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A new approach of implementation of Wave Boundary Layer in OpenIFS

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Despite of significant improvement in modelling of the atmosphere after years of research, the accuracy of predicting cyclone/typhoon waves still remains highly challenging. Evidence shows that the air-sea-waves interaction over the ocean surface can significantly impact on the coupled atmosphere-ocean systems, through momentum, mass, and energy exchanges. In particular, the momentum exchanges have been found to affect both the structure of the wave boundary layer and the sea state, through the wave dissipation and wave breaking. For many decades, studies suggested different parameterizations of the momentum fluxes, through drag coefficient (C_d) and the roughness length (z_0). In recent years, research has been focused on the theoretical approaches of the momentum parameterization within the Wave Boundary Layer (WBL) in order to obtain the best C_d and z_0 (Hara and Belcher 2002,2004; Moon et al. 2004; Du et al. 2017,2019). In this study, based on the works of Du et al. (2017, 2019), we introduce a new approach of the parameterization of the momentum flux using the roughness length. The potential of the scheme is analysed with extreme wind and wave events and the results are validated against buoy observations.