ILWS and the Magnetosphere

Findings of the
Magnetospheric Task Group
(M-TG)

Report by Hannu Koskinen (chair)
(presented by Reiner Friedel)

Outline....

- Task Group Report (politically correct...)
- Other voices.... (controversial...)

Composition of M-TG

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Inner Mag Theme?

- From LWS statements 2.) and 3.):
- Develop Predictive Models
- Utility for prediction of Space Weather
- Develop Improved space Weather predictions and space environmental design
- Fly low cost testbeds of rad-hard, rad-tolerant systems.

Main Findings

- Magnetosphere key region for space weather – processing solar / solar wind input
- Only space plasma region accessible for detailed, multi-point, multi-scale in-situ obs
- Depend on continuous L1 data
- Ionospheric interface important – ground based view still only “global” view,
- Agreed time span for ILWS?
- Good present coverage (Cluster, Image, Polar, Geotail, SAMPEX, FAST, GEO LANL/NOAA, GPS, Double Star, SOHO, ACE)
- Significant challenges to maximize scientific use of data flow
- Many missions about to finish – impacts on CAWSES, IHY, EGY
- Extensions ENCOURAGED

Missions during ILWS era

- USA: LWS of NASA
- *TWINS, 2 S/C, 2004/2006*
- *THEMIS, multi SC, 2007*
- Magnetospheric Multiscale, 4 SC, Inst. Sel. 2004, launch 2012
- LWS Geospace: Ionosphere-Thermosphere Storm Probes, 2010; Radiation Belt Strom Probes, 2012; AO in 2004
- Global Electrodynamic Connections, delay risk, 2016?
- Magnetospheric Constellation, delay risk, 2020?

- USA: Programmatic
- LANL GEO – next generation O.K.
- LANL GPS
- NOAA-GOES
- NOAA-POES
- DMSP
- HEO

Missions during ILWS era

- Canada
  - Canadian Geospace Monitoring program / CANOPUS ground truth for THEMIS
  - EPOP (Enhanced Polar Outflow) probe, 2006
  - RAVENS (Recurrent Auroral Visualization of extended northern Storms), 2 SC, 2008
  - ORBITALS, part of Rad Belt Probe network, 2012 with LWS RBSP
- Russia
  - Resonance: active & passive inner mag obs, orbit corotating with flux tubes L=5, 2009
  - ROY: main SC with 4 sub-SC, 5000km X 12-15 Re Polar
  - Interball-3: Space weather mission. Not before 2010

Missions during ILWS era

- Japan
- SCOPE (Scale Coupling in Plasma Environment), Multi-SC, 2012
- China
- Double Star co-op with ESA, 2003, 2004
- SWISE (Space Wind and Storm Exploration). 1: ITM mission 300-700km, 2: Mag mission, 700km-7.5Re, 3: bow shock/boundaries 2-22Re
- Europe
- STORMS (assessment study): contribution to LWS RBSP / Canadian ORBITALS
- M cubed, similar to MC, 2015-2025
- France: Hercales, 12 microsats
- United Kingdom: Maxwell/APEX, 2 SC on Molniya orbits
- Sweden: microsats for auroral acceleration

Recommendations

- Success of ILWS depends on SC missions in all sectors having a smooth continuum in time
- Keep present fleet alive as long as possible. ESP input monitors @L1
- High priority for inner mag fleet of at least 3 GTO missions
- Extended utilization of “operational” missions
- Maximum complementarity and co-operation for planned constellation-type missions

Recommendations

- European commitment to Solar-Terrestrial physics in general, and magnetospheric physics in particular, does not nearly correspond to the high level of scientific expertise in this field in Europe:
- URGE the European magnetospheric community to be more active nationally and within ESA to revive the European contribution to magnetospheric science.

Other voices....

- Without better, higher-level buy-in by main players (ESA, NASA, JAXA etc) ILWS effect will be marginal -> ISTP model.
- Realistically, Inner Mag shows best opportunities for “shorter term” collaboration (STORMS, ORBITALS, RBSP).
- Large fears of “nothing” till MMS/RBSP. How sure is their 2012 time frame? Pragmatism may dictate necessity for new/fresh approach.

Other voices...

- Uncertainty – will ILWS lead to better gurantee for missions under the “international” umbrella – or can agencies axe own programs since “others” are doing it?
- If ILWS doesn't ensure continuity, community will be forced to look elsewhere (University class small sats, other partnerships)
- Bottom line – we're mission driven, scientists generally “follow” the data.

Other voices...

- Inner mag research currently very dynamic – significant new research. Need to keep momentum up... lots of retirements
- Hardware experts / change of guards imminent. Difficult with no missions...
- Break up RBSB -> lots of explorer / midex class missions that can happen NOW.