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Breakdown of the Frozen-in condition and Plasma Energization in Cosmic Plasmas YAN SONG, ROBERT LYSAK, University of Minnesota — A dynamical theory shows that the generation of a sustained parallel electric fields is associated with the release of localized enhanced magnetic or mechanical stresses, and favors a low plasma density (*Song and Lysak*, *PRL*, 2006). This result suggests that reconnection and the energization and acceleration of charged particles in cosmic plasmas are natural consequences of Alfvenic dynamical interactions and should often occur when the plasma density is low. We demonstrate how the Alfvenic interaction of MHD wave packets at current sheets can generate parallel electric fields causing the breakdown of the frozen-in condition and plasma energization. In the auroral acceleration region, this interaction can create and sustain parallel potential drops in the form of double layers. These Alfvenic interactions are reactive in nature. The reactance associated with these interactions leads to a dynamo effect, and is often many orders of magnitudes larger than classical dissipative-type transport coefficients. The Alfvenic interaction leads to fast and efficient reconnection and plasma energization.

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