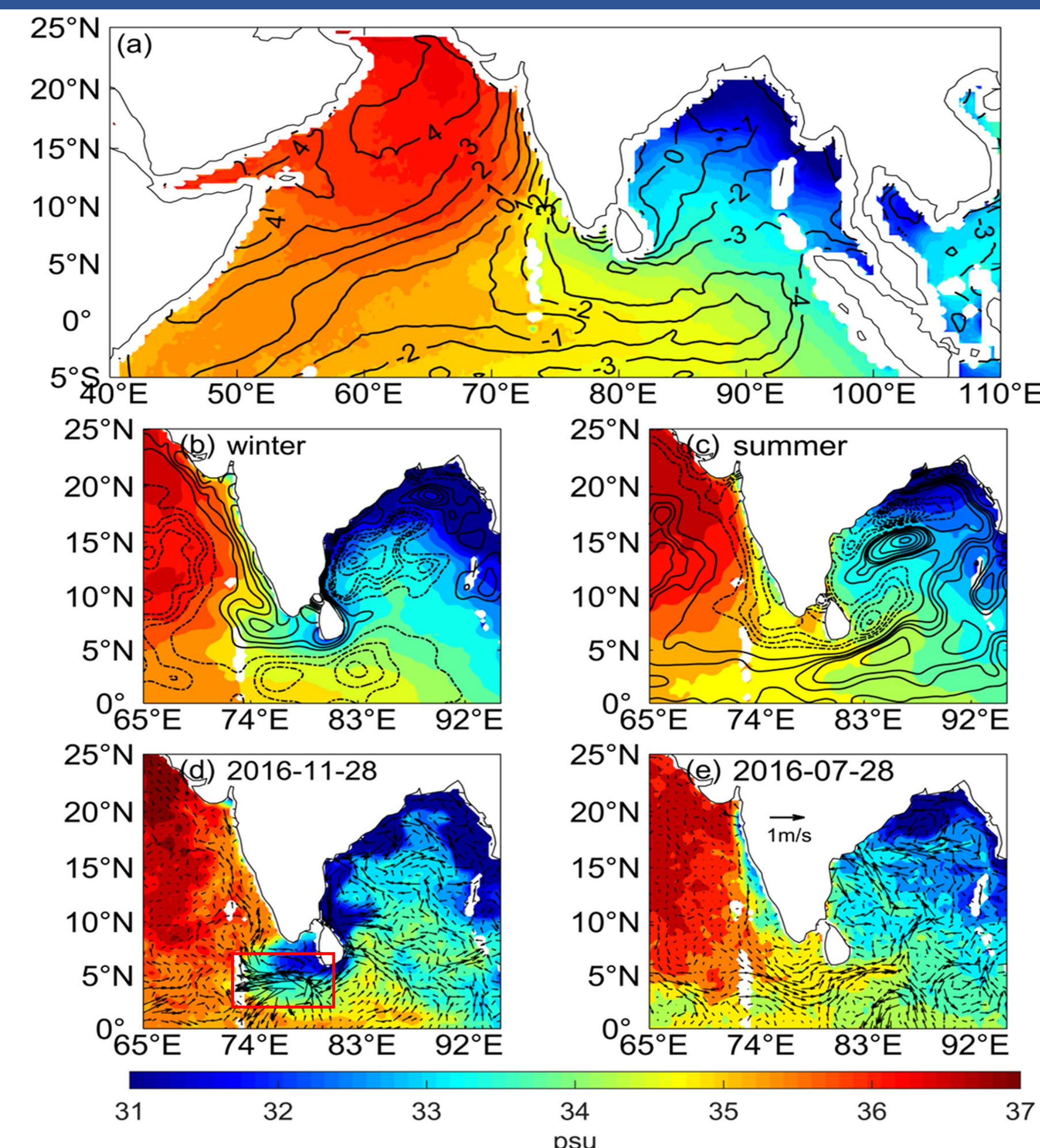
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Key points:

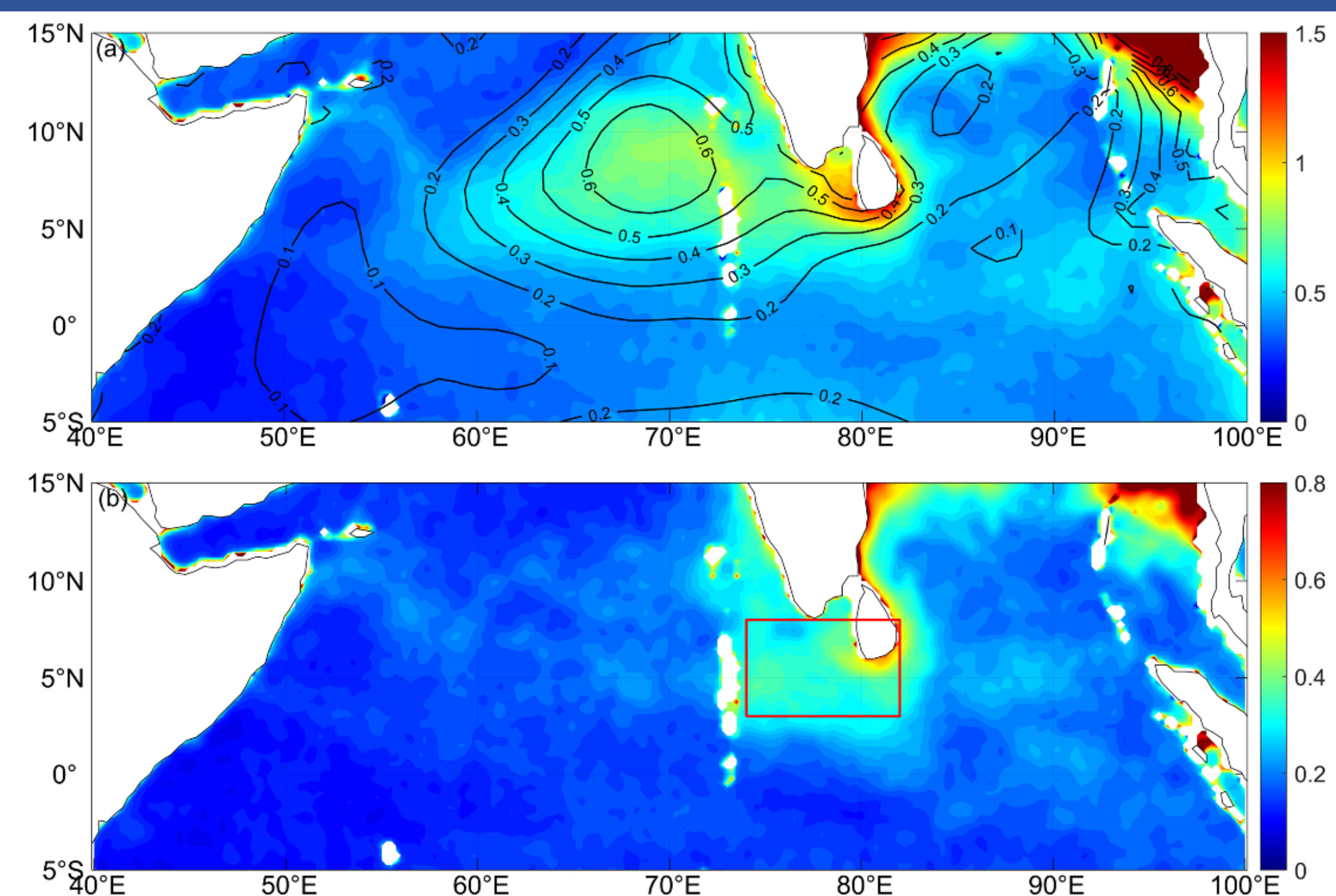
- The monsoon-induced inter-basin water exchange plays an important role in regional salinity balance and atmosphere–ocean feedback in the North Indian Ocean.
- The **SMAP SSS dataset** reveals that significant intraseasonal variabilities of Sea Surface Salinity (SSS) occur in the south of India with stronger amplitude in winter than in summer.
- Northeast Monsoon Current (NMC) and mesoscale eddies dominate the intraseasonal variabilities of SSS by transporting low-salinity water.

I. Seasonal distribution of SSS in the North Indian Ocean and the role of ocean circulation

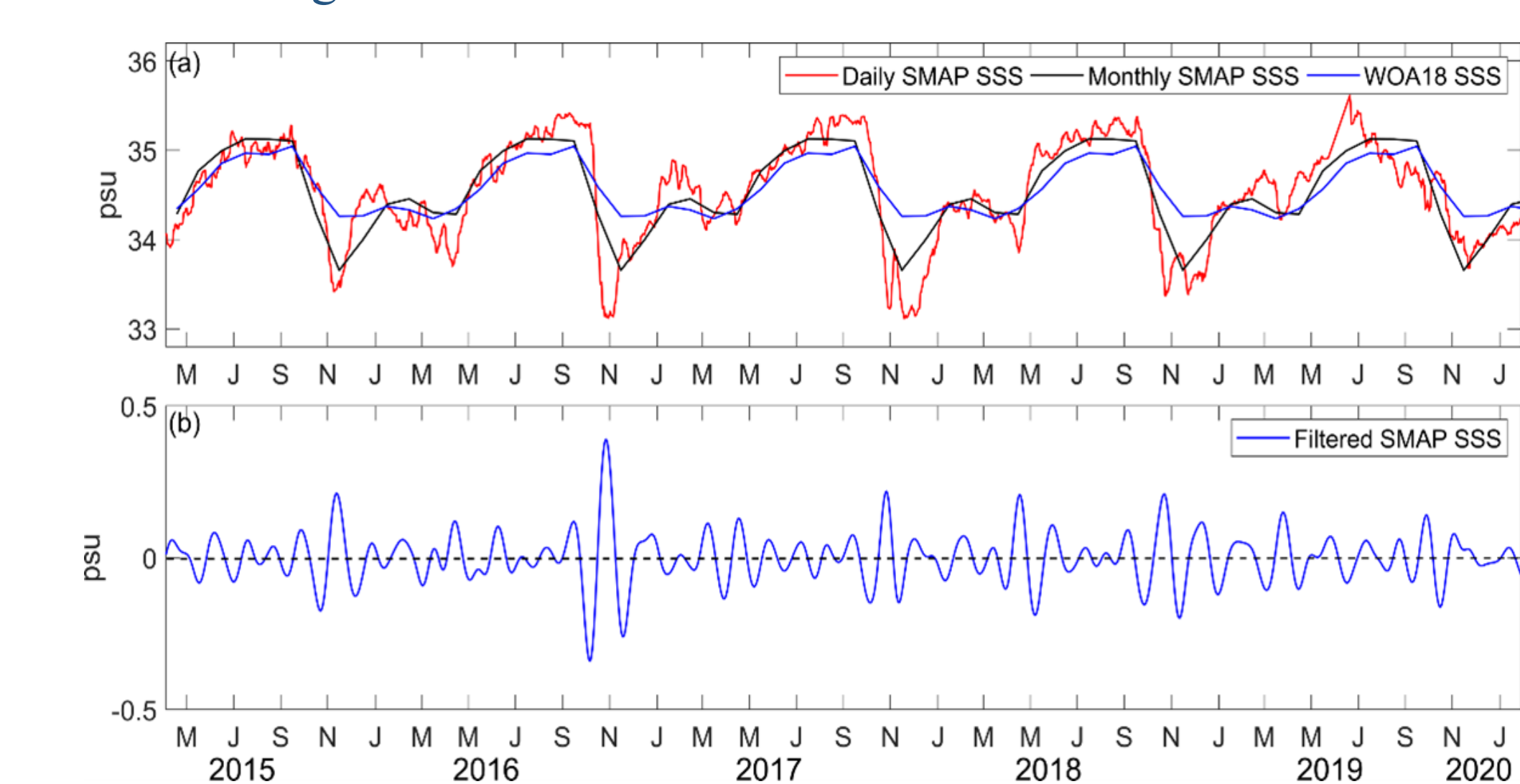


- ✓ The climatological distribution of sea surface salinity (SSS) in the Arabian Sea (AS) and Bay of Bengal (BoB) is in contrast due to differences in freshwater fluxes (evaporation minus precipitation) and river runoff inputs.
- ✓ Mesoscale eddies may occur on both sides of the NMC with anticyclones in the north and cyclones in the south.
- ✓ The region south of the Indian Peninsula is the key channel for the water mass exchange between the two basins.
- ✓ The low-salinity water transported by the East India Coastal Current (EICC) and NMC from the northern BoB causes a sharply SSS decrease in November.

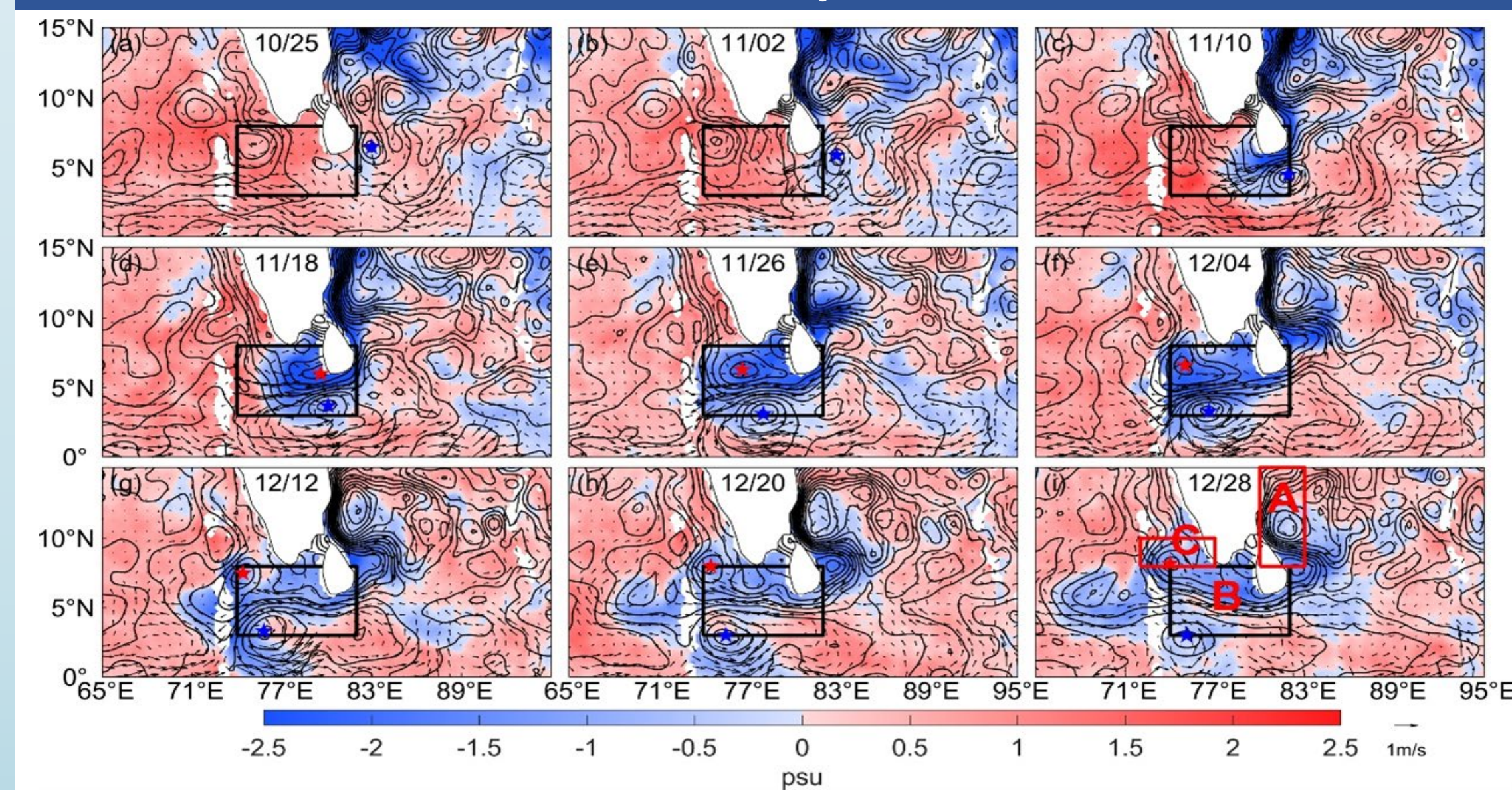
II. Intraseasonal variability of SSS in the region south of the Indian Peninsula



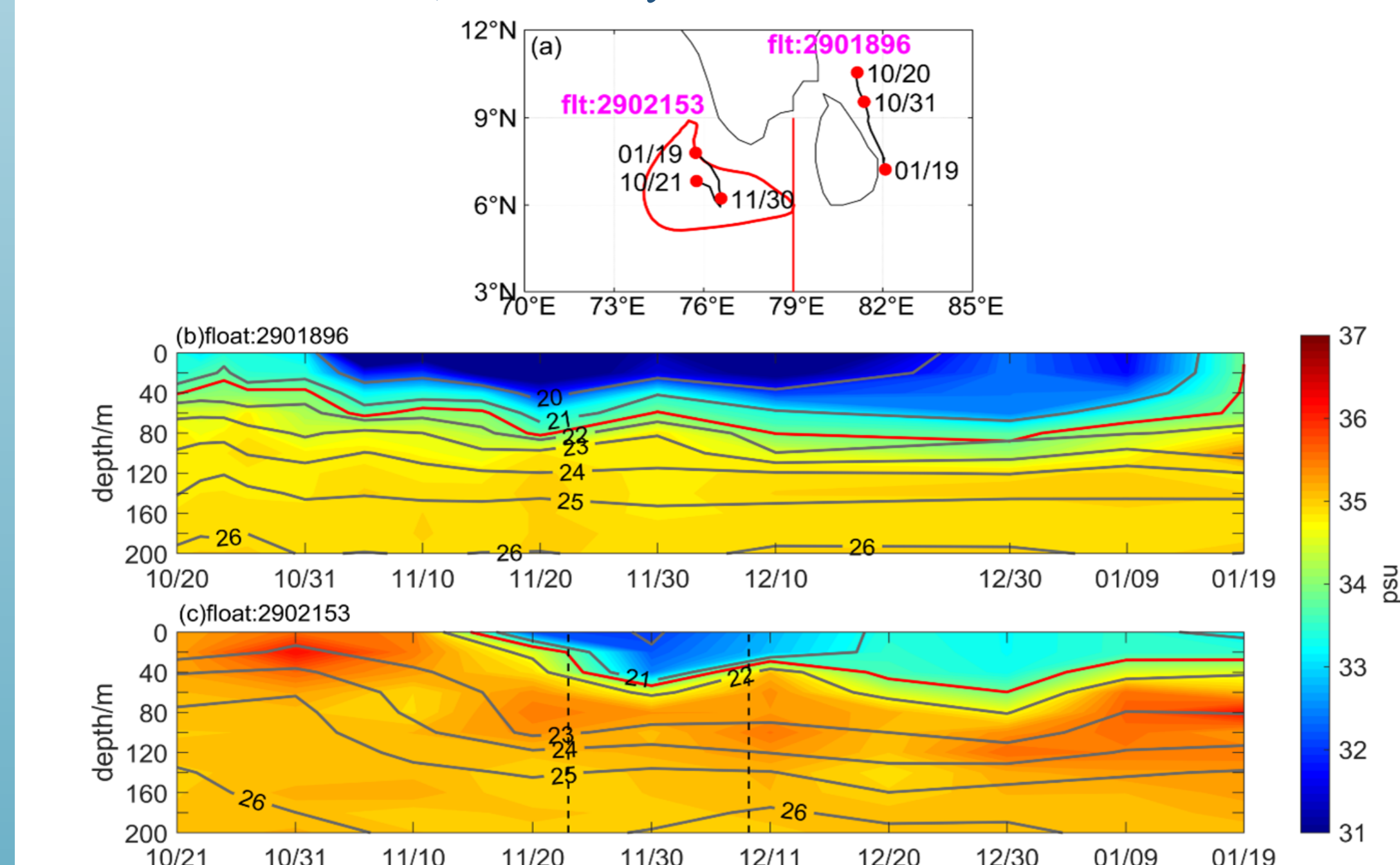
- ✓ The SSS along the Indian coast and south of India appears a large intraseasonal variation signal.
- ✓ Daily SSS have shows an apparent seasonal cycle within the past 5 years.
- ✓ The SSS experiences more prominent intraseasonal variability in winter than in summer.
- ✓ The low-SSS events in the autumn and winter of 2016 and 2017 are the strongest and the weakest in 2019.



III. A case analysis of 2016



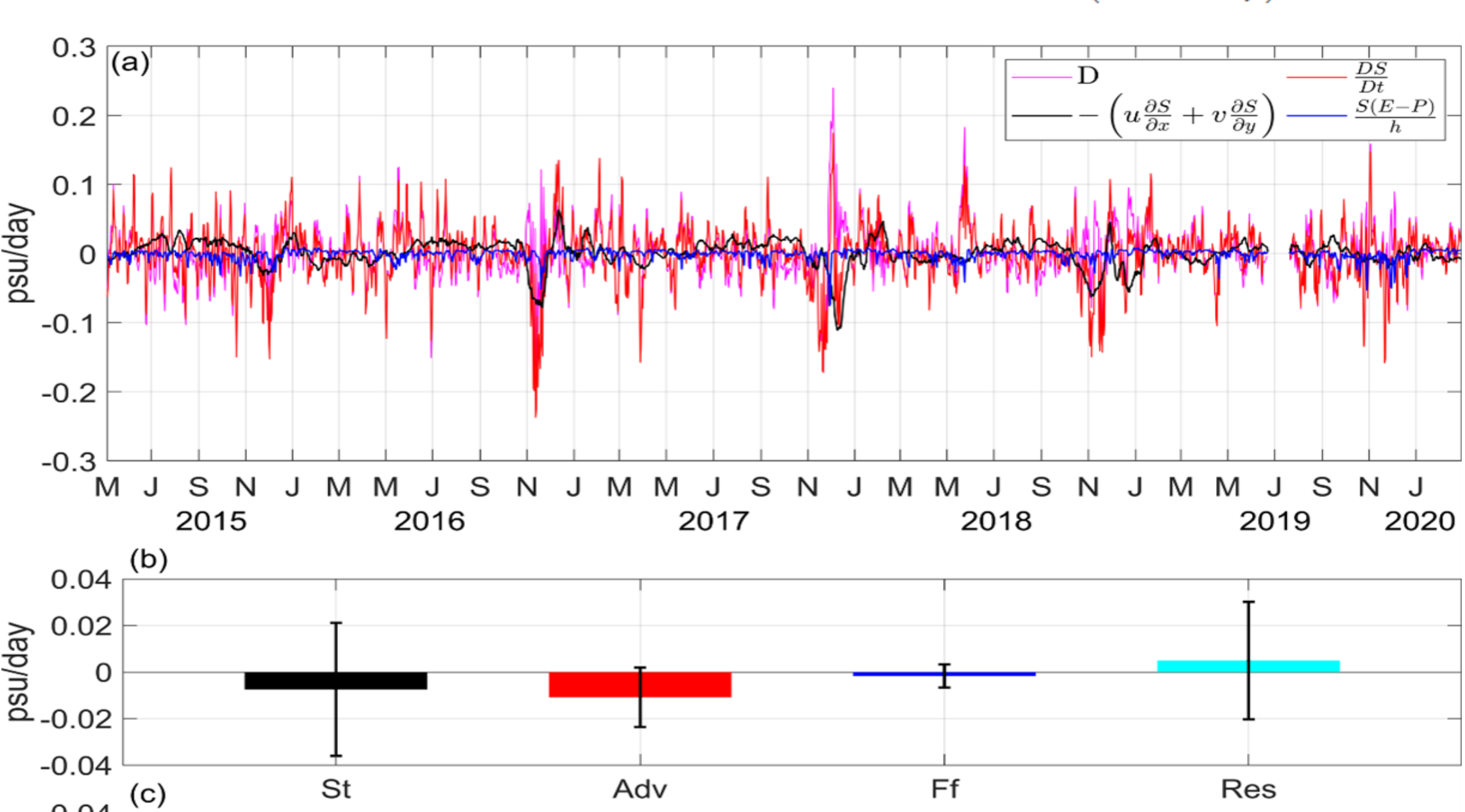
- ✓ The eddy pair strengthened the westward transport of low-salinity water of the NMC and plays an important role in redistributing the low-salinity water.
- ✓ The eddy pair persists for nearly a month in the region south of the Indian Peninsula, blocked by the Maldivian terrain to the west.



- ✓ The anticyclonic eddy can maintain the low-salinity characteristics well, with salinity in the upper 50 m all below 33 psu.
- ✓ The low-salinity water volume within the eddies accounted for 83% of the total volume transported through the transect, with anticyclonic eddies accounting for 67% and cyclonic eddies for 16%.

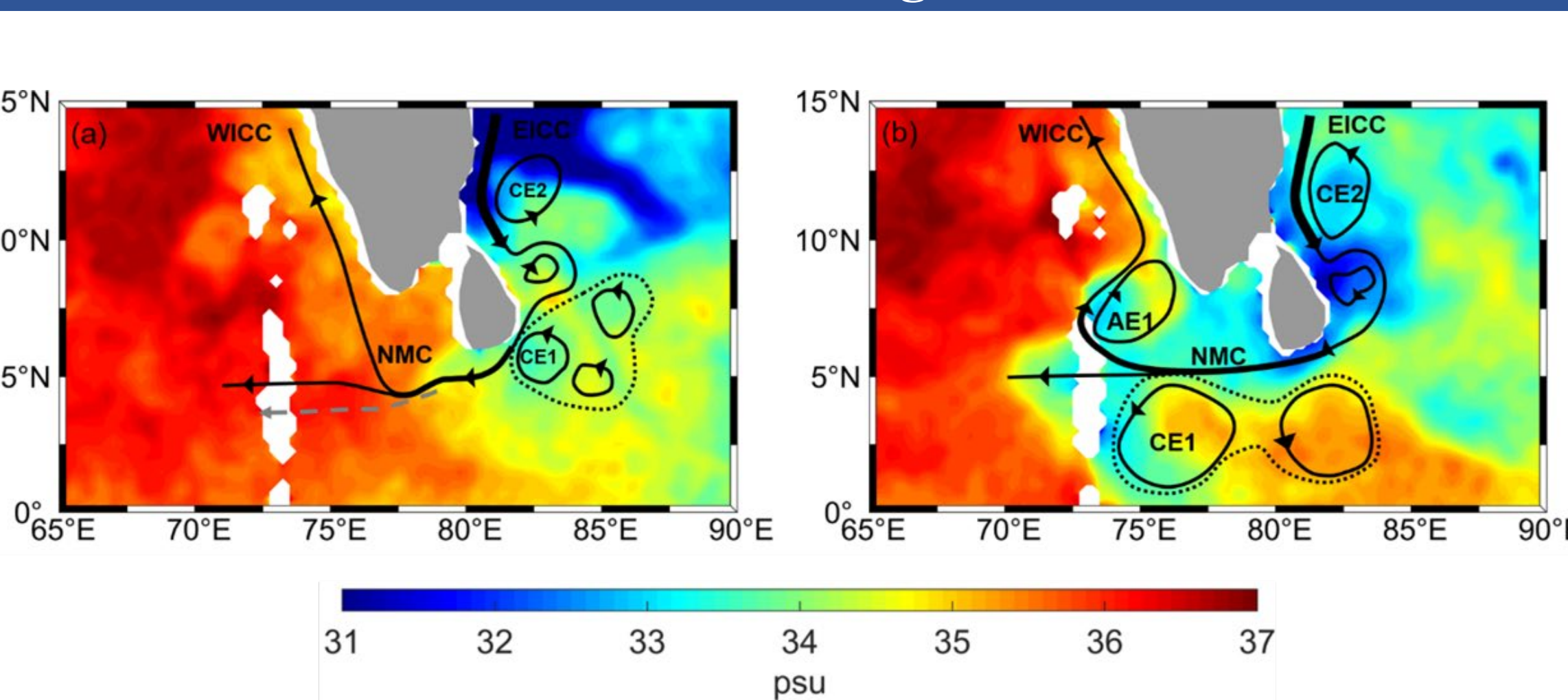
IV. Salinity budget analysis

$$\frac{\partial S}{\partial t} = \frac{(E-P)S}{h} - \left(u \frac{\partial S}{\partial x} + v \frac{\partial S}{\partial y} \right) - \frac{W_e \Delta S}{h} + D$$



- ✓ The contribution of local freshwater flux is relatively small. The horizontal advection term is the main reason for the change of local SSS.

Schematic Diagram



Acknowledgements

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