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A numerical study of the wave shoaling effect on wind-wave momentum flux. XUANTING HAO, LIAN SHEN, Univ of Minnesota - Twin Cities — Momentum transfer between wind and waves is crucial to many physical processes in air-sea interactions. For decades, there has been a number of observational evidence that the surface roughness in the nearshore region is notably higher than in the open sea. In order to explain the mechanism behind this important phenomenon, in particular the wave shoaling effect on surface roughness, we conduct a series of numerical experiments using the wind-wave module of WOW (Wave-Ocean-Wind), a high-fidelity computational framework developed in house. We use prescribed monochromatic waves with linear shoaling effect incorporated, while the wind field is simulated using wall-resolved large-eddy simulation. A comparison between a shallow water wave case and deep water wave cases shows remarkably stronger wave effects on the wind for the former. Detailed analyses show that the increased surface roughness is closely associated with the increased form drag that is mainly due to the reduced wave age in wave shoaling.

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