Estimation of horizontal wind gradient using 205 MHz ST radar

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Horizontal wind is estimated from VHF wind profiler radars by sampling at three orthogonal directions under the assumption that the wind is uniform over an area. This assumption is always not valid and there may be strong horizontal wind gradients at locations. Horizontal wind gradients occurring on a scale of up to 10 km can create serious difficulties to aircraft, especially in the landing and take off mode. It is also important to know vertical and horizontal wind gradients to study the evolution of atmospheric processes and kinematics associated with it. Wind profilers operating in Doppler Beam Swinging (DBS) mode provide the atmospheric parameters along the beam directions and wind components are obtained by measuring the radial wind components at different off-zenith directions. For the large off-zenith angle, the radar volume probed is typically away from the zenith beam by several hundred meters to a few kilometers. The average wind information provided by a wind profiler need not be completely reliable and precise to investigate the dynamics of winds and associated weather processes. In this work, we demonstrate the potential of multi-angle beam steering technique of the state of the art ST wind profiler radar operating at 205 MHz installed at the Cochin University of Science and Technology, Cochin (10.04N, 76.33E) for estimating the gradient of horizontal wind. Large horizontal gradient is observed in the zonal wind estimated using this technique.