Air-sea fluxes and ocean variability associated with atmospheric rivers

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Atmospheric rivers (ARs) generate strong upper ocean variability and substantial air-sea fluxes in the northeast Pacific and southeast Indian Oceans. In this presentation, we summarize dynamical and thermodynamical oceanic responses to AR-associated air-sea fluxes in these two regions, and discuss the similarity and differences between these regions. While the overall structure of large-scale latent heat flux (evaporation) variability associated with ARs are similar in the northeast Pacific and southeast Indian Oceans, a zonal and meridional extent of the areas of significant latent heat flux are different because of the different spatial pattern of the cyclonic circulation associated with ARs. While AR-associated latent heat flux is very small around the west coast of north America where the equatorward boundary current generates relatively cold SSTs, a significant latent heat flux is evident along the west coast of Australia because of the poleward flowing Leeuwin Current which maintains relatively warm SSTs in all seasons. The poleward coastal jets are generated by winds associated with landfalling ARs in the west coast of north America and Australia. However, a significant difference in the vertical structure is found, in which the poleward currents are nearly barotropic along the Australian coast, suggesting the effect of the relatively broad continental shelf and slope. The propagation of these coastal currents and associated sea level along the coasts are further discussed.

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