Particle acceleration by transient structures around Earth’s bow shock

Terry Zixu Liu\textsuperscript{1,2}, Vassilis Angelopoulos\textsuperscript{3}, Heli Hietala\textsuperscript{3,4,5}, San Lu\textsuperscript{3}, and Drew Turner\textsuperscript{6}

\textsuperscript{1}University Corporation for Atmospheric Research, United States of America (terryliuzixu@ucla.edu)
\textsuperscript{2}University of Alaska, Fairbanks, United States of America
\textsuperscript{3}University of California, Los Angeles, United States of America
\textsuperscript{4}Imperial College London, UK
\textsuperscript{5}University of Turku, Finland
\textsuperscript{6}Johns Hopkins University Applied Physics Laboratory, United States of America

Upstream of Earth’s bow shock, the foreshock is filled with particles that have been reflected at the bow shock and are streaming away from it. Interaction of these particles with solar wind particles and discontinuities within this region can cause foreshock transients to form. Downstream of Earth’s bow shock, localized magnetosheath jets with high dynamic pressure are frequently observed. When such a fast magnetosheath jet compresses the ambient magnetosheath plasma, an earthward compressional bow wave/shock can form. Here we present that foreshock transients and magnetosheath jets can accelerate particles through shock drift acceleration, Fermi acceleration, and the betatron acceleration. Foreshock transients and magnetosheath jets therefore can increase the particle acceleration efficiency of the parent shock by providing additional acceleration. The shock environment relevant for particle acceleration is not just the shock itself, but also the nonlinear transient structures both upstream and downstream of it.