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Predictability of Tropical Cyclone Intensities over the Western North Pacific using the IBTrACS dataset

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In this study, the predictability limits of the TC intensities (defined as the Minimum Central Pressure (MCP) and Maximum Sustained Wind (MSW), respectively) over the whole WNP (western North Pacific) basin are investigated using the nonlinear local Lyapunov exponent (NLLE) method, which provides a quantitative estimation of atmospheric and oceanic predictability based on the TC best track data from the IBTrACS data set. The result shows that the predictability limits of the TC MCP are about 108 hours (4.5 days), and comparable to (but slightly lower than) that of the TC MSW, with value of about 120 hours (5 days). The spatial distribution of the predictability limit of the TC MCP over the WNP is similar to that of the TC MSW, and both of them are gradual decrease from the eastern region of the WNP (EWNP) to the SCS. For the TC MCP and MSW, the predictability limits are relatively high over southeastern regions of the WNP where the modified accumulated cyclone energy (MACE) is relatively large, whereas it is relatively low over the South China Sea (SCS), with the relatively small MACE. The spatial patterns of the TC lifetime and the lifetime maximum intensity (LMI) provide a good reflection of the TC MACE in the WNP. The relatively strong intense and long lifetime TCs are mainly generated mainly in southeastern regions of the WNP, corresponding with a relatively high predictability of the TC MCP and MSW there. In contrast, there are only weak and short lifetime TCs generated in the SCS, where also corresponds well with a relatively low predictability of the TC MCP and MSW. In addition to the dependences of predictability limit on the genesis location, the present locations also have an influence on the predictability limit of the TC intensity. Generally speaking, the TC at the genesis location is favorable for a high predictability of the TC MCP and MSW, and the predictability limits of the TC MCP and MSW show a gradual decrease with the increasing time after the TC generated. These results provide a new perspective to promote the understanding of the predictability limits of the TC intensities, which could be used as a baseline for improving the TC intensities prediction.