The non-Gaussian nature of ionospheric vorticity fluctuations

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Measurements of ionospheric plasma vorticity are a proxy for the field-aligned currents (FACs) that dynamically couple the magnetosphere to the ionosphere. Hence, studying spatiotemporal variations of ionospheric vorticity will help to understand this coupling. Using a new technique to determine ionospheric vorticity from line-of-sight velocity measurements made by the SuperDARN HF radars, we have determined statistical distributions of vorticity using 6 years (2000-2005) of measurements from 2 SuperDARN radars in the northern hemisphere with overlapping fields of view. The measured vorticity distributions are distinctly non-Gaussian, with heavy tails. By taking the moments of these distributions we have determined that there are distinct variations of the distributions with both AACGM latitude and the measurement scale size. These two factors can be deconvolved to study the scaling of vorticity, and hence of field-aligned currents, in the polar ionosphere.