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Magnetic Reconnection or Alfvenic Interaction in Collisionless Plasmas? YAN SONG, ROBERT LYSAK, University of Minnesota — The magnetic reconnection hypothesis emphasizes the importance of the breakdown of the frozen-in condition, explains the strong dependence of the geomagnetic activity on the interplanetary magnetic field (IMF) and approximates an average qualitative description for many IMF controlled effects in magnetospheric physics. However, the crucial components of such models, such as the well-accepted X-line reconnection picture and the broadly-used explanations of the breakdown of the frozen-in condition, lack complete theoretical support. In fact, the generation of parallel electric field, which is necessary to break down the frozen-in condition, cannot be described by a purely dissipative or passive process and must be the result of Alfvenic interaction. The important Alfvenic interaction has often been overlooked in most reconnection models. We demonstrate how the Alfvenic interaction of MHD mesoscale wave packets at current sheets and in the auroral acceleration region can create and support parallel electric fields, causing the breakdown of the frozen-in condition and plasma acceleration. The Alfvenic interaction scenario not only explains some observational facts explained by the traditional reconnection model but also provides new and different interpretations and predictions for aspects of physical processes occurring at current sheets that are not given by previous models.

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