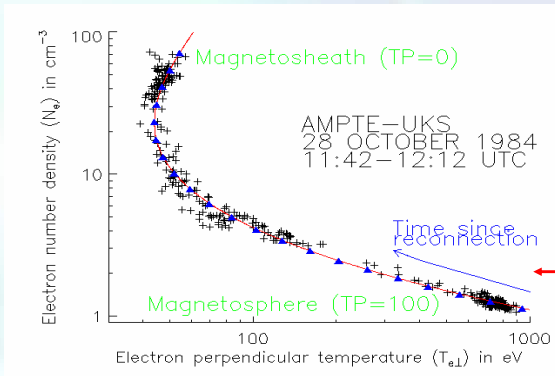


The magnetopause transition parameter as an indicator of dayside reconnection

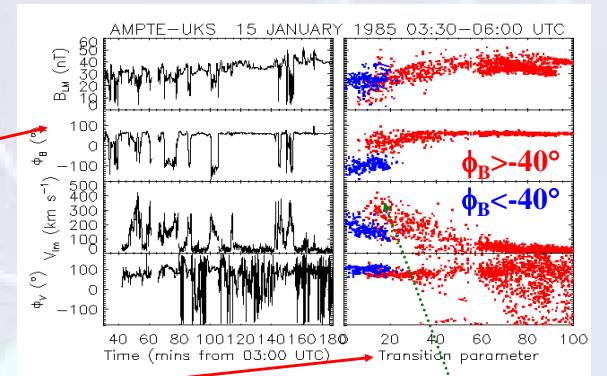
Mike Hapgood, Malcolm Dunlop and Mike Lockwood

(1)Rutherford Appleton Laboratory, Chilton, Oxfordshire, UK

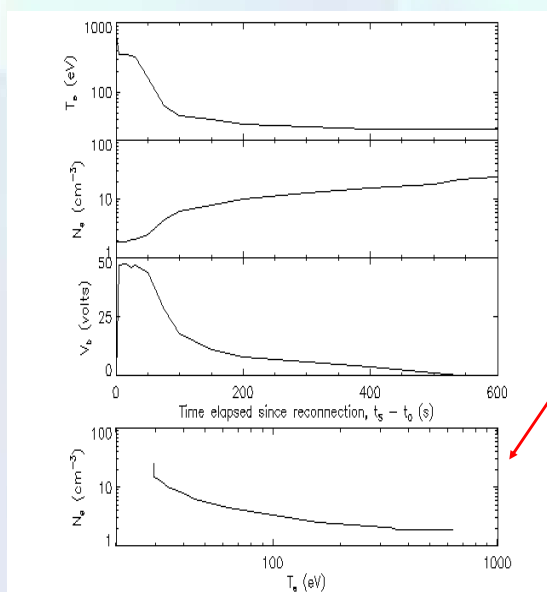


WHAT IS THE TRANSITION PARAMETER?

- Brings *remarkable order* to LLBL data which appear chaotic as time series [1]
- Tracks *non-linear anti-correlation* between N_e & T_e from 0 (sheath) to 100 (magnetosphere)
- Orders *independent quantities* such as magnetic field and plasma flow (left)

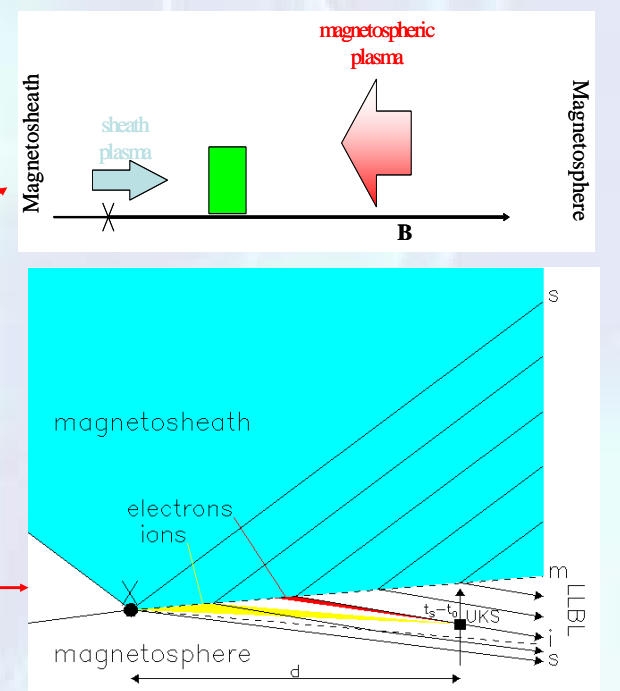


Plasma accelerated at RD arising from reconnection



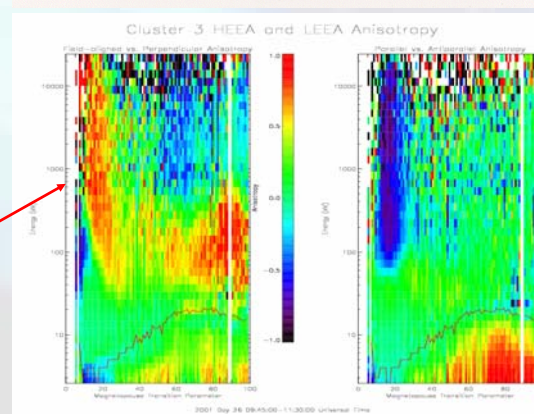
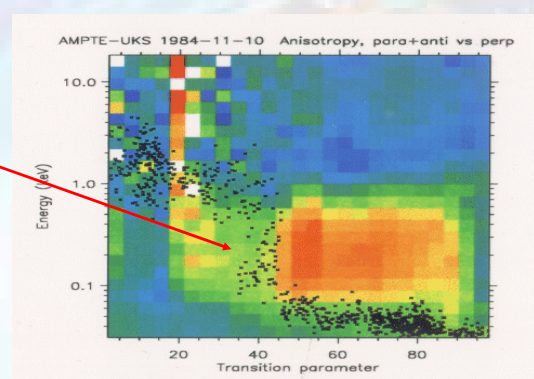
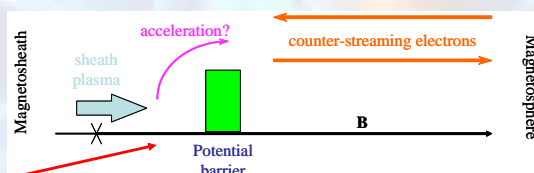
LINK TO RECONNECTION

- Model plasma mixing on newly-opened flux tubes [2]
- 1-D time-of-flight: potential barrier V ($eV \sim \langle E_{sheath} \rangle$) maintains quasi-neutrality
- Yields observed anticorrelation of N_e & T_e
- TP decreases as time from reconnection increases
- Relative measure of position across reconnection outflow
- So TP order is order in the outflow region



OTHER TP ORDERING

- Counter-streaming LLBL electrons
 - Low energy cut-off consistent with potential barrier in TP models
 - Inward of velocity shear = expected location of potential barrier
- Selection of LLBL data for Walen test
 - quantitative MHD test for tangential momentum balance across a RD
 - necessary test for reconnection
- Flux-tube acceleration away from X-line
 - Walen test yields “field-line” (de Hoffmann-Teller) velocity
 - Decreases with increasing TP
- Exceptions due to cold ionospheric plasma
 - Third population confuses TP calculation
 - Use of partial moments restores TP order
- Application to Cluster
 - TP order of electron anisotropy (right) shows electron outflow around magnetopause [3]



SOME FUTURE POSSIBILITIES

- Find reconnection interior wave
 - Expected to be slow mode
 - AMPTE results only suggestive
- Apply to magnetopause lobe reconnection!
 - Results here are from dayside
- Do counter-streaming LLBL electrons come from reconnection region?
- Use Cluster to explore TP as distance scale
- Apply to other reconnection environments Cassini + Saturn m/p [4]

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- 1.Hapgood M and Bryant D, 1992, Exploring the Magnetospheric Boundary Layer, Planet. Space Sci. 40, 1431-1459.
- 2.Lockwood M & Hapgood M, 1997, How the magnetopause transition parameter works, Geophys. Res. Lett., 24, 373-376.
- 3.Dunlop MW et al, 2003, The magnetopause transition: Cluster observations, Eos Trans. AGU, 84(46), Fall Meet. Suppl., Abstract SM51B-0532
- 4.McAndrews, H J et al, 2004, Initial results from the Cassini CAPS Instruments at the Magnetopause of Saturn, Eos Trans. AGU, 85(47), Fall Meet. Suppl., Abstract P51A-1402