



## **Multi-Species Measurements of the Firehose and Mirror Instability Thresholds**

Christopher Chen (1,2), Lorenzo Matteini (1), Alex Schekochihin (3), Mike Stevens (4), Chadi Salem (2), Ben Maruca (2), Matthew Kunz (5), and Stuart Bale (2)

(1) Department of Physics, Imperial College London, London SW7 2AZ, UK, (2) Space Sciences Laboratory, University of California, Berkeley, California 94720, USA, (3) Rudolf Peierls Centre for Theoretical Physics, University of Oxford, Oxford OX1 3NP, UK, (4) Harvard-Smithsonian Center for Astrophysics, Cambridge, Massachusetts 02138, USA, (5) Department of Astrophysical Sciences, Princeton University, Princeton, New Jersey 08544, USA

Recent investigations have examined how various temperature anisotropy and drift instabilities in different space environments constrain plasma parameters such as temperature anisotropy, beta, and differential flow. These investigations have tended to look at each species separately, and how the distribution of its parameters is separately constrained by the resonant kinetic instability arising from free energy in its own distribution. In reality, however, plasma stability depends on all species simultaneously. Here, we present an analysis which combines all major species (protons, alphas, electrons) together, and considers both anisotropies and drifts on an equal footing. A large data set from the 3DP and SWE instruments on the Wind spacecraft in the solar wind was used. We have found that when all species are combined, the long-wavelength firehose and mirror thresholds appear to well-constrain the distributions. The fractional contributions of each species to the thresholds were determined.