End User Task Group Status Report and Plans for 2007-8

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The Group

- "End users" are domains affected by space weather,
  e.g. spacecraft operations, communications, navigation, manned spaceflight, power transmission…
- Group (some updates) =

  Eamonn Daly (ESA, chair); Mike Xapsos (NASA, tbc); David Boteler (ISES and Canada); Rodney Viereck (NOAA); Maki Akioka (Japan); Mike Hapgood (SWWT and UK)
- SC recognised that although ILWS is targeted at the science of "governing processes", end users views were important
- This talk will:
  - Review the charter, composition
  - Present report on preliminary discussion
  - Report on plans for 2007-8

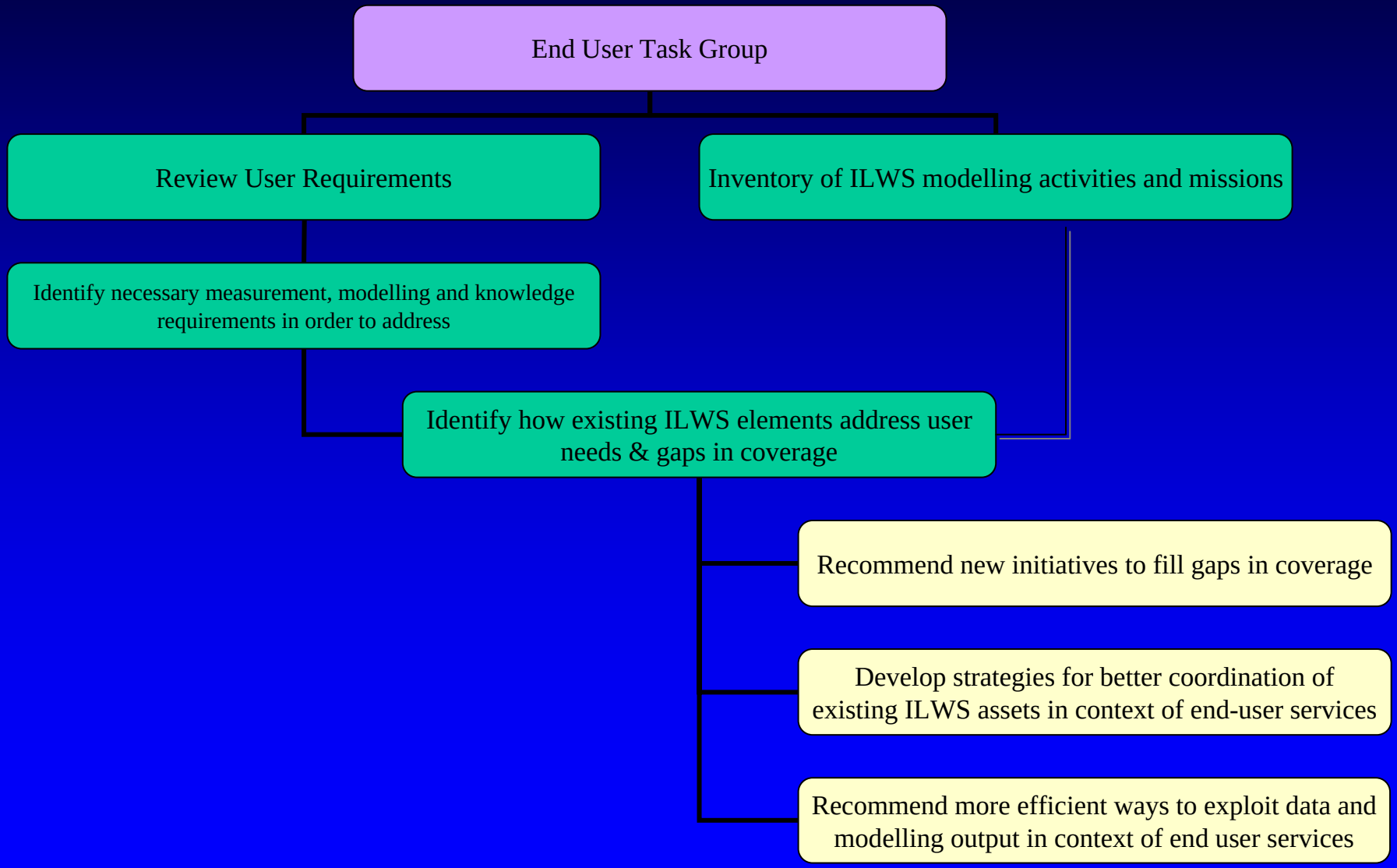
Charter (main points)

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 modelling 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.

Key Tasks


End User Task Group
Review User Requirements
Inventory of ILWS modelling activities and missions
Identify necessary measurement, modelling and knowledge requirements in order to address
Identify how existing ILWS elements address user needs & gaps in coverage
Recommend new initiatives to fill gaps in coverage
Develop strategies for better coordination of existing ILWS assets in context of end-user services
Recommend more efficient ways to exploit data and modelling output in context of end user services

End User Requirements and ILWS

Sources (to be) consulted:

- ESA Space Weather Studies and Pilot Project Services:
  User Requirements (BAS and QinetiQ), SWENET services
- NOAA User Requirements capture process
- NASA LWS Pre-Formulation Study
- NSWP assessment
- **Other…?**

End user	Primary Need	Derived (system) needs	ILWS element addressing the need
communications	ionospheric state (global ionospheric profiling (f0f2 & hmf2), scintillation, absorption;	Prediction based on solar observation (active region monitoring and flaring prediction, coronagraph CME monitoring, whole sun EUV (5min.-1 hr warning)), and solar wind obs. (storm prediction)	SDO, Solar Orbiter, IT ; SWARM; ITSP; CGSM (GB) **(TBC)**
navigation	ionospheric state (global ionospheric profiling (f0f2 & hmf2), TEC, scintillation, absorption);	Prediction based on solar observation (active region monitoring and flaring prediction, coronagraph CME monitoring, whole sun EUV (5min.-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 EUV 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;
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 addressing the need
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 geoeffective/storm prediction); magnetospheric precursors; muon telescopes	SDO, RBSP, Solar Orbiter; BepiColombo;
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 electrojet strength and location (therefore: solar observation (active region monitoring and flare/CME prediction, coronagraph CME monitoring), and solar wind obs. (storm prediction)); ground-based B observations	
Climate change	Long-term data on solar and geomagnetic parameters; Predictions of trends;	Long records of total and spectral solar irradiance, geomagnetic indices and cosmic rays;	
Resource exploration (magnetic surveys, directional drilling)	Forecast, nowcast 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 B observations; PC3 index	CGSM…
Others (tourism, education, outreach)	Predictions of Auroral occurrence (local); Solar and most other sw data	Good, tailored, data and delivery systems	All

Preliminary

Gap/weakness	How to address the weakness
L1 or upstream solar wind monitoring	Earthshine? New venture ?
Coronagraph	NOAA(?) GOES-R 2012; (Usefulness of Stereo data for end users still being established); Euro-Coronagraph?
Multi-point observations in the heliosphere	Sentinels. Solar Orbiter, BepiColombo…
Multi-point observations in the inner magnetosphere	RBSP implementation; Doublestar; national small satellite initiatives (e.g. Proba); auxiliary monitoring payloads (e.g. Galileo); US DoD missions auxiliary payloads
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; Requires real time beacon on SO; good ground comms ("DSN+")
Other real-time	
Knowledge gaps (solar cycle prediction,…)	TBD
Completeness of RB data for modelling	

Preliminary

Workplan

- Need to integrate fully the mission list into matrices and update
- 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

- Need to complete matrices
- Information collection will proceed to address tasks
- Next full meeting envisaged at ESWW4, 5-9th November
- Expected that a TG report will be produced Q1/2008 summarising first response to tasks