The kinetic physics of collisionless shock waves in the heliosphere

Organizers

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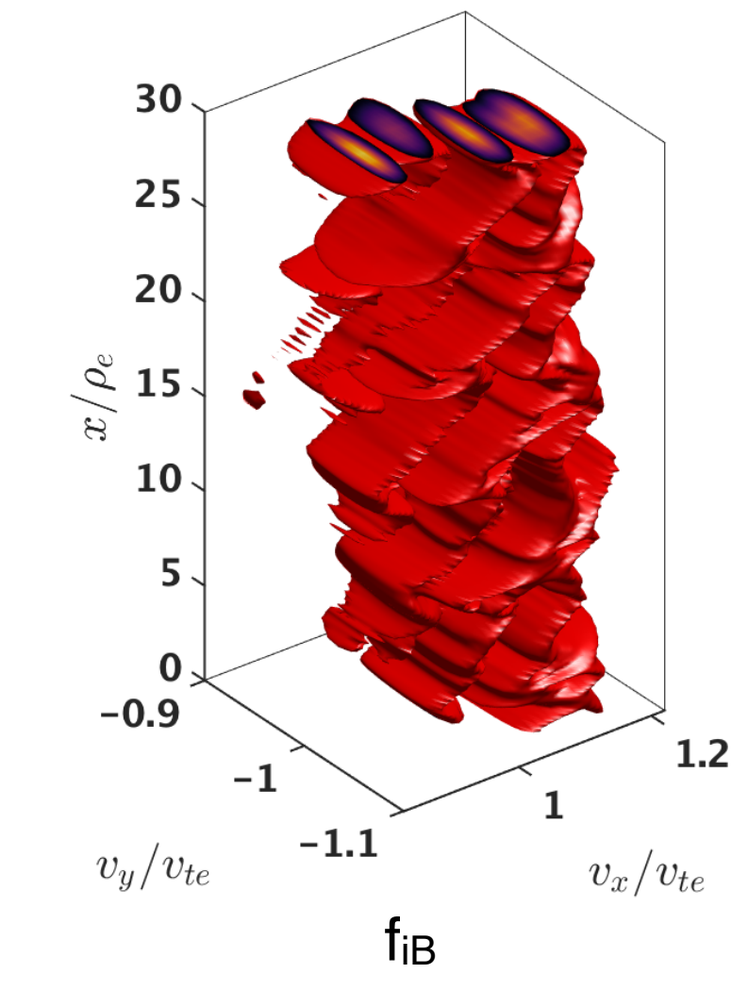

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Scene Setters

Jimmy Juno (Theory/Modeling)

Katy Goodrich (Observational)

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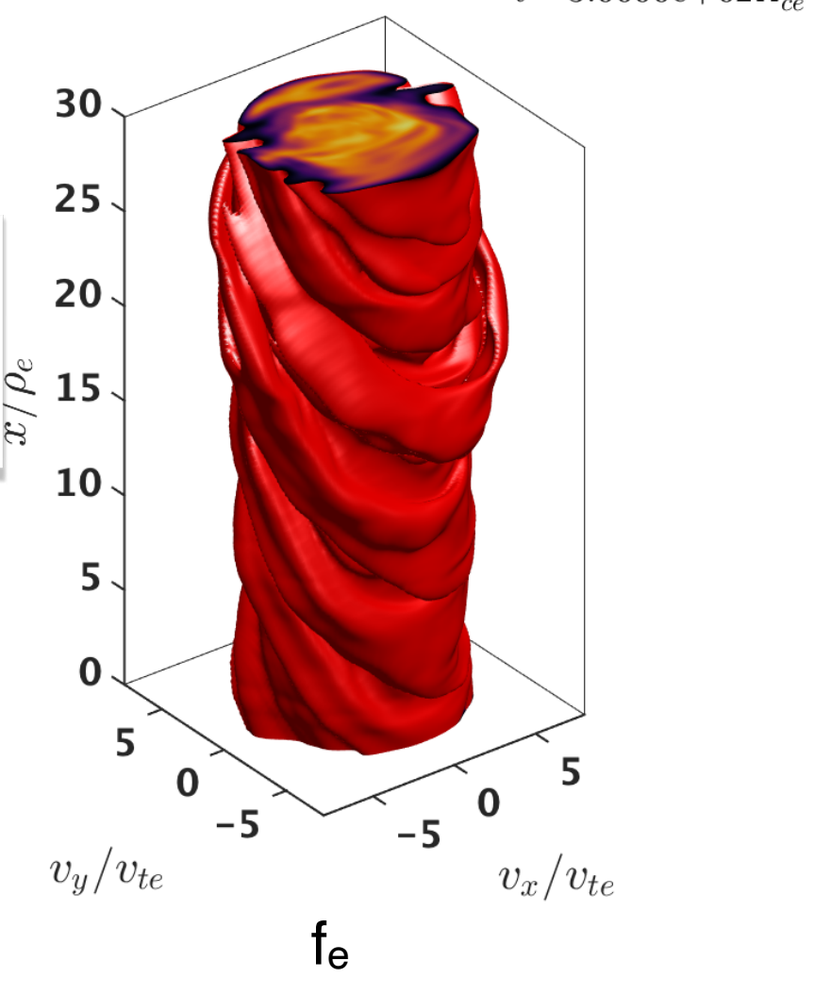

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Session Description and Questions

Shocks are a key mechanism responsible for transforming super-sonic flow energy into particle energization. However, most plasma in the heliosphere is sufficiently weakly collisional that the shocks are collisionless and must irreversibly process flow energy into thermal energy through means other than particle-particle collisions. These other processes are inherently kinetic, whether the shocks are driven by coronal mass ejections, the solar wind impinging on the Earth's magnetosphere, or at the heliospheric termination shock. Understanding these processes and how they connect the different systems separated by a collisionless shock requires a coordinated community effort combining kinetic modeling, in situ spacecraft data, and remote observations.

Science Questions

- How is energy dissipated/transferred at collisionless shocks through self-generated kinetic plasma mechanisms?
- How do these kinetic mechanisms depend on the local plasma environment throughout the heliosphere?
- How well can we address these questions with current and upcoming missions?