WG 2/3 Sessions

- Issues of connectivity
- Composition

Heat flux dropouts

- Heat flux electrons may disappear or weaken in regions of high density.
- Dropouts appear to be energy-dependent; occurring most at lower energies. Low intensity heat flux may still be visible.

- Connection scenario to explain this?

Heat Flux Dropouts

J.Gosling:

> The dropouts are a result of coulomb collisions in a sufficiently high density region (must be near Sun).

- Coulomb scattering would affect low energy electrons the most.
- Some scattered heat flux electrons could be focused during outward propagation, resulting in a faint heat flux population.
- The density at 1AU, where the dropouts are observed, has to be correlated with the density at the footpoint of the fluxtube, where the scattering occurs.
- Gordon Emslie: The effect of coulomb collisions should be weak at the lowest energies, increase with energy, then decrease at high energies. However, the heat flux electrons do not reappear at the lowest energies.
- Hugh Hudson: integrate coulomb collisions over a solar density profile.

Electrons as Sensors of field line disconnection

- N. Crooker
  - Interchange reconnection occurs near the Sun. A folded-back field line and local current sheet (high beta plasma) develops.
  - A dropout is observed when this structure passes the spacecraft because of scattering in the high beta plasma.
  - Electron isotropy is controlled by the plasma beta.
  - Intensity of the heat flux electrons is related to the time since the last interchange reconnection (recharge time)

Connection signatures in magnetic clouds (Davin Larson)

- Prompt onset electrons within a cloud:
  - > demonstrated magnetic connection of on\e leg to an active region
  - > field line lengths were consistent with a flux tube
- Electron observations in a cloud suggested that one leg was connected to the Sun, while the other was connected to the heliosphere.
- One never sees a case of both cloud legs connected to the Sun, even though filaments begin with both legs in an active region. Why?
- The energetic halo electrons may be heating the low energy core electrons by coulomb collisions and/or wave-particle interactions. This heating needs to be modeled.

Signatures of Ejecta (S. Lepri)

- Solar wind periods with high Fe charge state ($\geq 12+$) are strongly associated with ejecta.
- A comparison of Ulysses and ACE data indicate that low latitude CMEs tend to have high Fe charge states, while high latitude CMEs do not.
- What is the source of the high charge state Fe? Active regions at low latitudes? Are the higher latitude CMEs associated with sources outside active regions (polar crown filaments)?

Composition - M. Desai

- Compositional evidence for rigidity-dependent acceleration of suprathermal ions
  - upstream and shock abundances smoothly ordered by M/Q (S/W and shock abundances are not).
  - the abundance of 3He in the IP medium agrees with the frequency of shocks with 3He/4He enhancements
- What are the source populations?
  - Flare remnants (3He),
  - suprathermals;
  - solar wind not a strong source.

Composition - M. Desai

- Since 1998, the C/O ratio is lower in SEPs than solar wind. At what energy does it transition and why?
- During the present solar cycle, the frequency of 3He-rich shocks has peaked and declined, but the Fe/O ratio has increased and stayed high. What accounts for the different behavior?

Composition (cont)

- However, M. Popecki showed an event with:
  - > Local shock passage
  - > No evidence for flare-associated injection
  - > High charge state Fe in the solar wind
  - > High charge state Fe in SEPs

⇒ Solar wind source or suprathermals with energies between the solar wind and 200 keV/nuc?

- In magnetic clouds, Fe/O ratio is above the coronal reference, and the Fe charge states are higher than in large IP shock events. Some of this may be accounted for by direct injections of flare material while a spacecraft is in the cloud (up to ~33%). What accounts for the rest?

Charge state measurements at high energy (Rick Leske)

- Fe/O ratio increases with increasing Fe charge state (similar to ACE/SEPICA results at 0.3 MeV/nuc). Is this a superposition of different source material: 1-3 MK coronal ions plus ions stripped either by collisions during acceleration or flare heating/acceleration?
- Events with the highest Fe charge state were associated with the western hemisphere.
- An event with a prompt flux increase and a western source had QFe=20+. Flare product? Fe stripped while undergoing shock acceleration low in the corona?
- *The process of flare and shock acceleration close to the Sun should be studied in campaign events and modeled.*