Predictive model for wind fields in Sri Lanka

Wind maps are useful to estimate the wind energy potential, the impact of wind on crops and buildings, transport of pollutants and for meteorological studies. A mass-consistent wind model has been developed for Sri Lanka by modifying the ATHIN software developed by the National Observatory of Athens in Greece.

The region between $5^{o}5'$ to $9^{o}5'$ N latitude and $79^{o}4$ to $82^{o}0'$ E longitude was chosen as the computational domain to cover Sri Lanka. This 475 x 270 km region was co6 km and calculations were carried out in 26 vertical layers. The model is initialized with the radiosonde measurements of the Department of Meteorology in Colombo. The sea breeze and mountain thermal effects have not been incorporated in the model as yet.

Predictions for January are reported here as an example. The highest wind speeds are found far from the mountains. Wind is uniform in the North-Easterly direction as expected during January and the variation at surface level is qualitatively similar to observations. The wind directions are altered in the mountainous regions with wind being channeled through mountain passes. Maps of wind fields at altitudes as high as 5 km above sea level show that the Sri Lankan mountains significantly modify these wind fields.

This model has some shortcomings. The land surface friction has been estimated heuristically. Wind speeds in the lee of the mountain are slightly overestimated. The cumulative drag due to traverse over land has to be adequately captured. In spite of these shortcomings, this model is an effective tool to extrapolate and obtain hitherto unavailable wind fields from available measurements.