MS6S_12463

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Wave—mean Flow Interaction in Coupled Atmosphere–ice–ocean Systems

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A dynamically consistent framework for modelling atmosphere–ocean interaction must take account of surface waves, either implicitly or explicitly. We may account for the waves explicitly by employing a numerical spectral wave model, and applying a suitable theory of wave—mean flow interaction. Below the water surface the generalized Lagrangian mean (GLM) formulation is suitable, and a closed system of equations may be obtained to second order in wave slope by applying wave action conservation equations in the propagation of the spectral wave components. The coupled model system will also take account of the Earth's rotation, the momentum balance during wave generation and dissipation, the effect of depth-varying currents on wave propagation, the presence of surface films and sea ice, the effect of waves on the mean water level, and the generation of Langmuir circulations.

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