

End User Task Group

Report-back on Meeting 1

- “End users” are domains affected by space weather, e.g. communications, navigation, manned spaceflight, power transmission...
- Group =
 - Daly (ESA, co-chair); Barth (NASA, co-chair); Boteler (ISES and Canada); Viereck (NOAA); Akioka (Japan); Lefeuvre (SWWT and France)
- SC recognised that in spite of ILWS being targeted at the science of “governing processes”, end users views were important
- Talk will:
 - Review the charter, composition, plan
 - Present report on preliminary discussion

Charter (main points)

1. Review the end-user needs for space weather from the present through the ILWS period and identify measurement, modeling and knowledge requirements supporting these needs;
2. Develop an inventory of current and future space weather missions and associated modeling activities to be undertaken by ILWS participants, and their capabilities to support end user needs;
3. Identify ways in which these missions and associated modeling activities support the development of future systems to support end users;

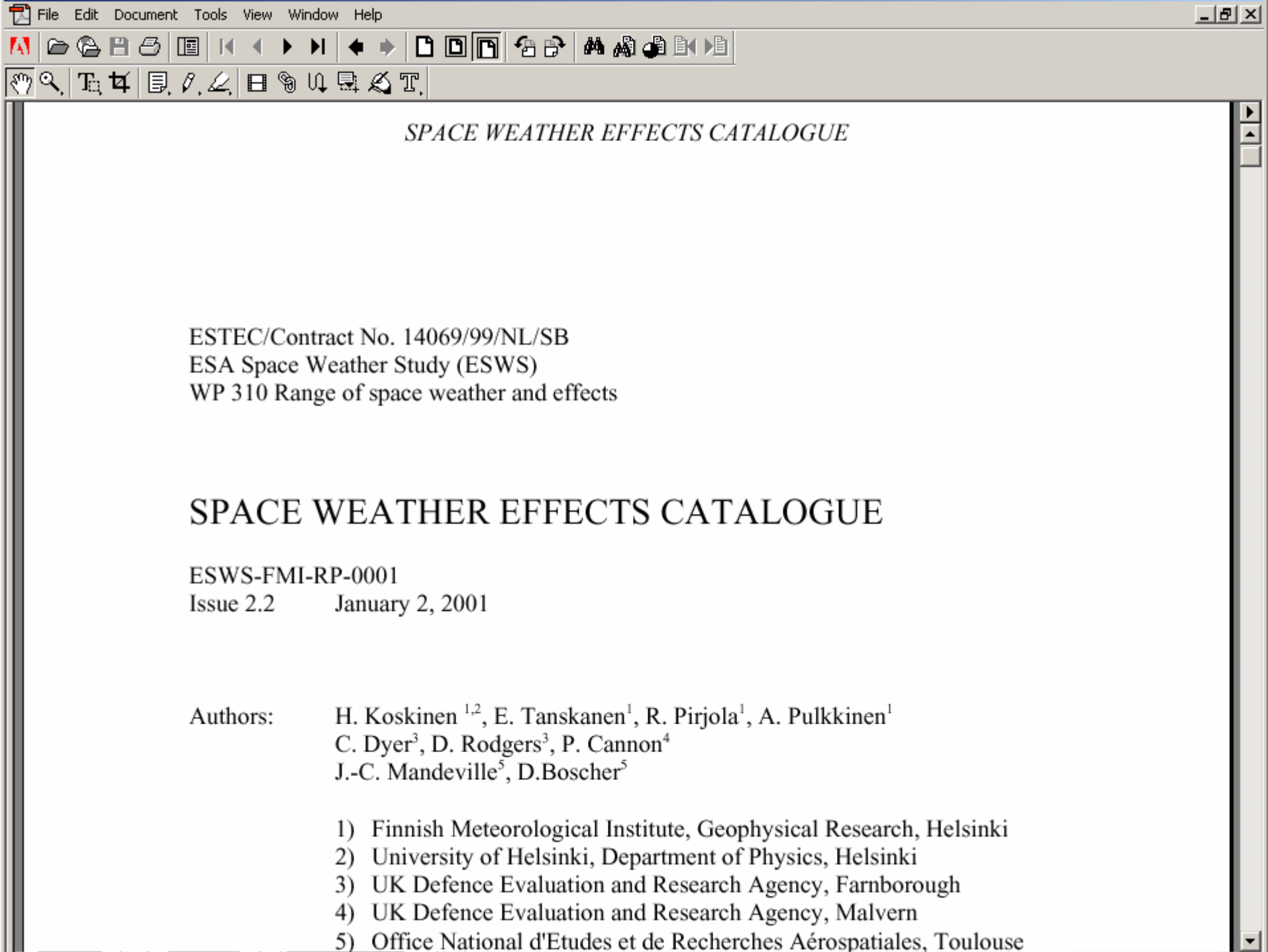
4. From 1, 2 & 3 determine weaknesses and gaps in space weather science and applications that are not addressed by the present set of existing or planned missions and associated modeling activities;
5. Prepare an applications promotion strategy and plan including:
 - any necessary improvement of the coordination of existing missions and associated modeling activities, and
 - coordination of planned initiatives, with a view towards maximum applicability and synergy with other global initiatives.

7. Recommend new initiatives that may not yet been considered by ILWS member and partner agencies;
8. Develop strategies for better coordination and collaboration within ILWS assets, in consultation with other TG's;
9. Recommend ways to implement more efficient data exploitation and modeling systems serving end-users, in the context of ILWS.

End User Requirements and ILWS

Sources (to be) consulted:

- ESA Space Weather Studies:
User Requirements (BAS and QinetiQ)
- NOAA User Requirements capture process
- NASA LWS Pre-Formulation Study &
Exploration Mission Task Group



SPACE WEATHER EFFECTS CATALOGUE

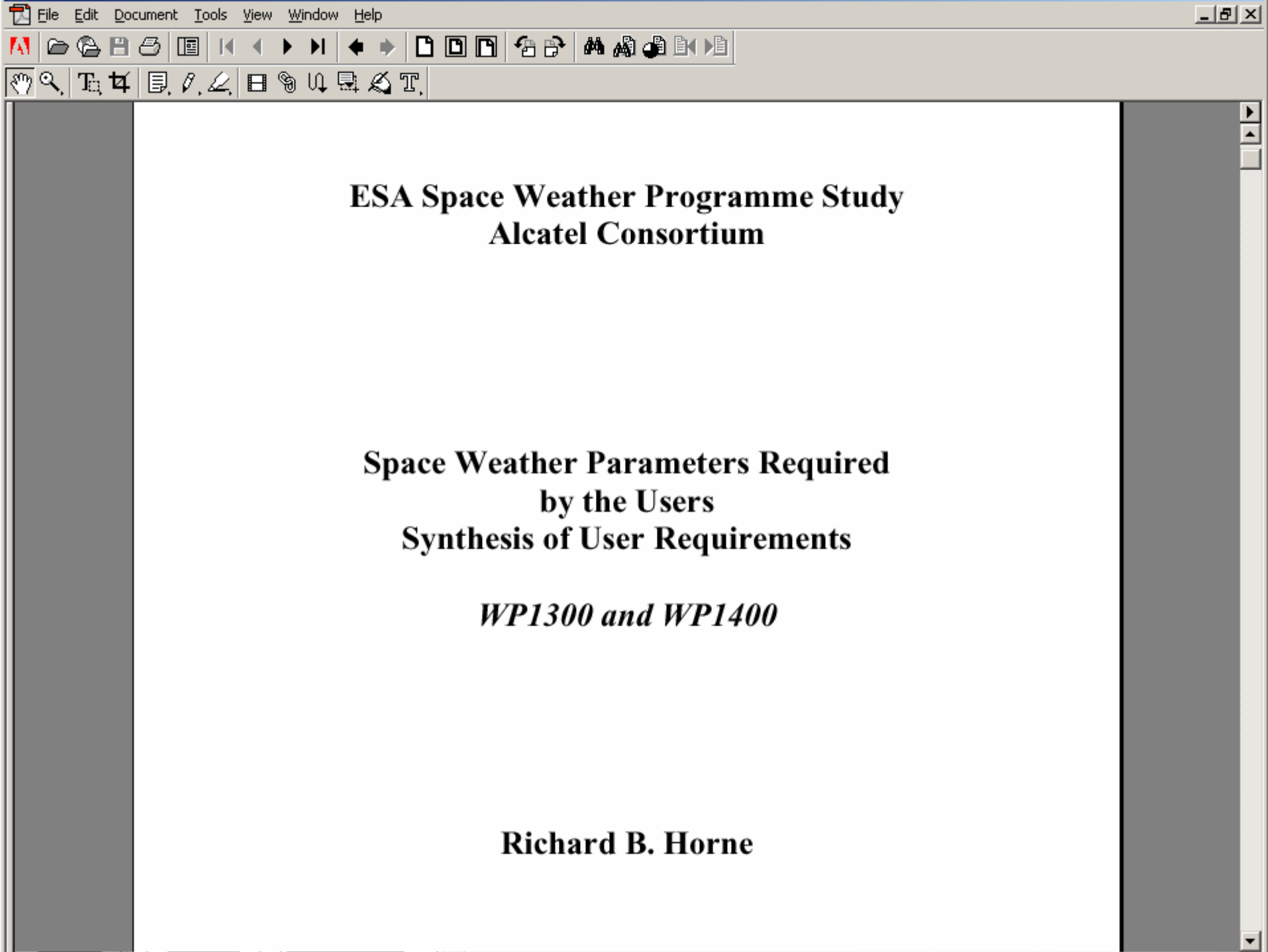
ESTEC/Contract No. 14069/99/NL/SB
ESA Space Weather Study (ESWS)
WP 310 Range of space weather and effects

SPACE WEATHER EFFECTS CATALOGUE

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Authors: H. Koskinen^{1,2}, E. Tanskanen¹, R. Pirjola¹, A. Pulkkinen¹
C. Dyer³, D. Rodgers³, P. Cannon⁴
J.-C. Mandeville⁵, D. Boscher⁵

- 1) Finnish Meteorological Institute, Geophysical Research, Helsinki
- 2) University of Helsinki, Department of Physics, Helsinki
- 3) UK Defence Evaluation and Research Agency, Farnborough
- 4) UK Defence Evaluation and Research Agency, Malvern
- 5) Office National d'Etudes et de Recherches Aérospatiales, Toulouse



**ESA Space Weather Programme Study
Alcatel Consortium**

**Space Weather Parameters Required
by the Users
Synthesis of User Requirements**

WP1300 and WP1400

Richard B. Horne

End user	Primary Need	Derived (system) needs	ILWS element
communications	ionospheric state (global ionospheric profiling ($f_{o}F_2$ & $h_{p}F_2$), scintillation, absorption);	Prediction based on solar observation (active region monitoring and flaring prediction, coronagraph CME monitoring, whole sun EU V (Δ min -1 hr warning)), and solar wind obs. (storm prediction)	SDO, Solar Orbiter, IT.; SWARM; ITSP; CGSM (GB) (TBC)
navigation	ionospheric state (global ionospheric profiling ($f_{o}F_2$ & $h_{p}F_2$), TEC, scintillation, absorption);	Prediction based on solar observation (active region monitoring and flaring prediction, coronagraph CME monitoring, whole sun EU V (Δ min -1 hr warning)), and solar wind obs. (storm prediction)	SDO, Solar Orbiter, IT.; SWARM; ITSP; CGSM (GB) (TBC)
Orbital dynamics	Atmospheric state; (global & local neutral density profiles (<5% specification); neutral winds. Martian atmosphere.	Prediction based on solar observation (coronagraph CME monitoring, whole sun EU V pred. & forecast), and solar wind obs. (storm prediction); gravity wave modelling/measurements?	
Spacecraft operations (reliability)	Alerts and data on hot plasma & energetic particles in the magnetosphere. Magnetospheric and heliospheric solar energetic particles;	Prediction based on solar observation (active region monitoring and flaring/CME prediction, coronagraph CME monitoring), and solar wind obs. (geoeffectiveness/storm prediction) magnetospheric precursors	SDO, Rbsp, SMART-3, Solar Orbiter; Bepicolombo; GSTB-V2 (+);
Space mission design	Statistical data and models on radiation belts, solar energetic particles, geomagnetic field, cosmic rays, hot plasmas; Long-term prediction of solar cycle variations.	Continuously available, quality controlled, data (energetic particles (RB, solar); plasma; solar activity proxies);	

Preliminary

End user	Primary Need	Derived (system) needs	ILWS element
Manned space programmes	Alerts and data on energetic particles in the magnetosphere. Lunar/Mars mission environments (solar energetic particles & potential shock acceleration events);	Prediction based on solar observation (active region monitoring and flaring/CME prediction, coronagraph CME monitoring), and solar wind obs. (non-Earth directed; Earth-directed <u>geoeffective/storm prediction</u>); <u>magnetospheric precursors</u> ; muon telescopes	SDO, RBSP, SMART-3, Solar Orbiter; <u>Repicolombo</u> ; GSTB-V2 (+);
Aircraft: aircrew and electronic systems	Solar energetic particles; geomagnetic cutoffs; cosmic ray fluxes; Ground-level neutron fluxes	Prediction based on solar observation (active region monitoring and flaring/CME prediction), and solar wind obs. (storm prediction); Neutron monitors.	CGSM...
Power transmission and GIC	E-field prediction and specification at earth's surface	Auroral <u>electrojet</u> strength and location (therefore: solar observation (active region monitoring and flare/CME prediction, coronagraph CME monitoring), and solar wind obs. (storm prediction)); ground-based E observations	Preliminary
Climate change	Long-term data on solar and geomagnetic parameters; Predictions of trends;	Long records of total and spectral solar irradiance, <u>geomagnetic indices</u> and <u>cosmic rays</u> ;	
Resource exploration (magnetic surveys, directional drilling)	Forecast, <u>nowcast</u> and specification of magnetic fields at earth's surface;	Solar observation (active region monitoring and flare/CME prediction, coronagraph CME monitoring), and solar wind obs. (storm prediction)); ground-based E observations; PC3 index	
Others (tourism, education, outreach)	Predictions of Auroral occurrence (local); Solar and most other <u>sv</u> data	Good, tailored, data and delivery systems	All

Gap/weakness	How to address
L1 or upstream solar wind monitoring	Earthshine? <u>Triana</u> ? New venture (NOAA?)
Coronagraph	<u>NOAA(?)</u> GOES-R 2012; (Stereo questionable for users); Euro-Coronagraph?
Multi-point observations in the heliosphere	
Multi-point observations in the inner magnetosphere	RBSP; SMART-3 selection; ST-8 implementation; <u>Doublestar</u> extension; national small satellite initiatives; monitor payloads (e.g. Galileo); (US <u>DoD</u> missions?)
Data quality assurance	Funding issue; coordinated quality assurance campaigns; improved metadata
Data continuity	Coordination of plans and instrument cross-calibration
The valley of death	Coordination and prioritization
Real time near-sun data	Difficult and expensive; real time beacon on SO; good ground <u>comms</u> ("DSN+")
Other real-time	
Knowledge gaps (solar cycle prediction,...)	TBD
Completeness of RB data for modelling	

Preliminary

Other Issues

- Discussion of the implications of the “President’s Vision” and importance to not switch wholesale to extra-magnetospheric domain
- Need to integrate fully the mission list
- Need to interact with Models and Theory TG
- Need to interact with domain groups and discuss user-derived science questions
- Discussion of how end user data requirements might differ from science requirements (e.g. data quality assurance, inter-calibration, continuity)

Conclusions

- Work has started ...
- Information collection will proceed to address tasks
- Next full meeting at ESA Space Weather Workshop, ESTEC 1-5 Nov
- Opportunity for some brainstorming at COSPAR (NB Panel on Space Weather 20-22 July)
- Expected that a TG paper is produced circa end 2004 summarising first full response to tasks