Research Interests and Synergies

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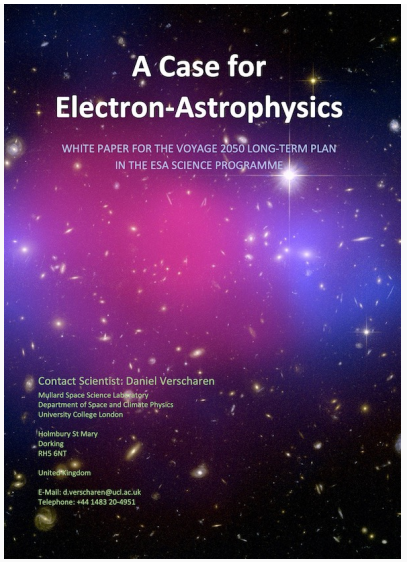
Research Interests

- Kinetic physics (mostly in the solar wind)
- Cross-scale couplings and interactions
- Plasma waves and instabilities
- Collisions in collisionless plasmas

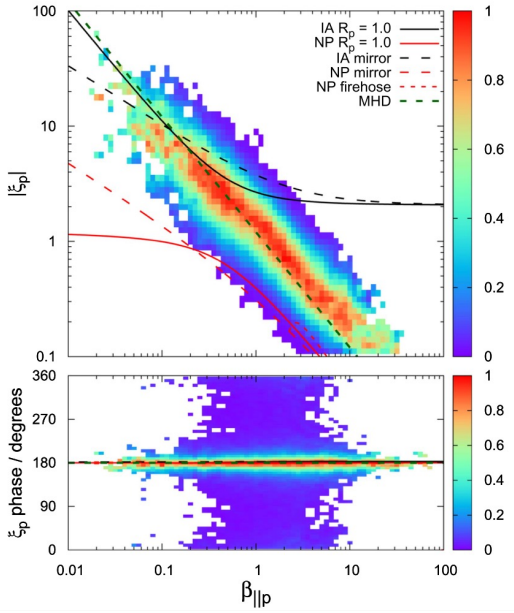


NHDS

ALPS

Approaches

- Analytical theory
- Linear Vlasov-Maxwell theory
  - NHDS
  - ALPS
- In-situ spacecraft observations



UCL

(Verscharen et al., 2017)

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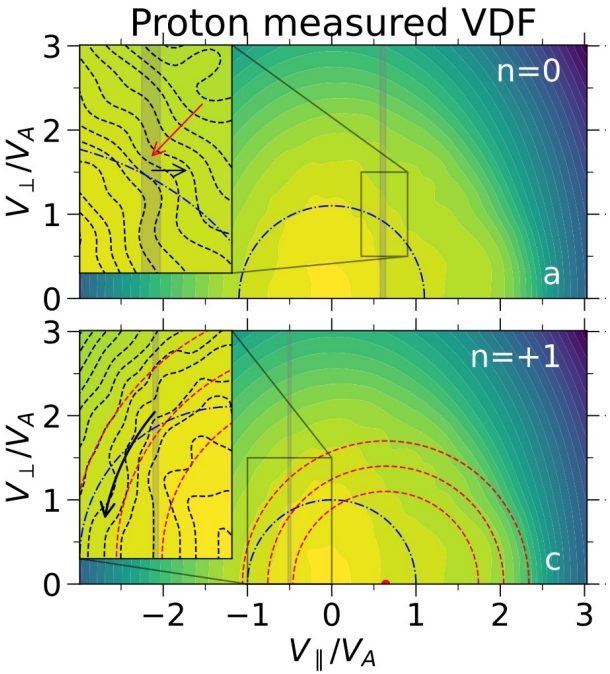
- Collisions in collisionless plasmas

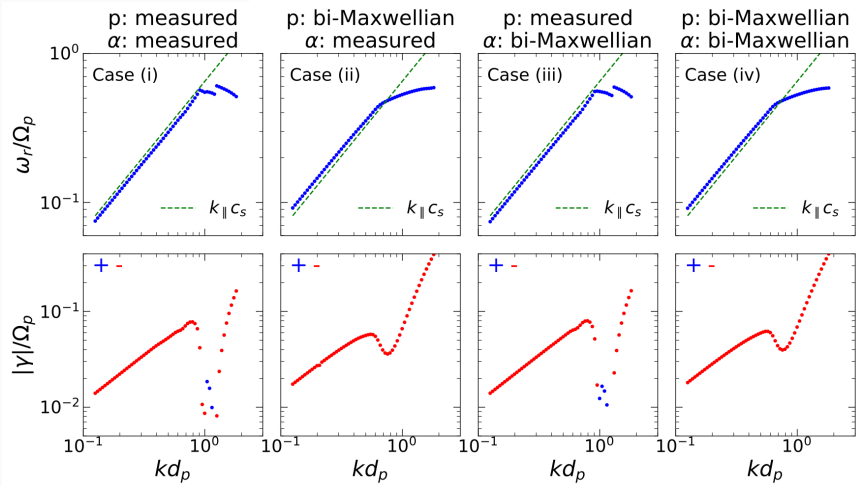
Measured distributions in the solar wind show that collisionless plasmas adjust very quickly to become transparent for ion-acoustic waves.

Ion-acoustic waves propagate without much damping even if

$$T_p \sim T_e$$

(Ran, DV, et al., 2026)





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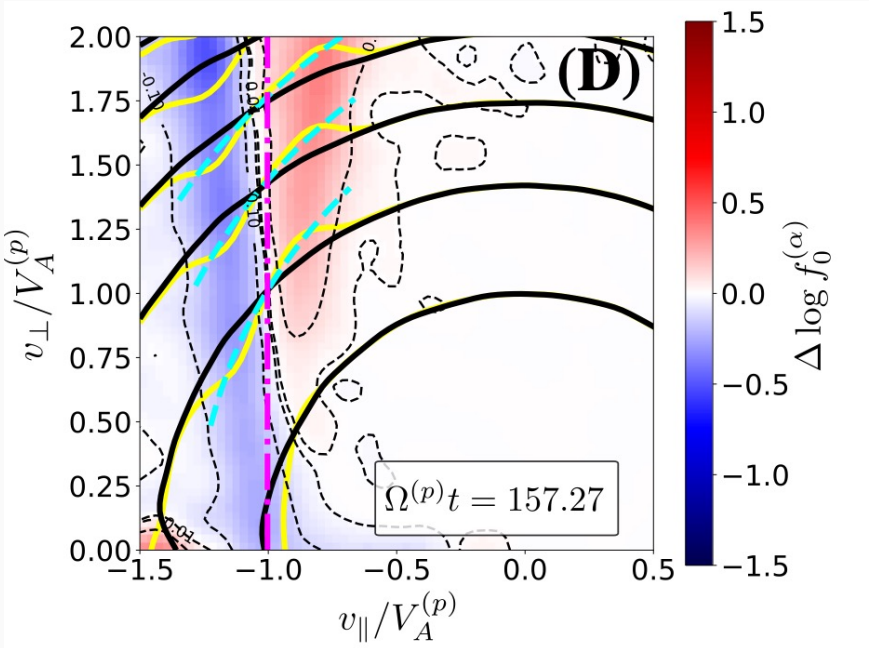
Resonant interactions between test-particles (here: alpha-particles) and ion-cyclotron waves.

Quasilinear diffusion leads to wave-particle equilibrium.

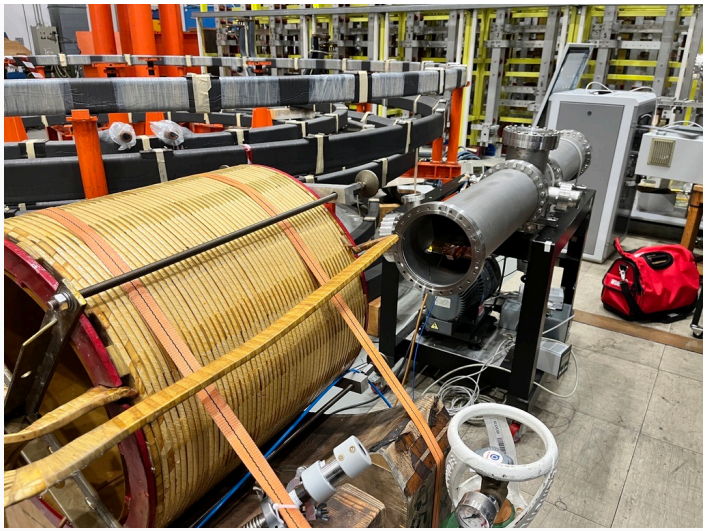
”Dissipation” ultimately via collisions?

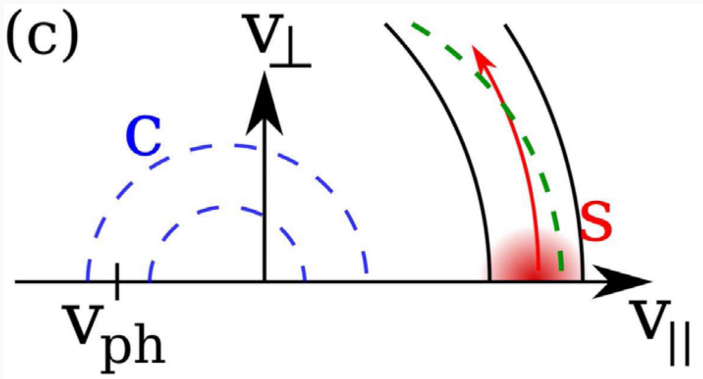


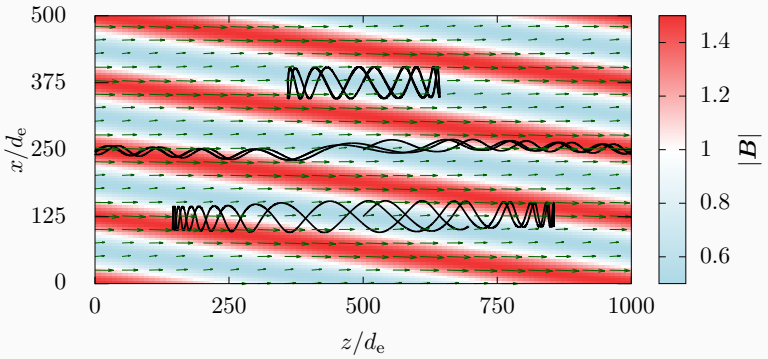
(Villarroel-Sepúlveda, DV, et al., 2026)

Potential Synergies

- **With laboratory plasmas**
  - Table-top experiments on kinetic instabilities and wave-particle interactions
  - The transition from collisional to collisionless conditions
- **With astrophysical plasmas**
  - Extrapolate collisionless heat-flux regulation to astrophysical systems
  - Wave-particle interactions in relativistic plasmas







(Verscharen et al., 2019)