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Different cyclone characteristics along the Gulf Stream and Kuroshio SST front regions

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The Northwest Atlantic and the Northwest Pacific are regions of strong temperature gradients and hence favourable locations for wintertime cyclone intensification co□located with the storm tracks. Although the Gulf Stream and the Kuroshio Extension are both western boundary currents with similar characteristics, the SST gradient is markedly stronger across the Gulf Stream. Further, upper-level flow is stronger and more zonal over the Kuroshio Extension. To estimate the relative contribution of the SST front to the evolution of cyclones and to identify the mechanisms for cyclone intensification in the two regions, we track individual cyclones and categorise them depending on their propagation relative to the SST front. We focus on cyclones staying either on the cold (C1) or warm (C2) side of the SST front, and on cyclones that cross the SST front from the warm to the cold side (C3). Comparing these categories, we find that low-level baroclinicity, particularly arising from the land–sea contrast, drives the higher intensification of cyclones in C1 and C3 in the Gulf Stream region, with the propagation of those cyclones near the left exit region of the North Atlantic jet contributing to the higher intensification and precipitation. In the Kuroshio region on the other hand, the land–sea contrast plays a less prominent role for the low□level baroclinicity. Cyclones remaining on the warm side of the Kuroshio SST front (C2), as well as those crossing the SST front from the warm to the cold side (C3) are characterized by higher intensification, associated with a stronger upper-level jet in the Pacific. Comparing the different cyclone categories, there is no direct effect of the SST front on cyclone intensification in both regions. However, the SST front contributes to the climatological low□level baroclinicity, providing a conducive environment for cyclone intensification for the cyclones crossing the SST front.