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The Impact of Ocean Mixed Layer on Regional NWP Model around the Korea Peninsula

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Ocean mixed layer (OML) affects diurnal cycle of sea surface temperature (SST) induced by change of solar radiation absorption and heat budget in ocean surface. The diurnal SST variation can lead to convection in ocean, which can impact on localized precipitation both over coastal and inland. In this study, we investigate The OML characteristics affecting the diurnal cycle of SST for the Korea Peninsula and surrounding areas. To analyze OML characteristics, HYCOM oceanic mixed layer depth (MLD) and 10 m wind fields of ERA-interim during the period of 2008-2016 are used. In the winter season, oceanic MLD is deeply formed when the strong wind field is formed perpendicular to continental slope over deep seafloor areas. Besides, cooling SST-induced vertical mixing in OML is reinforced by cold and dry air originated from Siberia. The OML in summer is shallowly distributed about 20 m over the analyzed areas. To estimate the impact of adapting OML model in high horizontal resolution (1 km) NWP model, four sensitivity tests are performed. At this time, the prognostic scheme of skin SST is applied in NWP to simulate diurnal SST variation. The simulation results of summer case show that CNTL (off-OML) overestimates diurnal SST variation, while EXPs (on-OML) indicate similar results to observations. And, the prediction of precipitation for the performance of EXPs shows improvement compared with CNTL over coastal as well as inland. In winter, on the other hand, there is no significant difference in CNTL and EXPs. The average heat budget at sea surface in February, which is the case period, is close to zero. As a results, it is considered that radiation balance at the sea surface occurs and diurnal SST variation due to net radiation in the prognostic scheme is small. This results suggest that the application of the OML model in the summer season properly that simulates diurnal SST variation, can contribute to improving the prediction for performance of SST and precipitation over coastal area and inland.