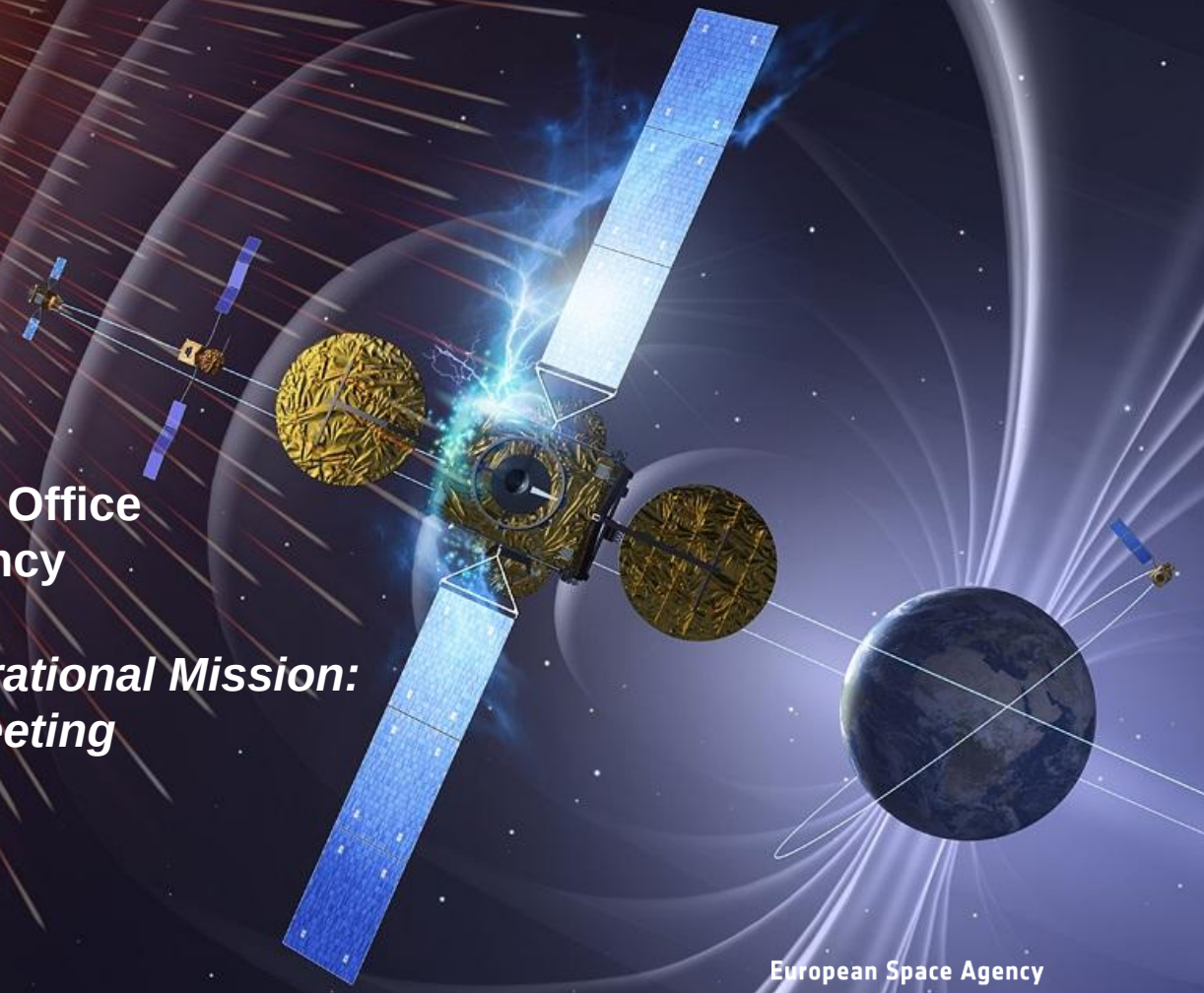
L5 mission from the perspective of the ESA SSA system



Juha-Pekka Luntama

ESA SSA Programme Office
European Space Agency

Science from an Operational Mission:
An L5 Consortium Meeting
11-14 May 2015
London, UK

ESA SSA SWE Segment Objectives

Detection and forecasting of the Space Weather events and its effects on European space assets and ground based infrastructure

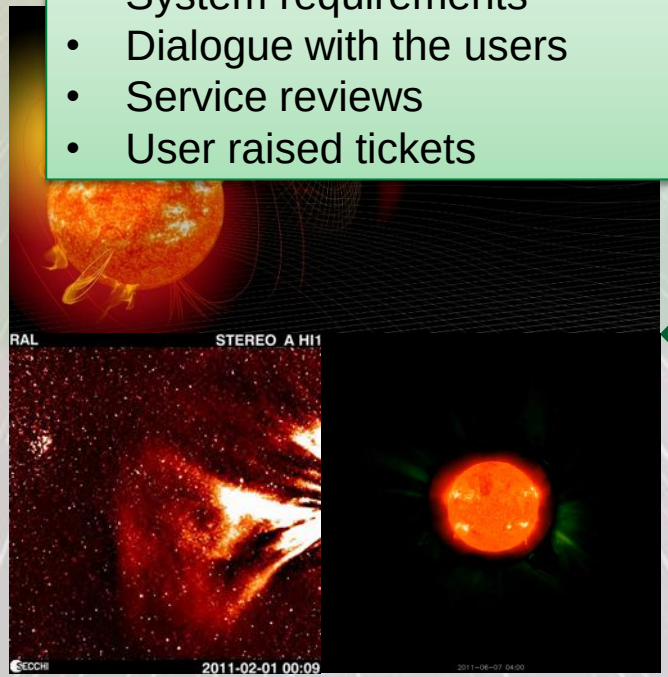
- Mission requirements
- Customer requirements
- System requirements
- Dialogue with the users
- Service reviews
- User raised tickets

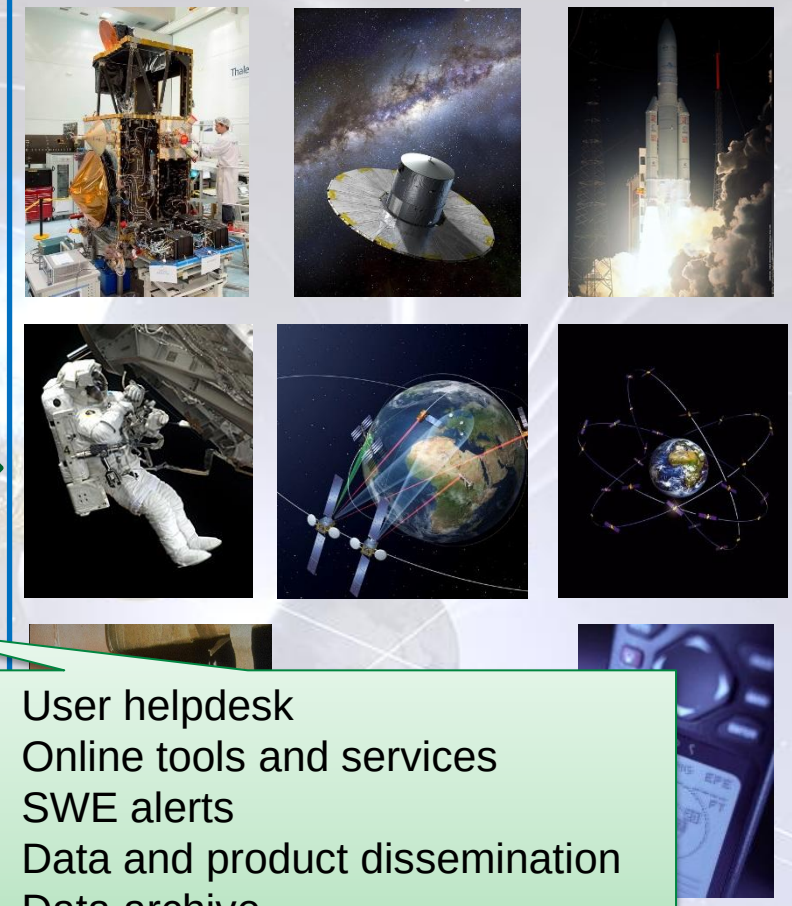
Requirements,
User feedback

SSA SWE system

Tailored
services

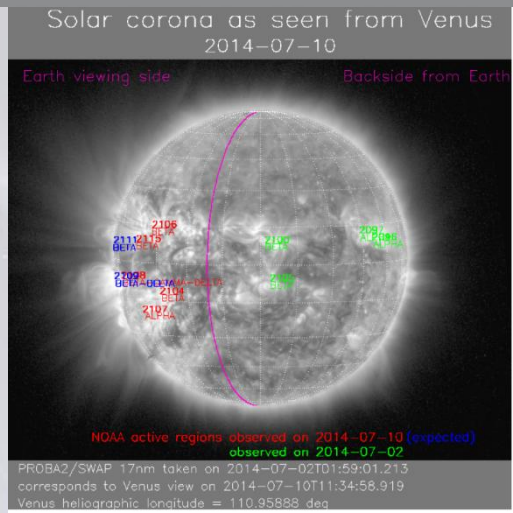
- User helpdesk
- Online tools and services
- SWE alerts
- Data and product dissemination
- Data archive
- Tailored SWE bulletins

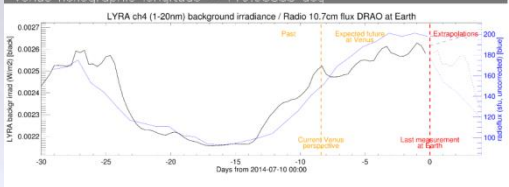


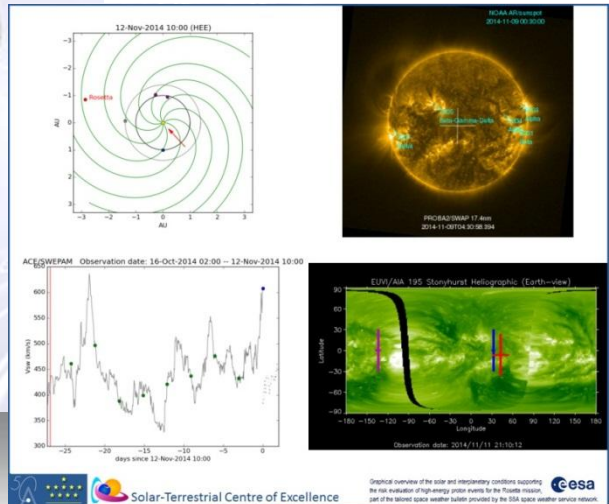


SSA SWE Customer Requirements Document

- User requirements for solar, solar wind and IMF measurements:
  - The SSA system shall provide space weather measurement data
  - Solar wind bulk velocity and density at L1
  - Interplanetary magnetic field at L1
  - Stereoscopic solar images of CMEs and CIRs
  - The SSA system shall provide near real-time monitoring of space weather including magnetic storms, substorms, high-speed streams, solar energetic particle events, Earth-directed CMEs,…
  - The SSA system shall provide alarms based on solar events
  - Forecasting of space weather and its effects







SSA SWE System Requirements
Solar and interplanetary Measurement data

Sun-Earth line	Outside Sun-Earth line
➢ EUV images	➢ EUV images
➢ White light coronagraph images	➢ White light coronagraph images
➢ Solar disk magnetic fields	➢ Heliospheric imaging of the Sun-Earth line
➢ While light solar imaging	➢ *Data on Interplanetary Medium Outside L1 - Nowcast*
➢ Solar disk magnetic fields	
➢ H-alpha images	
➢ Soft X-ray images	
➢ Radiospectrographic observations	
➢ EUV, X-ray and UV flux	
➢ In-situ proton, electron and heavy ion data at L1	
➢ IMF at L1	
➢ Solar wind bulk velocity, density and temperature at L1	

ESA SSA SWE System

SSA-SWE Users

SSA and collaborating sensor systems

Federated data archives

SSA SWE Coordination Centre
Space Pole, Belgium

SWE Data Centre

swe.ssa.esa.int

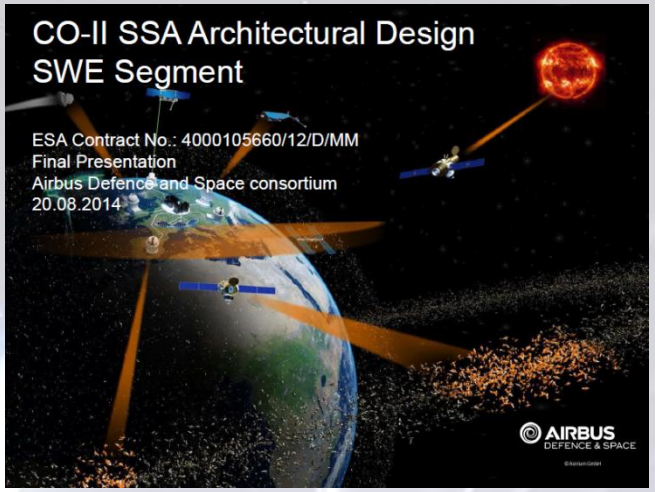
SWE Expert Service Centres

Solar Weather | Ionospheric Weather | Space Radiation | Geomagnetic Conditions | Heliospheric Weather

European expert groups and centres of excellence

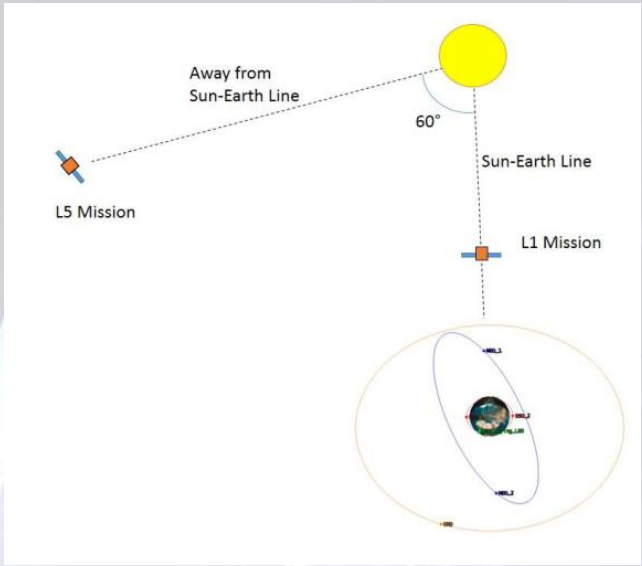
SSA SWE Architecture Definition Studies

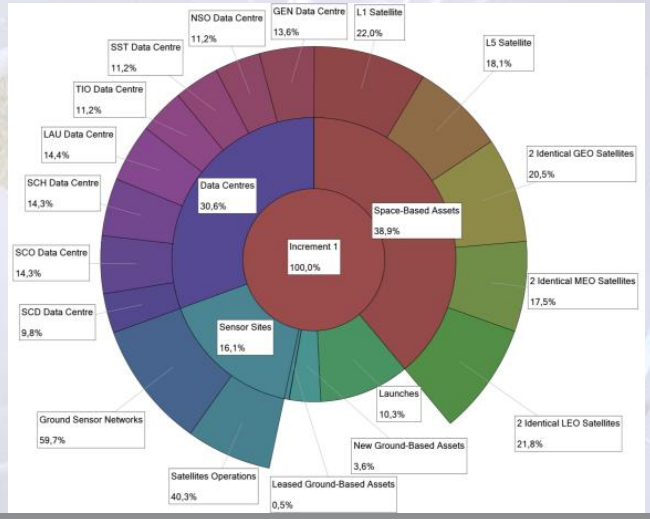
- Two parallel SSA SWE Segment architecture definition studies performed in 2012 - 2014
- Objective: Definition of a system capable of fulfilling all SWE Customer and System requirements
- Top-down approach
- Utilisation of existing assets considered in the second part of the study
- Study consortiums led by:
  - Airbus Defence and Space GmbH
  - OHB System AG



Some Results from SWE Architecture Study

- In-situ observations in L1 are mandatory for SWE services
- L5 (away from Sun-Earth line) is a potential way to improve SWE forecasting
- Candidate payloads for L5 include as minimum
  - EUV imager
  - Coronagraph
  - Heliospheric imager
  - High energy proton and ion detectors
- Analysis of the study results ongoing



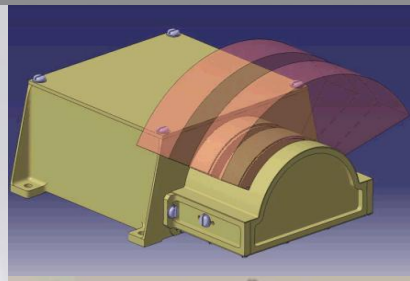


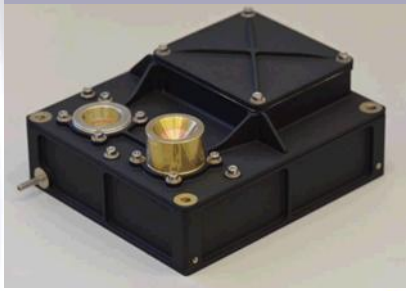
SSA SWE Space Segment Development

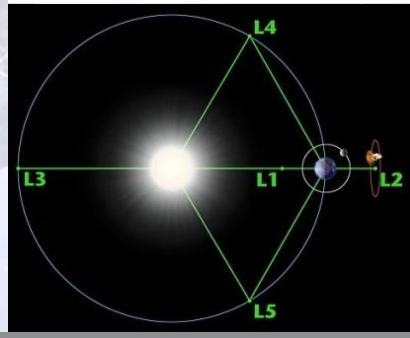
- SSA Period 2 includes activities for
  - Phase C/D developments of SWE instruments for HP missions: magnetometer, electron spectrometer, EUV imager, miniaturised radiation monitors, …
- ESA technology programmes include instrument prototyping activites e.g.
  - HOPE-M: Compact hot plasma monitor
  - 3DEES: 3-d Energetic Electron Spectrometer
  - SCOPE: Prototyping of a compact coronagraph

=> Candidate instruments for L1 and L5 missions

- Concept studies for operational SWE missions to L1 and L5 to be started shortly
  - Two parallel studies to identify mission concepts and consolidate cost estimates







SWE Segment Objectives in SSA Period 3

- **Transition towards an operational system**
  - Integration of more European SWE assets into the system
  - SLAs with service and data providers
  - Development of new services in the framework of the SWE Expert Service Centres

- **Ensured long term availability of observation data**
  - SWE space segment development
  - Implementation of the first dedicated space weather satellite mission
  - Hosted payload missions of European SWE instruments
  - International collaboration and data exchange

- **Enhancement of the underpinning science for more reliable SWE forecasting**

THANK YOU

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