The Drift Coefficient for Energetic Particles in a Turbulent Plasma

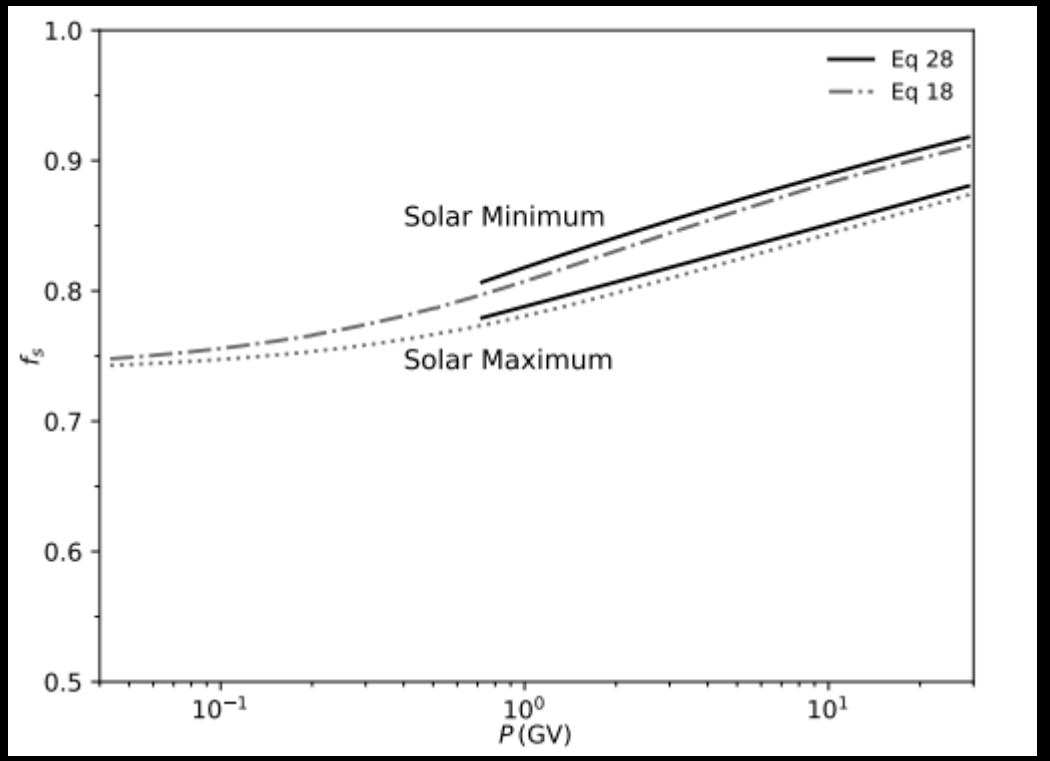
Science Question:
How does turbulence modify the classic drift coefficient?

Method/Approach:
We revisit Stawicki's quasilinear model by incorporating higher-order terms and discuss extensively the properties of the general form of the drift coefficient.

Results and Implications:
We propose a new parametric form of the suppression factor (fs), defined as the ratio of the net and standard drift coefficients. The new parameterized form of fs depends on the logarithm of particle rigidity, which differs from some existing empirical models.We also find that suppression occurs at a similar level during the solar minimum (2008/1–2010/12) and solar maximum (2013/1–2015/12).

$$f_s = 1 - \frac{\pi S_{2D}(k_b) k_b}{B^2} \ln\left(\frac{1}{P}\frac{Bc}{k_l}\right) = a + b \ln(P), \qquad (31)$$

where $a = 1 + \pi S_{2D}(k_b) k_b / B^2 \ln(k_l/(Bc))$ and $b = \pi S_{2D}(k_b) k_b / B^2$.



The suppression factor fs as a function of particle rigidity during the solar minimum and solar maximum. The solid lines are from analytical formula and the dashed–dotted lines represent the numerical result.

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