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Stochastic Heating and Diffusion in the Near-Sun Solar Wind[1]
KRISTOPHER KLEIN, BENJAMIN CHANDRAN, Univ of New Hampshire, SOFIANE BOUROUAINE, Univ of Iowa — A plethora of mechanisms have been proposed to explain the observed temperature profiles of solar wind plasma in the near-Sun environment. In this work, we study the efficacy of one mechanism, stochastic ion heating, in reproducing these observations. We find, through evaluation of the gyroaveraged kinetic equation with an additional stochastic diffusion term using a fast solar wind model for magnetic and velocity magnitudes, that stochastic heating is capable of producing realistic perpendicular temperature profiles. Additionally, we calculate the evolution of the proton velocity distribution and show that it significantly deviates from a Maxwellian. In its core, the distribution is significantly flattened, while the tails are significantly steeper when compared to a Maxwellian fit to the distribution. We can test for the presence of stochastic heating by looking for these signatures in the Helios data set as well as in upcoming observations from Solar Probe Plus and Solar Orbiter.

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Kristopher Klein
Univ of New Hampshire

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