

## Multi-fluid model for driven ion-acoustic waves on the auroral field lines

# Gurbax S. Lakhina[1]; R. V. Reddy[2]; S. V. Singh[2]; R. Bharuthram[3]

[1] RISH, Kyoto Univ; [2] IIG; [3] University of KwaZulu-Natal

Nonlinear electrostatic spiky structures associated with ion cyclotron waves have been observed on the auroral field lines by Polar and FAST spacecraft. A multi-fluid model consisting of electrons, protons (stationary or beams) and oxygen ions (stationary or beam) have been developed to explain the spiky electrostatic structures on the auroral field lines. The coupled system of equations is reduced to a single nonlinear differential equation in the rest frame of the propagating wave for any direction of propagation with respect to the ambient magnetic field. The electric field of cyclotron wave (either proton or oxygen) can act as a driver to excite the ion acoustic waves. Periodic electric field structures ranging from sinusoidal to sawtooth to highly spiky wave forms are obtained by changing the driving field at the boundary. The results from the model are compared with the recent observations.