

NONLINEAR STRUCTURES UPSTREAM OF THE BOW SHOCK

G. K. Parks¹, Z. W. Yang², Y. Liu², E. S. Lee³, S. Y. Fu⁴, M. McCarthy⁵, M. Goldstein⁶

¹*Space Sciences Laboratory, UC Berkeley, Berkeley, CA*, ²*National Space Science Center, Beijing, China*, ³*Kyung Hee University, Suwon, Korea*,
⁴*Peking University, Beijing, China*, ⁵*University of Washington, Seattle, WA*, ⁶*NASA, GSFC, Greenbelt, MD*

The nonlinear structures that occur in the upstream region of Earth's bow shock include Density holes (DH), Hot Flow Anomalies (HFA) and Short Large Amplitude Magnetic Structures (SLAMS). These nonlinear structures are transient and consist of a steepened edge that resembles a shock and a hole where the density is depleted. These structures, which can be as short as 4s (spin period of the spacecraft), are seen only when back-streaming particles are present. But not all back-streaming particles produce the structures. The SW inside the density depleted region is often field-aligned and one or more components of the magnetic field change sign indicating interplanetary current sheets are involved. The physical mechanisms for producing the structures are not known but preliminary simulation results suggest that the non-linear structures could result from the interaction of the current sheet and the bow shock.