SSA-SWE Segment Approach for SSA Period 2

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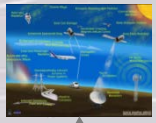
SSA / SWE Precursor Service System in 2013

SSA-SWE Users



SSA-SWE Service Portal: swe.ssa.esa.int

SWE Data Centre Redu, Belgium

SWE Service Coordination Centre, Space Pole, Belgium

SWE Expert Service Centres

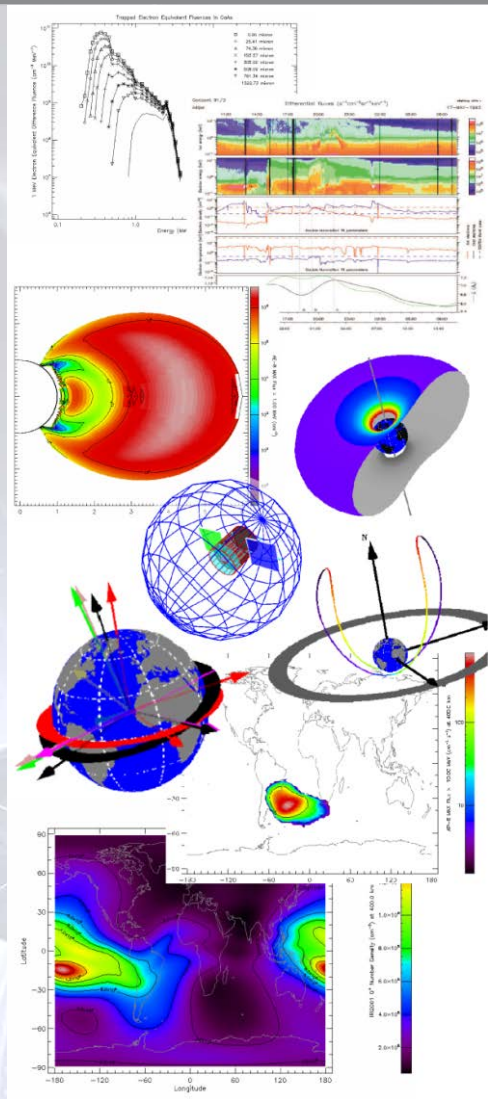
Solar Weather	Ionospheric Weather	Space Radiation	Geomagnetic Conditions	Heliospheric Weather
ROB, Belgium (coord.) Uni. Graz, Austria	DLR, Germany (coord.) NMA, Norway NOA, Greece CLS, France	BIRA, Belgium (coord.) AIT, Austria UOA, Greece	TGO, Norway (coord.) FMI, Finland	TBD

SWE Segment objectives in SSA Period 2

1. **Networking of available national and European SWE assets** (sensors, data centres, service centres, service coordination, user support)
2. Continuation of the **preparation of SWE additional services**
3. Continuation of the **Proba-2** operations and exploitation
4. Implementation of the **first flight opportunities for hosted payload SWE instruments** and planning for the future HP missions
5. **Exploitation of SWE instruments**, as well as **data** and European centres of expertise
6. **Study** (phase A) of a **mission** to ensure availability of **solar wind, IMF and coronagraph data** from L1
7. **Studies** of mission concepts **for enhanced SWE monitoring and forecasting** with sensors away from the Sun-Earth line
8. SSA-SWE **technologies** development

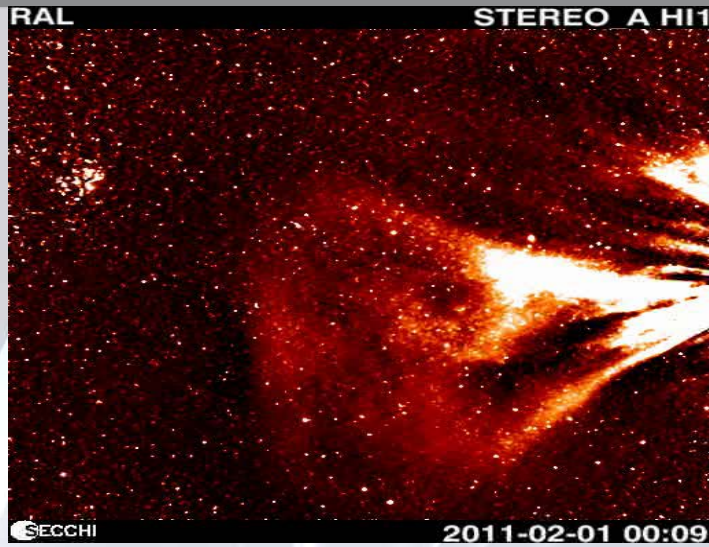
Expert Service Centre (ESC) Evolution

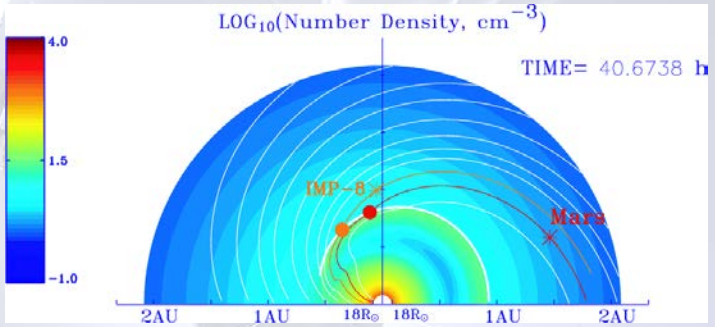
- ESC profile to be further elaborated during Period 2
  - Focussing on their role as thematic centres of expertise
  - Provision of 2nd line expert support to SWE users
  - Targeted development of new services
  - Evaluation of new applications/products through targeted campaigns run together with the users.
  - Organisation of regular workshops with users
  - Service performance metrics and monitoring
  - Recommendation for updates of service roadmaps
- ESC network will expand to
  - Existing ESCs will include new Expert Groups
  - Include new ESC(s)



Heliospheric Weather ESC

- New ESC to be established at the beginning of Period 2
- Focus on magnetospheric response to solar wind disturbances
  - Multi-point remote sensing of heliospheric phenomena
  - Physical modelling of solar wind/CME initiation and evolution, Interaction solar wind/IP CMEs
  - SEP event modelling
  - Nowcast & forecast techniques to be prototyped and tested





- Heliospheric and Solar Weather ESC outputs will form key inputs to the ESC network

SWE space segment objectives for P2

- **Utilisation of Proba-2 mission SWE data**
  - Mission Management has been handed over to SSA Programme on the 1st July 2013
  - SSA covers the MOC, SRE continues to cover the SOC
- **Implementation of the first SWE hosted payload (HP) missions**
  - First opportunities are based on results of SN-II activity in SSA PP
  - First HP mission implementation: NGRM instrument onboard EDRS-C
  - Other flight opportunities identified including AOs for national instruments
  - Available budget is the main limitation for HP mission implementation
  - Development of a Remote Interface Unit for HP missions in planning
  - HP flight opportunities for individual instruments to be identified
  - Implementation of HP missions with Galileo is very unlikely due to Galileo programme schedule constraints

SWE space segment objectives for P2

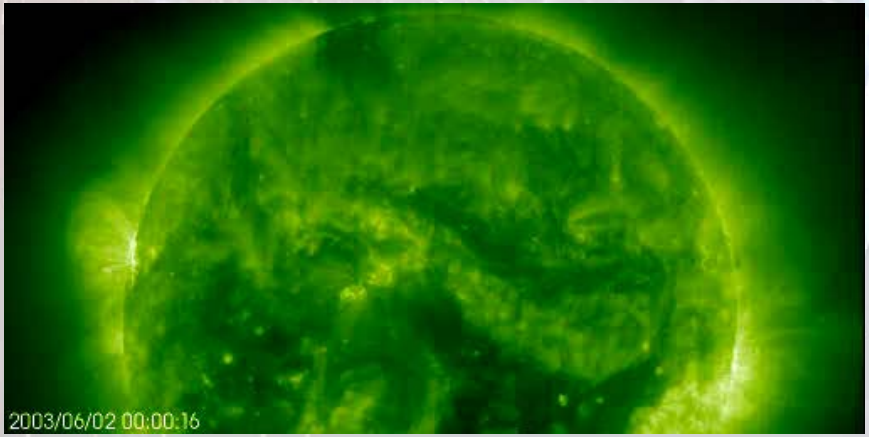
- **Development of new SWE instruments**
  - Phase C/D of the compact coronagraph (Phase A/B proposed in GSTP)
  - Magnetometer based on the SOSMAG Phase A/B
  - Phase C/D of the ESIO instrument (Phase A/B in GSTP)
  - Phase C/D of the 3DEES (Phase A/B in GSTP)
  - Phase C/D of hot plasma instrument
- **Preparation for the new SWE missions into solar wind**
  - Phase A/B1 of an L1 mission for operational solar wind monitoring and solar imaging

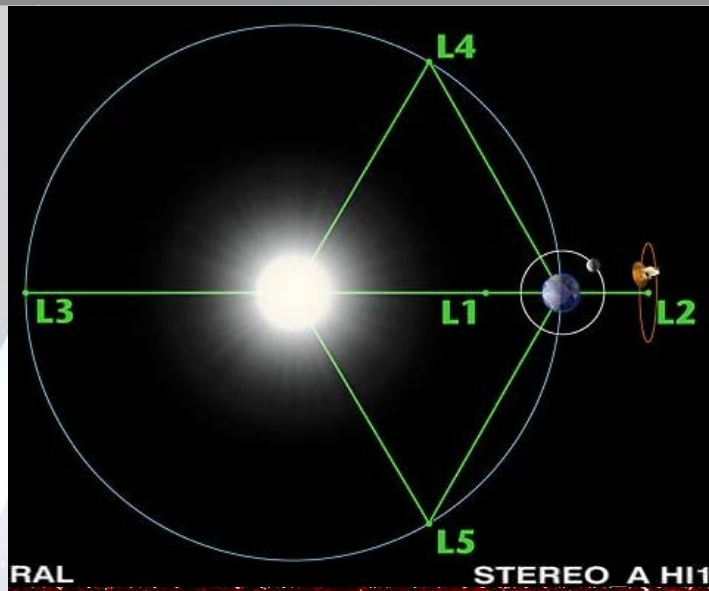
    => objective is to launch the mission by 2020
  - Phase 0 study for off-Sun-Earth-line missions to enhance SWE monitoring

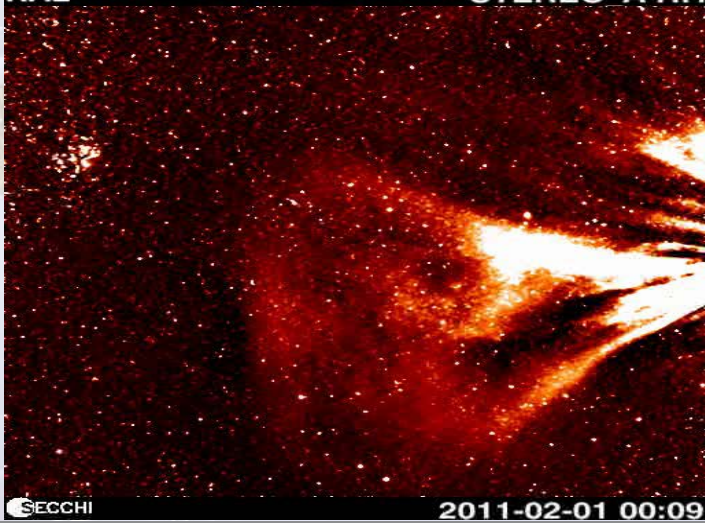
    => Cost/benefit of the enhanced system to be demonstrated

Concepts for enhanced SWE monitoring

- In-situ L1 observations are critical for consolidating the CME warnings and geoeffect predictions
- EUV imaging of the solar disc from behind the Earth (e.g. L5) => early detection of potentially hazardous active regions
- In-situ observations of particles and fields ahead of Earth (e.g. L4) gives advance information about well connected particle events (SEPs)







Workplan 2013:
SWE Service Development activities

- **ESC Definition and Development**
  - ESC profiles, roles in support of service providers, SWE data policy, data and product formats, validation and verification, ESC network approach
  - Solar Weather, Radiation environment, Ionospheric Weather, Geomagnetic Conditions, Heliospheric Weather (first new ESC)
  - Identification of critical data items, expansion of the network, new service products, workshops, updates of the roadmaps, service quality
  - Agreements to guarantee availability of critical data
- **Tailoring SWE services for the Arctic region**
  - Characterisation of requirements for the users in the Arctic region and produce a roadmap for the implementation for these services
- **Testing of SWE services during rocket launch campaigns**
  - Demonstration and user feedback of services to launch operators

Workplan 2013:
SWE Service Development activities

- **Part 2 of the Virtual Space Weather Modelling Centre**
  - Development continued based on results from Part 1
- **Advanced SWE service prototypes**
  - Utilisation of the results of FP7 service prototype developments
- **SSCC Operations and Enhancements**
  - Strengthened and pro-active interaction with end users
  - Collection of user feedback for service roadmap updates in coordination with the ESCs
  - Definition of requirements for development towards a forecasting centre
- **Space Weather Service Developments**
  - Development of new capabilities based on European building blocks

More SWE technology developments

- Heliospheric modelling techniques
- AIDA Impact Detector Phase C/D for SSA
- Next Generation Micro Debris and Meteoroid Analyser for SSA
- Standardised airborne radiation detector
- H-alpha Solar Telescope Network prototype for Applications (HASTENet)
- SWE observations in Super L1 region
- Energetic Neutral Atom Imaging for Space Environment Monitoring
- Ground-based atmospheric sounding over remote locations based on GNSS and integrated sensors in support of weather and space weather forecasting
- Solar X-Ray Monitor Proto-Flight Model and Low-Resolution Imager Design for SSA
- Wide frield Auroral Camera Phase A/B
- Cubesats for operational SWE monitoring
- Solar Earth Radio Wave Monitor – Phase A/B
- Combined Radiation Monitor Data Analysis System (CORMODAS)

Priorities for activities in 2014 – 2016?

- What user domain would require most urgent attention
  - Space systems vs. non-space systems?
  - Any specific domain urgently requiring addressing?
- Priorities in space segment
  - What would be the most critical elements of the space segment outside solar wind/IMF/coronagraph?
  - Importance of cube/nanosats in operational SWE system?
- Ground based observation systems
  - How should SSA utilise and enhance the ground based observation systems for SWE?
  - What are the most critical observation systems?
- What should be the role of SSA in supporting the developments of empirical, semi-empirical and physics based models?