can be interpreted in terms of the pressure disturbance propagation through the magnetosphere at a velocity of the order of 200 km/s that is essentially slower than a magnetosonic (fast Alfvén) wave, and generation of a potential (curl-free) electric field in the wake of the disturbance. We suggest that the interchange instability is a possible reason for the development of discrete dayside auroral forms after the SI. We discuss the reasons for the slow propagation speed of the disturbance and for a vortex-like convection pattern associated with the auroral motions.

SM43A CC: 220 C-E Thursday 1330h

Reconnection? Posters

Presiding: **J E Borovsky,** Los Alamos National Laboratory**; P W Daly,** Max-Planck-Institut fr Aeronomie

SM43A-01 1330h POSTER

Magnetotail Bubbles and Current Sheet Stability

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Using three-dimensional MHD simulations, we further investigate stability and dynamical properties of the magnetotail current sheet. We compare the effects of localized entropy depletions in 2-D and 3-D models and investigate the role of the entropy distribution in ideal MHD stability. We also investigate the mechanisms that may couple the dynamically evolving flux tubes with near-Earth effects.

SM43A-02 1330h POSTER

Magnetic reconnection in the flow of an MHD-scale Kelvin-Helmholtz vortex triggered by electron inertial effects

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In order to understand the structure of an MHD-scale Kelvin-Helmholtz (K-H) vortex universally, magnetic reconnection triggered by the vortex flow must not be neglected. To study the nature of magnetic reconnection within the MHD-scale K-H vortex, we have performed two-dimensional two-fluid simulations considering finite electron inertial effects. In the two-fluid system, magnetic reconnection occurs spontaneously by electron inertial effects. An MHD-scale velocity shear between the two regions is set up and evolution of MHD-scale K-H mode is followed. The K-H vortex can grow up to a highly rolling-up stage when the shaer is strong enough to overcome the stability effect of in-the-plane magnetic field component. In the non-linear state, the magnetic field lines are stretched into an anti-parallel geometry, and then magnetic reconnection occurs within the vortex. First, we have simulated basic cases where the magnetic field has only in-the-plane component with the uniform density. Particularly, we focus on two cases in which in-the-plane component is parallel between two regions and in-the-plane component is anti-parallel. We observe that magnetic reconnection in the flow of the highly rolled-up vortex occurs in both cases. Then, numerous magnetic islands are formed within the vortex by reconnection and the flow pattern of the vortex is destroyed. Only in the anti-parallel case, magnetic reconnection occurs even when the vortex does not highly roll-up. Furthermore, when in-the-plane magnetic intensity is extremely different between two regions, we observe the magnetic islands to be injected into the side with the weaker field. On the basis of these results, we have simulated cases with the LLBL like geometry in a two-dimensional two-fluid system. The density gradient between two sides of the shear layer and the out-of-the-plane magnetic field component are set up. In the LLBL like situation, magnetic reconnection in the flow of the MHD-scale K-H vortex occurs and essential features stay the same as the basic cases.

SM43A-03 1330h POSTER

Formation of Slow Shocks in Anisotropic Plasmas

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The Petschek's reconnection model involves two pairs of slow shocks that play the role of accelerating plasma by reducing the magnetic field. There have been some observational evidences for the existence of slow shocks in the Earth's magnetotail where the plasma beta is usually low. For plasmas in strong magnetic field, the thermal pressure is found to display the gyrotropic form with two distinct pressure components parallel and perpendicular to the local magnetic field. In this study, the structure of slow shocks is examined based on the anisotropic MHD model for which the energy closure is of the double-polytropic laws (Hau and Sonnerup, 1993). In particular, slow shocks are formed through the evolution of a tangential discontinuity current sheet initiated by the presence of magnetic normal field. The results are compared with those obtained from the isotropic MHD model.

SM43A-04 1330h POSTER

Time Scales for Energy Release in Hall Magnetic Reconnection

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We present a study of the time scales for energy release in 2D Hall magnetic reconnection. We use the NRL Hall MHD code VooDoo for this study. We consider a 2D reversed field current layer with a magnetic perturbation that initiates the reconnection process. We use boundary conditions that allow inflow and outflow (i.e., not periodic) and let the system reach a steady state. We find that the system goes through three stages: a relatively long current layer thinning process, a fast reconnection phase, and a final steady state phase. We define the time scale for energy release as the fast reconnection period: from onset to steady state. Preliminary results indicate that the time for energy release scales as the initial thickness of the current layer. We apply these results to the magnetotail and magnetopause.

Research supported by NASA and ONR.

SM43A-05 1330h POSTER

The scaling of reconnection in magnetospheric relevant systems

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Reconnection is a process ubiquitous to plasmas which plays a very important role in the dynamics of the Earth's magnetosphere, allowing solar wind and magnetospheric plasma to mix, and releasing large amounts of magnetic energy in the tail during a substorm. Recently, much progress has been made on understanding how fast reconnection rates consistent with those inferred from observations can occur. However, these previous studies were limited to highly idealized systems lacking many properties ever-present in the magnetosphere: asymmetries acrosss the current sheet, equilibrium normal magnetic fields, equilibrium shear flows, and multiple charged species in the plasma. In this paper, we will present initial results on the scaling of the reconnection rate in these complicated systems and discuss which aspects most strongly affect the reconnection rate.

SM43A-06 1330h POSTER

Plasma Transport Across the Magnetopause

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Particles enter the magnetosphere through transport processes which occur near the magnetopause. It has been estimated that the transport coefficient must be $D \sim 10^9 \mathrm{m}^2/\mathrm{s}$ in order to maintain a quasi-steady plasma density gradient at the magnetopause. There are two main candidate mechanisms for producing this transport: direct entry along reconnected field lines and particle transport via wave-particle interactions. Most of the observed wave energy is at frequencies below the ion cyclotron frequency and the low frequency transverse wave are almost always observed during magnetopause crossings. When there is large magnetic shear (southward IMF) across the magnetopause, the magnetic reconnection rate is expected to be faster and the transverse wave amplitude is observed to be larger. A larger reconnection rate would imply a faster particle entry into the magnetosphere from the magnetosheath. It has also been shown that larger amplitude kinetic Alfveń waves with wavelength the order of ion gyroradii can cause stochastic particle transport leading to magnetosheath ion entry across the magnetopause with $D \sim 10^9 \mathrm{m}^2/\mathrm{s}$. We will discuss the relative importance of these two mechanisms for producing plasma transport arcoss the magnetopause.

SM43A-07 1330h POSTER

Motion of the Flank LLBL During Changes of Upstream Parameters

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The magnetopause is a principal boundary dividing the magnetospheric and solar wind plasmas and magnetic fields. At low latitudes, one can identify the low-latitude boundary layer (LLBL) on the magnetospheric side and rather often a depletion layer on the magnetosheath side of the magnetopause. A thickness of these layers varies from 0.2 to 1 Earth's radius but several examples of a very thick LLBL have been reported in flank parts of the magnetopause. Plasma parameters inside the LLBL are variable, the spacecraft usually observes a mixture of magnetosheath and plasma sheet plasmas. Several mechanisms including intermittent reconnection, impulsive penetration, and Kelvin-Helmholtz instability have been proposed to explain this phenomenon. We are using the INTERBALL-1/MAGION-4 satellite pair separated by several thousands of kilometers in order to distinguish between spatial and temporal changes. The observation of LLBL crossings invoked by sudden changes of upstream conditions during strongly northward IMF, shows that (1) even very complicated temporal profile measured by one satellite can be explained in terms of surface waves, (2) the LLBL thickness is a rising function of the solar wind dynamic pressure, and (3) the most probable source of a magnetosheath-like plasma in the flank LLBL is reconnection in the cusp region.

SM43B CC: 220 C-E Thursday 1330h

Bow Shock, Foreshock, and Magnetosheath Posters *(joint with SH)*

Presiding: **H Kucharek,** University of New Hampshire**; L L Kepko,** Center for Space Physics, Boston University

SM43B-01 1330h POSTER

Statistical analysis of periodic solar wind number density variations

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Several recent studies have suggested that the solar wind sometimes contains number density variations at periodic, repeatable intervals. As these number density variations interact with the Earth, they alternately compress and expand the magnetosphere, leading to