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寒候期の黒潮続流域における海面気圧極小と傾圧帯の経年変動
Interannual variations of a local pressure minimum and baroclinicity around the Kuroshio Extension in the cold season

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In the cold season, prevailing advection of a cold/dry continental airmass by the northwesterly monsoonal flow induces strong upward surface turbulent (sensible and latent) heat fluxes in the Kuroshio-Oyashio Extension (KOE) region. A recent study based on the ship-measured ICOADS dataset has shown that a local minimum in the climatological-mean sea-level pressure (SLP) field is collocated with a band of local maxima in the surface heat fluxes along the Kuroshio and its extension. Another recent study has shown through numerical experiments that meridional contrasts in the surface sensible heat flux (SHF) across a prominent oceanic front can act to maintain a surface baroclinic zone within the KOE region. The present study is the first to investigate the interannual variability of SLP minimum (trough) and surface baroclinicity in the KOE region, mainly based on the JRA25 monthly data for a recent 32-year period.

Our analysis reveals that the pressure trough is very likely anchored at 33.75N along the Kuroshio Extension (KE) axis. The trough is situated slightly southward of the heat flux maximum, but their positions vary to some extent interannually. Our additional analysis reveals a statistically significant difference in mean northerly wind speed in between months when the trough axis is located 1.25 deg. south of the heat flux maximum and when their displacement is 2.5 deg. or greater, suggesting the importance of the advective effect by the monsoonal wind.

In wintertime a well-defined surface baroclinic zone marked by the strongest surface air temperature (SAT) gradient forms in the KOE region. Our analysis of interannual variations of the baroclinicity reveals that the latitudinal position of its maximum is collocated with or slightly south of the maximum SHF gradient while situated north of the maximum gradient in the meridional cold advection. This result suggests that the latitudinal position of the baroclinic zone is determined in balance between the heat supply from the ocean and advective effect of the monsoonal wind.