Can Luzon Strait Transport Play a Role in Conveying the Impact of ENSO to the South China Sea?

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ABSTRACT

The Luzon Strait transport (LST) from the Pacific into the South China Sea (SCS) is examined using results from a high-resolution ocean general circulation model. The LST from the model has a mean value of $2.4 \, \text{Sv} \left(10^6 \, \text{m}^3 \, \text{s}^{-1}\right)$ and reaches its seasonal maximum ($6.1 \, \text{Sv}$ westward) in winter and seasonal minimum ($0.9 \, \text{Sv}$ eastward) in summer. Both the annual mean and seasonal variation of LST compare favorably with earlier observations. On an interannual time scale, LST tends to be higher during El Niño years and lower during La Niña years, with its maximum (minimum) leading the mature phase of El Niño (La Niña) by 1 month. The interannual variation of LST appears to be oppositely phased with the Kuroshio transport east of Luzon, indicating a possible nonlinear hysteresis of the Kuroshio as a driving mechanism of LST. For the annual average, water leaving the SCS in the south is of higher temperature than that with LST, thus producing a cooling advection in the upper 405 m equivalent to a surface heat flux of $-19 \, \text{W m}^{-2}$. Most of this cooling advection is balanced by the atmospheric heating ($17 \, \text{W m}^{-2}$). From late spring to early fall, surface heat flux is the primary heating process; only a small part of the heat content change can be explained by heat advection. But, in winter, heat advection seems to be the only important process responsible for the cooling in the upper layer of the SCS. The interannual variation of the upper-layer heat content has a strong signature of ENSO, cooling in the development of El Niño and warming in the development of La Niña. An oceanic connection is revealed, in which LST seems to be a key process conveying the impact of the Pacific ENSO into the SCS.