

Effects of non-unity refractive index on SuperDARN velocity estimates

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Recent studies revealed that ionospheric ExB drift velocity estimates derived from SuperDARN Doppler shift data are on average by 25% smaller than those measured simultaneously by DMSP satellites positioned on the same field line. The 500-km altitude shift from the effective scattering volume to the satellite position leads to an 11-% increase in the E/B ratio, but this only accounts for less than a half of the observed effect. While the SuperDARN data processing algorithms assume that HF scatter occurs in a free space, our theoretical calculations and numerical ray tracing show that accounting for the non-unity refractive index in the ionosphere can qualitatively and quantitatively explain the remainder of the discrepancy between two instruments.