Effects of time interpolation of sea surface winds considering propagation of disturbance on wave hindcast

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A hincast of ocean waves is important for climate study, and practical applications such scheduling the ship navigation and fishery. Ocean wave model for the hindcast is driven from archived atmospheric reanalysis data set. However, the time resolution of archived atmospheric reanalysis data is much longer than the time step required for wave prediction. Therefore, the surface wind is interpolated with respect to time. A linear interpolation with respect to time is often used because it is simple and robust. However, the linear time interpolation cannot retrieve atmospheric fields in the case of moving cyclone. A moving tropical cyclone is expressed by the parametric form such as a Rankine vortex and surface wind field is deduced from the parametric model. This approach may be useful for the case study that investigates the ocean response to moving the storm. It is difficult to apply the method for both moving cyclone and stationary fields co exist. It is also difficult to express a moving extra tropical cyclones by the parametric form such as a Rankine eddy. We developed a new and simple time interpolation method of atmospheric field which can apply to both moving and stationary disturbances. In this method, a value is interpolated from the data on the same positions not in a fixed coordinate system but in the coordinate that is moving with a disturbance such as a cyclone.
The predicted wave heights and periods from the liner interpolated winds and winds by the present method are compared with in-situ observations from NDBC deployed buoys and JMA drifting buoys. The improvement of wave prediction is evident in the case that the difference of predicted wave parameters between from the linear interpolation and from the the present method is large. The improvement of wave prediction is statistically significant. This case occurs frequently anywhere, although the case is not often in the in-situ observation point. It is shown that the wave prediction can be improved only by improving the time interpolation method.

Keywords: wave hindcast, sea surface wind, time interpolation, cyclone

