Observation and modelling of the influence of synoptic scale features on the sea / land breeze circulation during Southwest and Northeast monsoon seasons over Northeast coastal station in Peninsular Malaysia

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Sea/land breeze is formed by the differential heating between land and sea surfaces. It plays a vital role in the local circulation features of the coastal region. The micro scale aspects of the sea/land breeze circulation are analyzed using the high resolution radiosonde and AWS data over the northeast coastal station, Bachok. The sea breeze over the station is easterly in direction. The study utilizes wind, temperature and humidity data from the micrometeorological tower installed at Bachok, with slow response sensors. The onset characteristics of sea breeze during different seasons as well as the sea/land breeze onsets have been investigated for cloudy, overcast and non-cloudy days using the satellite imageries and AWS zonal wind / wind direction data. Time-height intensity diagrams of air temperature, relative humidity zonal wind etc were analyzed for the identification of sea/land breeze onset and circulation characteristics, on spatial and temporal basis. The high resolution radiosonde profiles made available during monsoon season and northeast monsoon season in Bachok Marine Research Station (BMRS) are utilized for the study. It is observed that the onset of sea breeze occurs at about 9.00 am (local time), with easterlies prevailing up to about 960 hPa in the lower boundary layer. The synoptic scale monsoon flow is well established above the sea breeze cell, which intrudes into the sea breeze layer during early morning or in the late night hours. The intrusion of synoptic scale monsoon flow into the local scale sea breeze circulation is analyzed in detail, giving emphasis to the onset and flow characteristics of sea breeze-land breeze circulation over the northeast coastal station. A WRF model simulation is carried out to understand the spatial features of the Sea breeze over Bachok and it is found that WRF can well simulate the sea breeze circulation.