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A mathematical model to forecast surface winds over Sri Lanka

The wind field plays a major role in weather over Sri Lanka. Topography of the island modifies these wind flows both in direction and speed, to produce effects on different scales. This feature is observed to be dominant during the inter-monsoon periods (spells between Southwest and Northeast monsoon periods) where the prevailing wind tends to be calm and having no definite direction.

The surface wind model (SWM) is a single-level primitive equation model, in terrain following the sigma (σ) coordinate system that predicts the winds at the anemometer level. Physical processes are incorporated and suitably parameterized in order to render the model more accurate. The SWM is calibrated against observed data (hourly wind data at selected locations) taken during the inter monsoon periods in the years 1999 and 2000. The SWM has potential to be used as a forecasting tool in day-to-day weather forecasting.

The SWM is applied to Sri Lanka area (79 ^{o} E to 83 ^{o} E and 5 ^{o} N to 11 ^{o} N) to simulate surface winds at the anemometer level during the inter-monsoon periods. The SWM well simulates thermally driven meso-scale circulations such as Sea Breeze, Land Beeze, Anabatic (upslope) and katabatic (downslope) winds. During the warm afternoon, maximum wind speed of the sea breeze front is reported to be about 7 ms^{-1} (~ 14 Kts) near the shoreline. Penetration of the sea breeze is about 35 Km from the shoreline to wards the is about 35 km from the shoreline towards the land. A weak Anabatic wind flow is seen around the central hills of the island. The results land. A weak Anabatic wind flow is seen around the central hills of the island. The results conform well to the real observations. Nocturnal winds are comparatively a little stronger than the real situation. This effect has already been minimized during the model calibration.