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Formation of double layer in active space plasma and auroral particle acceleration YAN SONG, ROBERT LYSAK, University of Minnesota — Mechanisms for magnetic reconnection and for the acceleration and energization of charged particles are two of the most important and long-standing questions in space plasma physics. The existence of a non-zero parallel electric field, which is often in the form of a double layer, is a necessary condition for auroral particle acceleration as well as the breakdown of the frozen-in condition required for reconnection. However, the basic dynamical theory of the generation of parallel electric fields has yet to be established. Models based mainly on the generalized Ohm's law yield only a force balance, not the generation of parallel electric field itself. Most models and theories of double layer are based on an assumed existence of the parallel potential drop, without explaining how the parallel potential drops are formed. The first dynamical double layer model will be given, based on the combination of a localized dynamo and parallel potential drop. The formation of double layers is often the result of nonlinear interaction of MHD wave packets rather than sinusoidal waves. Energy to support a significant double layer and the energization of charged particles comes from releasing the local free magnetic energy and/or kinetic energy during the nonlinear wave packet interaction.

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