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The implications of simple estimates of the 2D outerscale based on measurements of magnetic islands for the modulation of galactic cosmic ray electrons

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The behaviour of the 2D turbulence power spectrum at the lowest wavenumbers has a significant effect on the perpendicular diffusion coefficients of charged particles in the heliosphere derived from first principles, and thus on the modelled transport of cosmic rays and solar energetic particles. The lengthscale at which the energy-containing range begins, as opposed to that at which the inertial range commences, is of particular interest. This 2D outerscale has, however, never before been directly observed. Recently, direct measurements of magnetic islands in the solar wind have been reported by various authors. Assuming that these may provide an estimate of the 2D ultrascale, the direct calculation of the 2D outerscale becomes possible, should an observationally-motivated form for the 2D turbulence power spectrum be employed. This study presents the results of such a calculation, and provides comparisons of these with previous estimates of the 2D outerscale. Furthermore, the sensitivity of galactic cosmic ray electron intensities calculated using a 3D ab initio cosmic ray modulation model to this quantity is demonstrated.