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Variation of the surface coastal current in the marginal sea off the west coast of Sumatra during Pre-YMC & YMC periods

Variation of the surface coastal current in the marginal sea off the west coast of Sumatra during the Pre-YMC and YMC periods was investigated by the R/V "Mirai" cruises (Pre-YMC [Years of the Maritime Continent]: MR15-04 and YMC: MR17-08).

One of the major differences between the cruises of MR15-04 and MR17-08 was the direction of the surface coastal current. According to the LADCP observation, the southeastward current along the coast was continuously dominant under the forcing of a weak easterly winds in the MR15-04, whereas in the MR17-08, the current direction was rotated counterclockwise around 10 days under the strong westerly wind forcing after the passage of the MJO, suggesting the passage of meso-vortices.

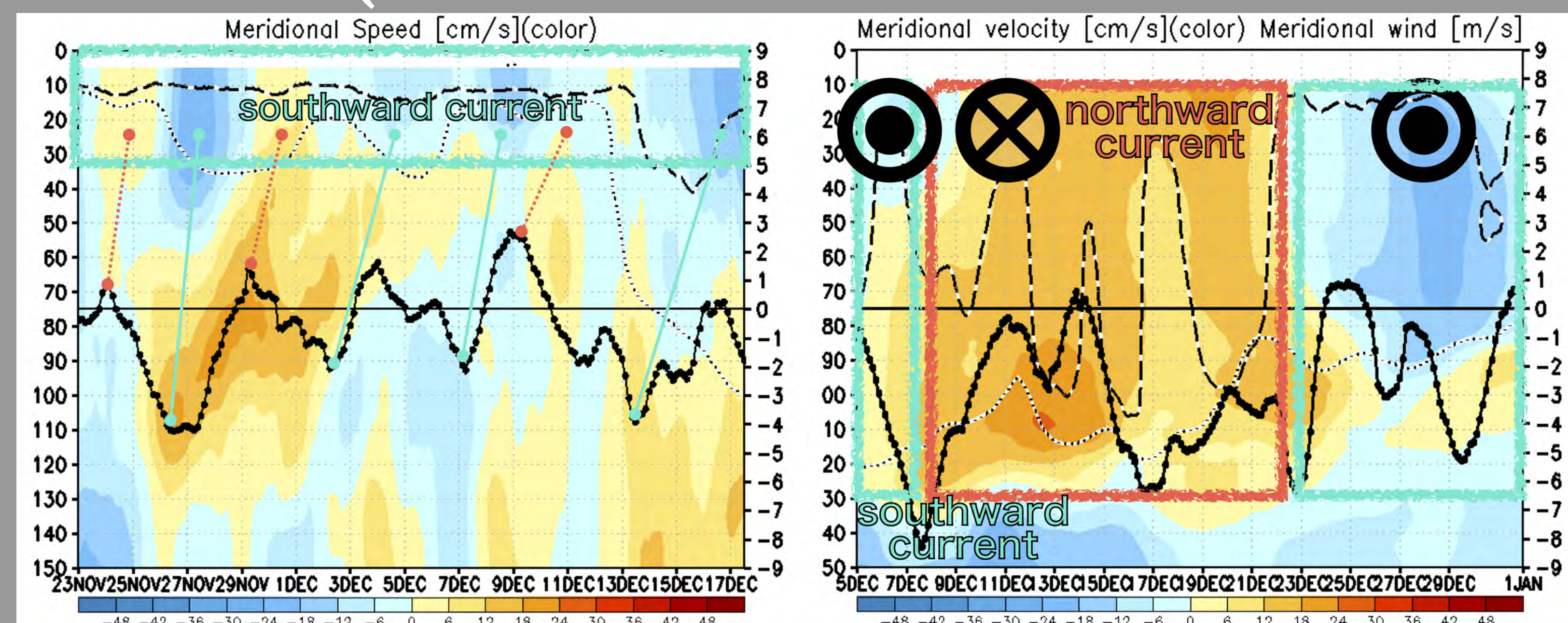
The difference was confirmed by the oceanic reanalysis of the ECCO2, and it was confirmed that the meso-vortex was slowly moved along the coast (about 300 km / 10 days).

It was suggested that the presence or absence of the meso-vortex formation caused a large difference in not only the horizontal advection but also the up or down welling in the mixed layer.

The meso-vortex was also accompanied by a clear maximum of the sea surface height, and a large vertical motion in the mixed layer is estimated in ECCO2.

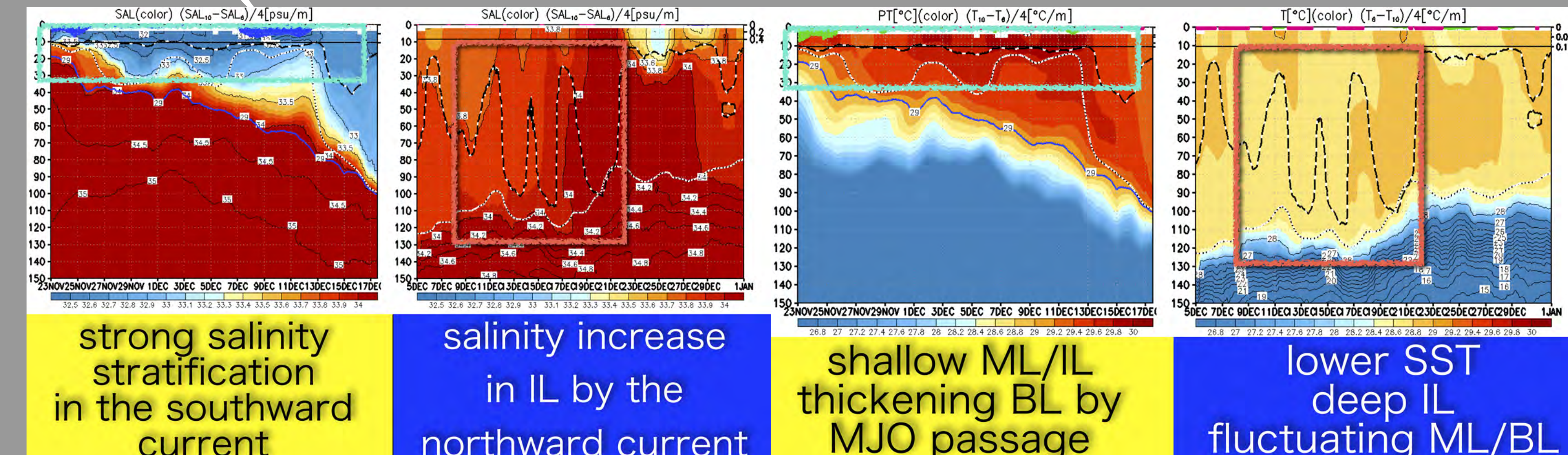
The coastal meso-vortex was developed under the continuous westerly wind forcing more than 10 days after the MJO passage.

LADCP (observed coastal V currents)



wind-driven variation geostrophic current

CTD (observed coastal T/S variations)



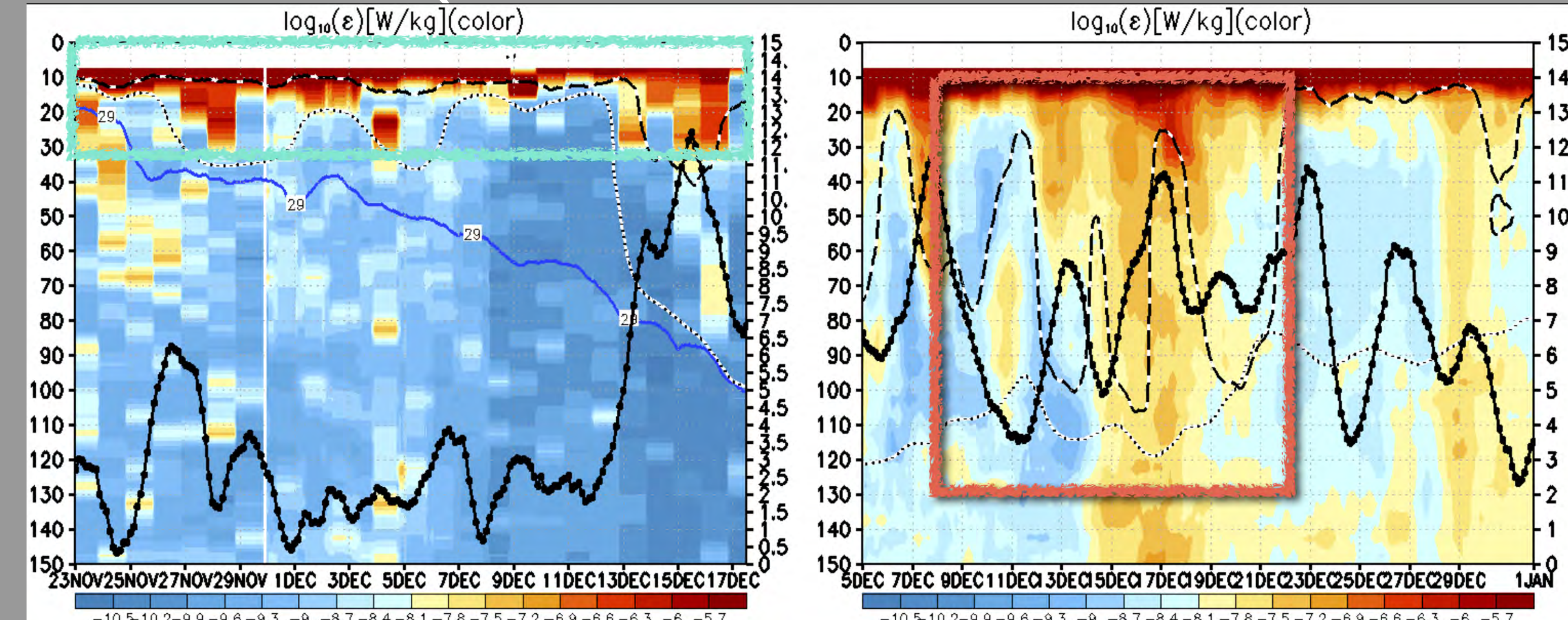
strong salinity stratification in the southward current

salinity increase in IL by the northward current

shallow ML/IL thickening BL by MJO passage

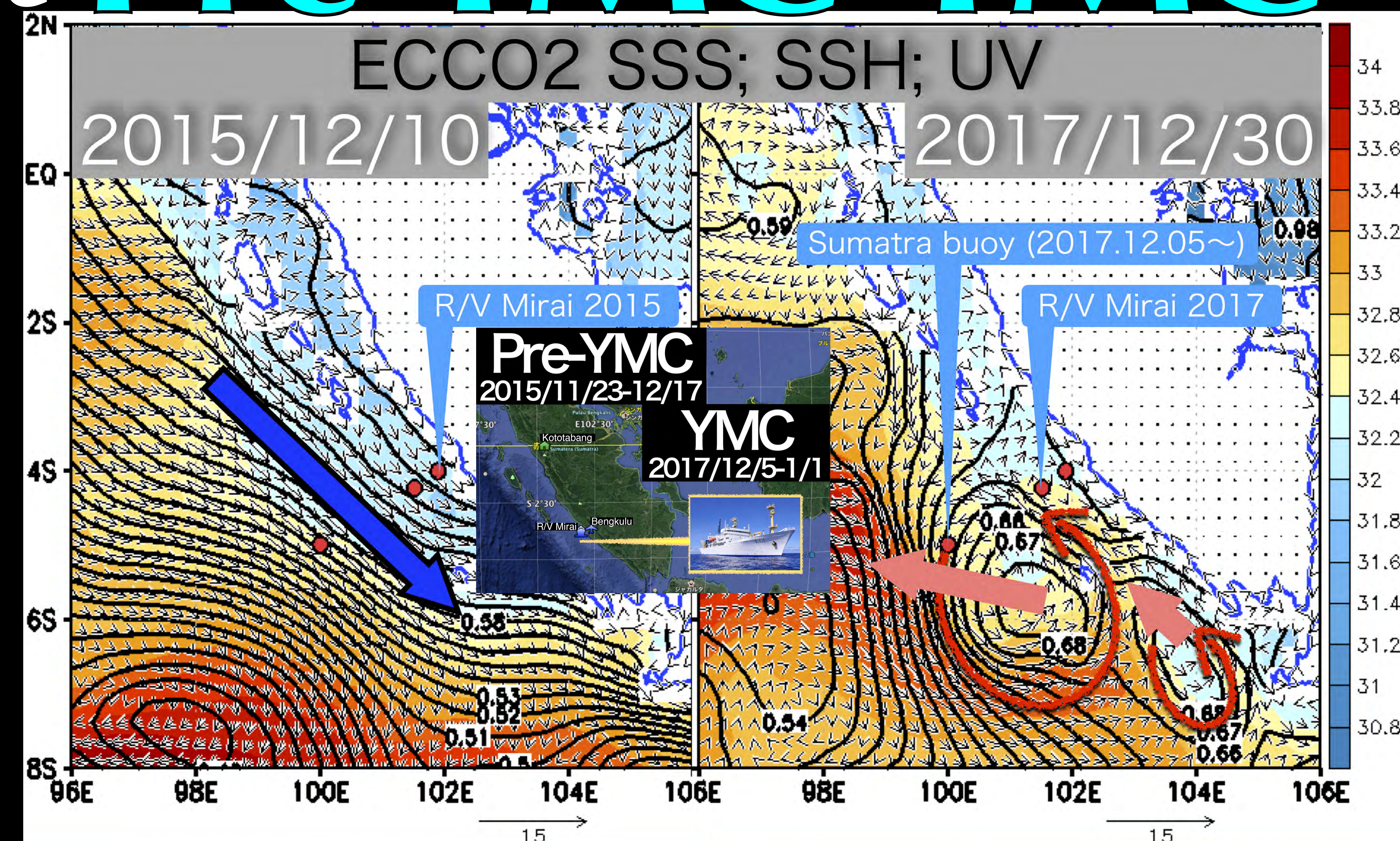
lower SST deep IL fluctuating ML/BL

TurboMAP (observed coastal turbulence)



turbulence variation following wind variation

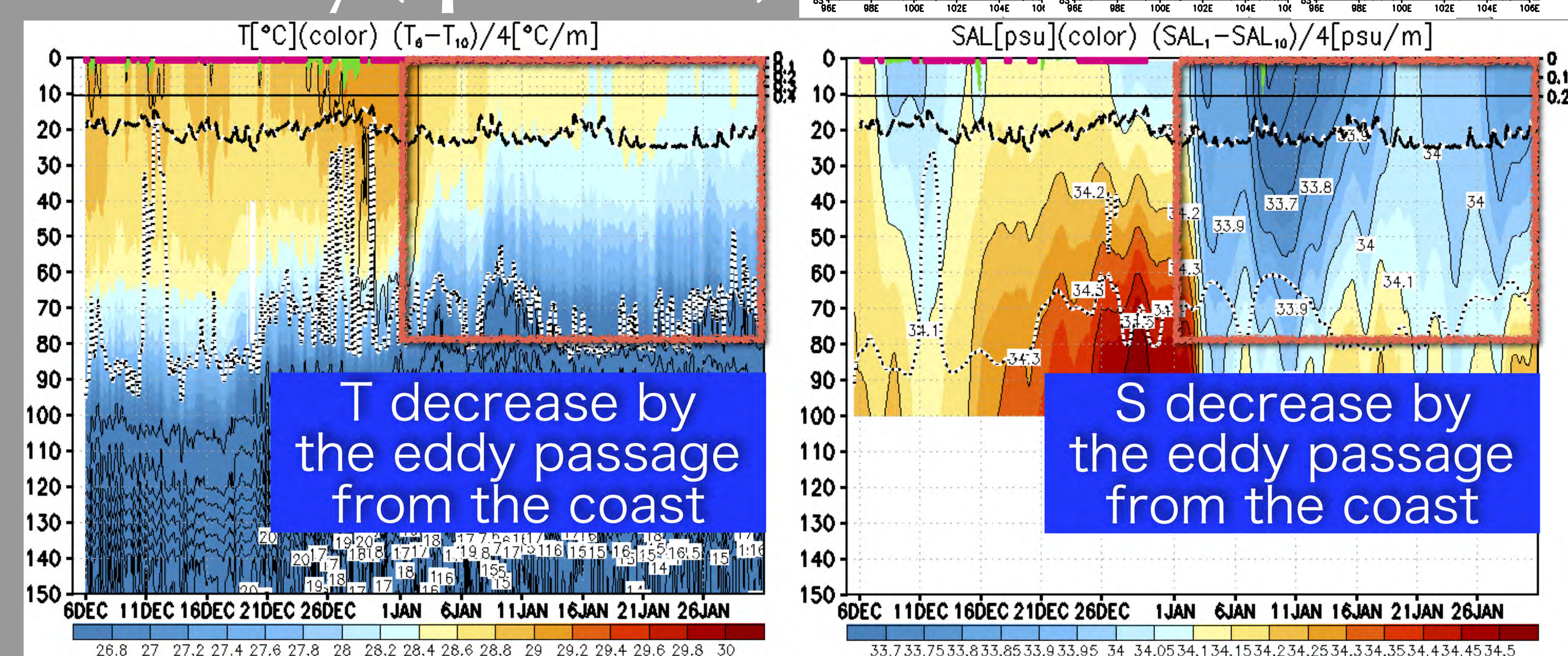
turbulence increase by the northward current



alongshore flow alongshore eddies
2015 before MJO 2017 after MJO

The coastal eddy with higher SSH extends the areas of lower SST and SSS to the west.

Sumatra buoy (open ocean)



T decrease by the eddy passage from the coast

S decrease by the eddy passage from the coast