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Pickup Ion–Mediated Magnetic Reconnection in the Outer Heliosphere

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It has now been established over several decades that pickup ions (PUIs) born through the interaction of interstellar neutral atoms with the solar wind play a crucial role in shaping the physics and structure of the heliosphere.

Although large-scale structures, waves, and discontinuities are mediated by PUIs in the heliosphere, the question of how PUIs affect magnetic reconnection in the heliosphere has not been addressed in any detail.

It is reasonable to expect that PUIs reduce the reconnection rate since the plasma beta (the ratio of the thermal plasma pressure to the magnetic pressure) becomes much greater than 1 when the PUI pressure is included.

However, this expectation is based on an ideal-fluid perspective exclusively, and does not include some important PUI-induced physics, these being PUI-driven turbulence, heat conduction, and viscosity.

In this presentation, we show that PUI-induced turbulence, heat conduction, and viscosity can act preferentially to increase the reconnection rate at heliospheric current sheets (HCSs) in the outer heliosphere.