The surface layer fluxes and stability are found to vary during various seasons. Higher momentum flux is noticed during the pre-monsoon and onset periods than post-monsoon season. This is as a result of the high-speed winds during the pre-monsoon and monsoon season. Sensible heat flux is high during certain days in the pre-monsoon months because of higher temperature during the period. By the onset the increase in wind speed causes the increase in sensible heat flux. During the post-monsoon months the sensible heat flux increases from October to December due to increase in surface temperature after the monsoon activity. The latent heat flux is found to be higher during onset because of the increase in evaporation due to high-speed winds. In the post-monsoon period higher latent heat flux is noticed during October due to higher winds and rainfall in association with the withdrawal of monsoon. After that the latent heat flux decreases and turns downward due to the reduced availability of moisture at the surface for evaporation. The surface stability shows a tendency of the atmosphere to become less unstable during onset from highly unstable situation during pre-monsoon and it tends to become highly unstable after the withdrawal of monsoon. Less unstable or near neutral situation during monsoon and withdrawal period is due to radiative cooling of the surface because of overcast sky and moist winds during the period. This indicates the influence of monsoon activity on the surface layer characteristics.

The occurrence of mesoscale and synoptic scale disturbances and the surface layer characteristics are found to have close linkage. The atmosphere becomes highly unstable prior to the occurrence of the disturbances. Due to the increased instability the surface turbulence also increases. High surface fluxes are noticed during the occurrence of these disturbances due to the increase in turbulence. The impact of synoptic scale disturbance on the surface layer characteristics is not only near the region of its formation and along its track but also on the entire subcontinent.
The drag coefficient computed indirectly also shows variation during various seasons. Higher drag coefficient occurs during pre-monsoon and shows a gradual decrease by monsoon onset and it increases gradually during the post-monsoon after the withdrawal of monsoon. The decrease in drag coefficient during monsoon is due to the increase in wind speed. The drag is found to decrease with increasing wind speed. It is also found to decrease when the atmosphere becomes less unstable or near neutral. Steep increase in drag coefficient occurs when the wind speed is less then 4ms\(^{-1}\) at the west coast stations. The drag coefficient during less unstable or near neutral condition are much less than that given by Garratt (1977).

The surface fluxes are higher during most of the days during the northeast monsoon period over Bay of Bengal during the BOBMEX Pilot experiment. This is due to the increase in turbulence over the region due to the depression, low-pressure area and deep convective activity during the period. Though the fluxes computed by various methods shows more or less similar trend the magnitudes are not same. The eddy correlation method using fast response data from sensors which gives data at 0.1s interval will be more accurate than the other two methods. The computed drag coefficient gives a higher value than that used in the bulk aerodynamic method. Also the drag was higher during the occurrence of disturbances and deep convection. The drag coefficient over the marine boundary layer is much less than that over the land boundary layer.

The thermodynamic structure of the atmosphere shows variation during various seasons. The onset of monsoon causes lowering of the Lifting Condensation Level, which was at higher levels during pre-monsoon. During monsoon due to moist winds and rainfall the atmosphere becomes more humid therefore a slight lifting of air parcel will leads to saturation and then condensation. After the monsoon during post-monsoon the LCL is found at higher levels. That is the atmosphere will be less humid during post-monsoon so that an air parcel needs to be lifted to higher levels for saturation and condensation. During the pre-monsoon and onset period CAPE was higher than CINE which indicates that the atmospheric condition is favourable for supply of energy to an air parcel for initiation of convection. During post-monsoon CINE was high in most of the days, which indicates highly stable lower atmosphere. During the occurrence of thunderstorms high CAPE and low CINE values are noticed. This indicates that lesser
amount of energy is required for the air parcel to reach LFC after which the parcel rises on its own and high amount of energy is supplied to the parcel by the atmosphere. This leads to convection and thunderstorm occurs.

The wind structure during monsoon onset shows an increase in depth and speed of westerly wind. The westerly wind reaches even up to 250hPa or above at the time of onset. As the monsoon advance over the country the surface easterly winds are pushed up the westerlies and they reach even upto 250 hPa prior to onset or on the onset day of monsoon at each station. The westerly speed is also found to increase on the onset day. By the onset the precipitable water content over Arabian Sea and adjacent region increases. The increase is significant over the oceanic region especially the Arabian Sea region through which the monsoon current flows towards the subcontinent.

Therefore in general the boundary layer and thermodynamic characteristics over the subcontinent varies during different seasons and during the occurrence of disturbances. This study gives a better understanding of the boundary layer and thermodynamic structure and their variations during various periods, which can be used in the modelling studies.