Abstract

The exchange of momentum and radiation fluxes plays a vital role at the interface of atmosphere and ocean. In the present study an attempt has been made to develop a flux coupling algorithm for coupling atmosphere and ocean models as a single model system. The developed coupler has been used for the Kalpakkam region located in the east coast of India as a case study to understand the coastal processes and effect of thermal water pollution on coastal processes due to the establishment of nuclear power plants. The annual and seasonal variation of air temperature, wind speed, sea surface temperature and radiation fluxes; latent and sensible heat fluxes over the Kalpakkam region for a period of five years (2007 - July 2011) has been observed with available OAFlux data. During this period increasing trend of dynamical and thermodynamical variables has been observed. The Weather Research and Forecast (WRF) model has been configured and used to simulate atmospheric parameters over the Kalpakkam region. Thereafter the developed coupler has been used to extract the wind components and radiation parameters from the WRF model output, wherein the wind and radiation stresses were computed using bulk aerodynamic formulations. The heat fluxes show a positive correlation with the temperature gradient and wind speed. The robustness of
developed algorithm was assessed through numerical experiments and statistical methods. The model simulated output and coupler estimated variable of wind speed and radiation fluxes have been validated with the available observations. The model results showed the overestimation of radiation fluxes than the observational data. The overestimated fluxes have been added as a correction factor in the coupler to maintain the constant variation in the fluxes. The comparison ascertains the fact that model and coupler performance is satisfactory in comparison with observational data.

References


Index Terms

Computer Science
Applied Mathematics
Keywords
Radiative fluxes  momentum fluxes  flux coupling algorithm  WRF model  coupled models  modeling system.