ABSTRACT

Surface data during premonsoon season for a period of 5 years (1987-1991) are examined at an inland station Kharagpur ($22^{0}21'N$, $87^{0}19'E$) over south West Bengal to confirm sea breeze (SB) activity as a result of land-sea temperature contrast. After SB activity is identified, surface layer fluxes, turbulent kinetic energy and Richardson number are calculated using tower observations, to investigate any prior signature to onset of SB and its possible impact on surface layer characteristics. A mesoscale numerical model is used to investigate the importance of differential temperature gradient and to identify various factors affecting SB circulation over the region. Radar, pilot balloon and surface observations are used to verify the model results and to improve our understanding regarding various processes and possible connection with the thunderstorm activity which occur over the region.

The normal flow during premonsoon period is characterized by predominant southerlies over the region. However, SB activity is quite significant eventhough it is influenced by large scale situation. Changing forenoon surface wind as a result of the influence of large scale situation makes the onset clear. In such cases, a drastic change in meteorological parameters influence the surface layer considerably. Surface layer becomes near stable even before sunset where the residual turbulent kinetic energy is mainly due to the contribution of mechanical production. An abnormal variation of turbulent kinetic energy along with the surface fluxes before onset on weak or relatively strong SB with unclear onset indicates a prior signature.

Model simulation with homogeneous land surface

characteristics over the domain reveal some of the important features regarding SB circulation over the region. The importance of land-sea contrast is emphasized. The mesoscale pressure gradient thus created is enough to produce SB, which can move to inland station Kharagpur and beyond even with moderate initial offshore wind. However, initial observed onshore flow allows to set early at inland and topography added extra speed on it. The flow would have been SSW-ly as a result of local turning due to coriolis force. But the curvature of the coastline makes it SSE-ly or SE-ly at Kharagpur. In addition, observed upper wind and wind discontinuity at low level are important regarding significant vertical velocity development, which is in agreement with the observed cloud coverage.

Inclusion of heterogeneous land surface characteristics over the domain identified an important problem concerning regional climate change. The reduced intensity of SB circulation due to wet soil adjacent to sea surface, which is depicted in two dimensional studies, may have significant impact in near future.