

Aspect sensitivity revisited from the perspective of improving wind-profile data quality

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The term aspect sensitivity principally refers to the zenith angle dependence of lower-VHF radar return power. It can also refer to an azimuth angle dependence. The Aberystwyth MST radar is a Doppler Beam Swinging instrument. It uses a variation on the 5-beam method for wind-profiling purposes. Observations are principally made in the vertical direction and at an off-vertical zenith angle of 6.0° in 4 orthogonal azimuths. Observations are additionally made at a zenith angle of 4.2° in a single azimuth. The sole purpose of the latter is for determining the effective zenith angle of the 6.0° beams, which decreases as aspect sensitivity increases. Wind speeds will be systematically underestimated unless a compensation factor is applied. Nevertheless, it has been found that the current way in which this factor is determined increases the random measurement error. This is partly because the azimuth angle dependence at a zenith angle of 4.2° has not been taken into account. It is also because the small difference in zenith angle between 4.2° and 6.0° makes the compensation factor calculation highly sensitive to small variations in signal powers. Using a secondary zenith angle of 0.0° rather than 4.2° avoids both of these problems. This presentation will make use of a special dataset, which includes observations made in all of the 17 available beam pointing directions for the Aberystwyth MST radar.