Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07029, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07029
EGU General Assembly 2008

Observation of small scale plasma structures and ion heating in deep equatorial plasma bubbles during the November 2004 magnetic storm.

J.J. Berthelier (1), M. Malingre (1), J. Jasperse (2), R. Pfaff (3) and E. Seran (1).

(1) CETP/IPSL, 4 avenue de Neptune, 94100 Saint-Maur, France.

(2) AFRL, Hanscom Field, Massachussets, MA 01731, USA.

(3) NASA/GSFC, Greenbelt, Maryland MD20771, USA.

During the November 2004 magnetic storm, DEMETER crossed deep and extended plasma depletions in the equatorial ionosphere that were characterized by strong variations in the ion composition with NO+ reaching about 40% of the O+ density. In one occasion, a very narrow plasma enhancement was detected in the middle of the depletion simultaneous with the disappearance of NO+ indicating that the satellite was crossing a plasma bubble in the process of bifurcation. Inside the plasma depletions small scale plasma structures with typical dimensions of a few tens of metres and density decrease of up to 15% the ambient density. These ion density structures were observed in a period when an intense lower-hybrid turbulence triggered by electromagnetic whistlers propagating from thunderstorms in the atmosphere below the satellite evolved into solitary structures with amplitudes from 10 to 20 mV/m. Several of these solitary structures are coincident with the small scale ion density decreases, in good agreement with models that predict that solitary structures may result from the interaction of lower-hybrid turbulence with plasma irregularities with typical dimensions and density drop-out consistent with our observations. In addition to these small scale plasma features, the detailed analysis of the retarding potential analyzer data have revealed a phenomenon that was totally unexpected along equatorial field lines. Consecutive to the occurrence of the lower-hybrid turbulence and of solitary structures, a super-thermal tail develops in the ion population characterized by a tem-

perature of a few eV and a density of a few percent the ambient thermal ion density. Since the temperature of the thermal ion population is unaffected, this super-thermal ion tail may result from the heating of ambient ions by the lower-hybrid waves in the solitary structures.