Examining Ion-Scale Wave Properties in the Inner Heliosphere Observed by Parker Solar Probe

Abstract:
One of the objectives of the Parker Solar Probe mission is to understand how the solar wind is heated and accelerated. The plasma in the inner heliosphere is considered to be collisionless due to its low density and, for this reason, the primary way for particles to interact with each other is through wave-particle interactions. Past research has shown that energy can be transferred to ions if they are in a resonant configuration with waves, and previous observations have demonstrated that the solar wind cools more slowly than expected. In this project, we study left-hand polarized ion-cyclotron wave activity and examine its energy transfer in the inner heliosphere. This is done by analyzing data obtained from the FIELDS and SWEAP instrument suites and identifying regions with left-handed wave power signals in the trajectory of Parker Solar Probe during its first three encounters. Increased ion-cyclotron wave power is found near the perihelia, indicating wave energy dissipation to their surroundings as they travel farther out from the Sun. Furthermore, by determining how much wave energy is transferred to the solar wind, we study how ion-cyclotron waves contribute to its heating and acceleration.

Keywords: Solar wind, Space plasmas

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