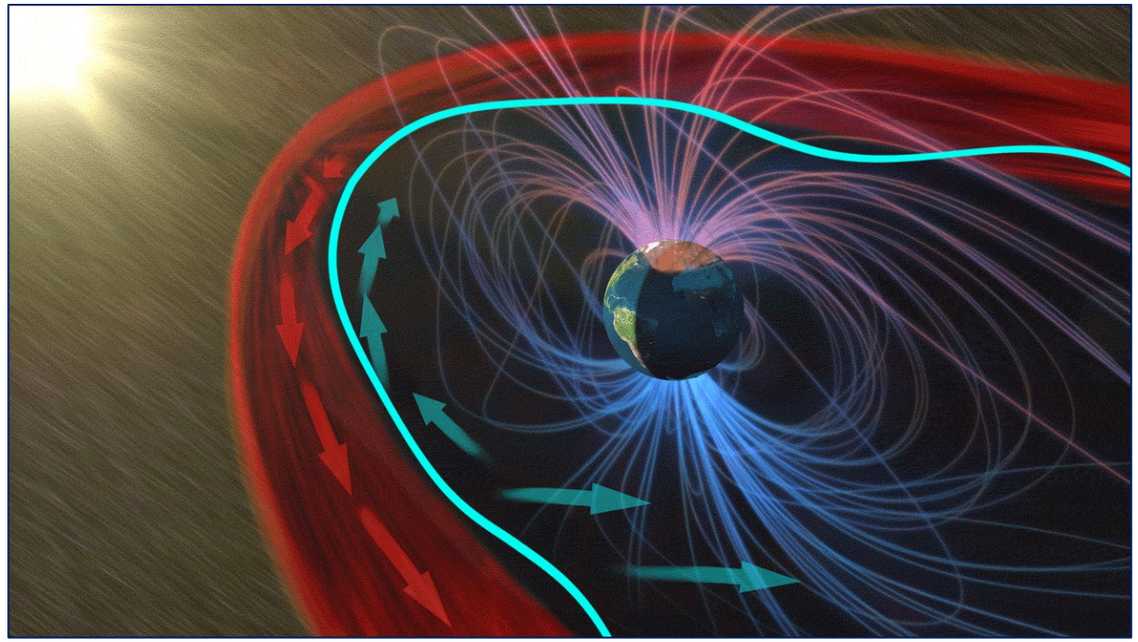
Standing Waves at Edge of Earth's Magnetic Bubble

- A new study reveals that waves in our magnetosphere don't behave the way we expected. Ripples in the plasma (hot, ionized gas) around the earth don't always travel in the direction of the solar wind, but instead form "standing waves" along the border of our magnetic bubble.
- Researchers found when solar wind pulses strike, the waves that form not only race back and forth between Earth's magnetic poles and the front of the magnetosphere, but also travel against the solar wind.
- This finding has wide ramifications: standing waves in plasma occur elsewhere in the universe, from the magnetospheres of other planets to the peripheries of black holes. Studying these waves close to home can help scientists understand many of these distant objects.
- This work uses a combination of models and observations from NASA's Time History of Events and Macroscale Interactions during Substorms (THEMIS) mission. The researchers were from NASA Goddard Heliophysics Science Division, Imperial College London, Space Science Institute, and Austrian Academy of Sciences.



An animated illustration of magnetospheric waves, in light blue. At the front of the magnetosphere, these waves appear to be still.
Credits: Martin Archer/Emmanuel Masongsong/NASA

Archer, M.O., Hartinger, M.D., Plaschke, F. et al. Magnetopause ripples going against the flow form azimuthally stationary surface waves. Nat Commun 12, 5697 (2021). https://doi.org/10.1038/s41467-021-25923-7