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Atmospheric responses to the Gulf Stream and the Kuroshio: Similarities and Differences

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In this presentation, we explore similarities and differences in atmospheric responses to the Gulf Stream and the Kuroshio. The both western boundary currents strongly influence the atmosphere, but reflecting the background SSTs and large-scale atmospheric structures the atmospheric responses also exhibit substantial differences. Over the Gulf Stream, two atmospheric modes of responses are prominent. One is the shallow heating mode in winter, and is characterized by strong surface wind convergences, maximal ascent in the lower troposphere associated with sensible and latent heatings in that layer. The other is the deep heating mode in summer, and is characterized by the maximal ascent in the middle of the troposphere accompanied by strong convective latent heating. The shallow heating mode is also clearly seen over the Kuroshio Extension, but in this region the deep heating mode is much weaker than that over the Gulf Stream. Interestingly, however, deep heating mode is identified over the Kuroshio in the East China Sea in June, i.e., Baiu-Meiyu season. The atmospheric response of deep heating mode in this region is embedded in the large-scale Baiu-Maiyu precipitation band, and act to locally enhance precipitation and ascent over the Kuroshio.

Keywords: air-sea interaction, precipitation, Baiu