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Perpendicular Ion Heating by Low-Frequency Alfven-Wave Turbulence in the Solar Wind BENJAMIN CHANDRAN, University of New Hampshire, BO LI, BARRETT ROGERS, Dartmouth College, ELIOT QUATAERT, University of California, Berkeley, KAI GERMASCHEWSKI, University of New Hampshire — A critical unsolved problem in the study of solar wind turbulence is to determine whether low-frequency Alfven-wave (AW) and kinetic-Alfven-wave (KAW) turbulence can explain the perpendicular ion heating that is observed in coronal holes and low-beta fast-wind streams. In linear wave theory, low-frequency AWs and KAWs are incapable of causing perpendicular ion heating. On the other hand, a number of observations suggest that low-frequency AW/KAW turbulence is the primary heating mechanism in the solar wind. This presentation describes recent work that offers a possible solution to this long-standing problem, and which extends previous studies of "stochastic heating." An analytic expression for the stochastic heating rate in low-beta plasmas is derived and tested against simulations of test particles interacting with a spectrum of randomly phased AWs and KAWs. This expression is then used in conjunction with an observationally constrained model of solar-wind turbulence to obtain ion temperature profiles, which agree well with observations from the Ultraviolet Coronagraph Spectrometer.

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