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Seasonal forecasting of western North Pacific tropical cyclones: relationship to teleconnections

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Tropical cyclones (TCs) are among the most hazardous weather phenomena on the planet. The western North Pacific (WNP) is the most active area for TC activity, where accurate TC predictions, for example several months ahead, remain challenging. Predictability of the UK Met Office global seasonal forecasting system (GloSea5) for WNP TCs is presented, based on the 23 years of ensemble forecasts initialized in June. TCs are tracked from the 6 hourly forecasts for July to October (JASO). The interannual variability of JASO TC frequency is verified against the IBTrACS and reanalysis.

Results show that GloSea5 has good skills for TC track density predictions in the central Pacific, moderate skills in the South China Sea and east of China, but no skills in the east of Japan. The TC prediction skills are closely related to the representability of ENSO teleconnection. Although ENSO is well predicted, the teleconnection of large-scale environment to ENSO is erroneously displaced. In the El Nino/La Nina years, the predicted cyclonic/anti-cyclonic wind circulation anomaly in the North Pacific is too weak compared with observations, with an eastward biased North Pacific Subtropical High, while the westerly/easterly wind anomaly in the western and central tropics of Pacific is too strong. These effects, together with others, cause TCs to steer further east in the El Nino/La Nina years once they are formed in the central Pacific, relative to observations. Bias of TC track density is then diagnosed, characterized with an overestimation over the basin wide. TC bias is associated with the excessive precipitation, which produces a favourable condition for TC to form and develop in WNP. Finally, we propose a method to conditionally correct the TC bias. With this method, the prediction skills of GloSea5 in the western Pacific are substantially improved.