FIRST OBSERVATION LINKING THE ORIGIN OF PLASMASPHERIC HISS TO DISCRETE CHORUS EMISSIONS

JACOB BORTNIK[1], Wen Li,[1] Richard M. Thorne,[1] Vassilis Angelopoulos,[2] Chris Cully,[3] John Bonnell,[4] Olivier Le Contel,[5] Alain Roux,[5]
[1] Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles, California, 90095, USA.
[2] Institute of Geophysics and Planetary Physics/ESS, University of California, Los Angeles, California, 90095, USA.
[3] Swedish Institute of Space Physics, Box 537, SE-751 21, Uppsala, Sweden.
[4] Space Science Laboratory, University of California, Berkeley, California, 94720, USA.
[5] Centre d'Etude des Environnements Terrestre et Planétaires, Velizy, France

For over four decades, the origin of plasmaspheric hiss remained an open problem in space physics. This naturally-occurring, incoherent, electromagnetic wave is found ubiquitously within the high-density plasmasphere and plumes, is in the frequency range of about 200 Hz to 2 kHz, and was known since the 1970's to play a dominant role in scattering energetic electrons in the inner magnetosphere, thus creating the slot-region between the inner and outer radiation-belts. Prior to 2008, there were essentially two leading theories for the origin of hiss, either being attributed to an "in situ" cyclotron instability that would amplify the background noise to observable levels, or alternatively due to lightning-generated whistlers that would propagate out into the plasmasphere and merge into an incoherent spectrum. Both theories explained certain observable features of hiss, and both theories suffered from significant difficulties. However, a recent theory tied the origin of hiss to a seemingly different wave in the outer magnetosphere called chorus, but this theory was difficult to test due to a very unique set of observational requirements. In this presentation, we report on the first observational verification of the theory, made with the new THEMIS mission, we compare to theoretical predictions, and discuss implications for radiation-belt research.

plasmaspheric hiss, chorus, propagation

Jacob Bortnik, jbortnik@gmail.com, Department of Atmospheric and Oceanic Sciences, University of California in Los Angeles, CA 90095, USA. Fax: +1-310-206-5219, Tel: +1-310-825-1659.