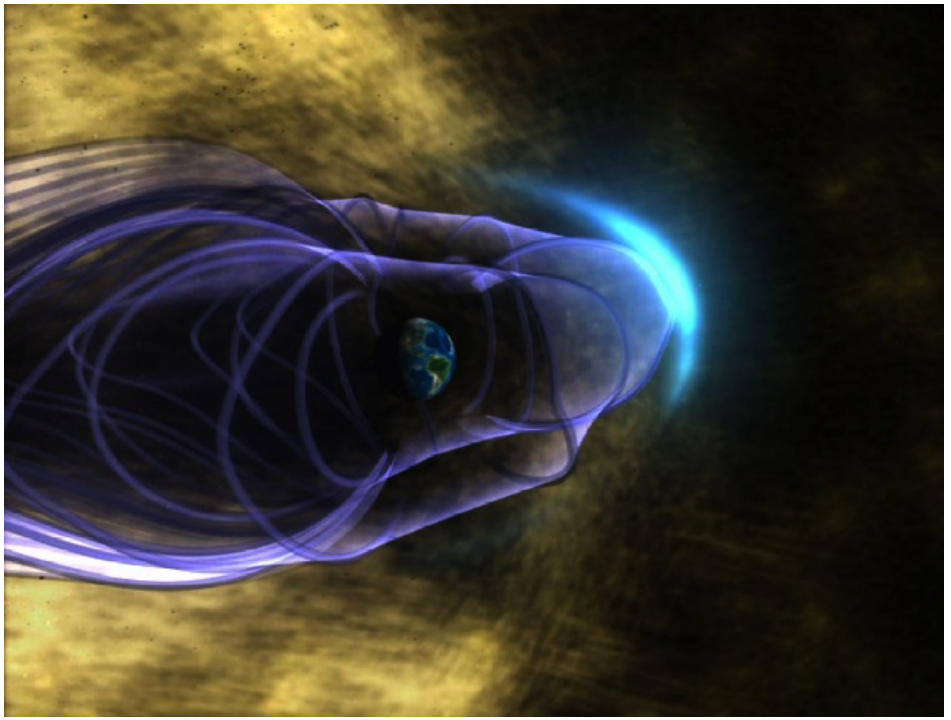
When Solar Electrons Reach Earth's Magnetic Shield

What is the science question? How are the solar-wind electrons heated when they reach the leading edge of Earth's magnetic shield?

What were your findings? The electron stream is accelerated, upon interacting with Earth's magnetic shield, to such high speeds that the streaming breaks down and is transformed into heat.

What was the impact? The discovery reveals a never-before-seen picture about how solar-wind electrons are heated when reaching Earth's magnetic shield.



Why does it matter to non-scientists? Understanding how Earth's magnetic shield transforms the direct streaming energy to randomized heat enables more accurate space-weather forecasts. Fundamentally, scientists need to resolve shock physics to understand energetic particles in the universe, and now we have the observations that will support new theoretical work. This has broad applicability to the understanding of shocks and particle acceleration in solar flares and supernovae, as well as astrophysics in general.

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Chen, L.-J., S. Wang, L. B. Wilson III, et al. (2018), Electron bulk acceleration and thermalization at Earth's quasiperpendicular bow shock, *Phys. Rev. Lett.*, 120, 225101, doi:10.1103/PhysRevLett.120.225101.