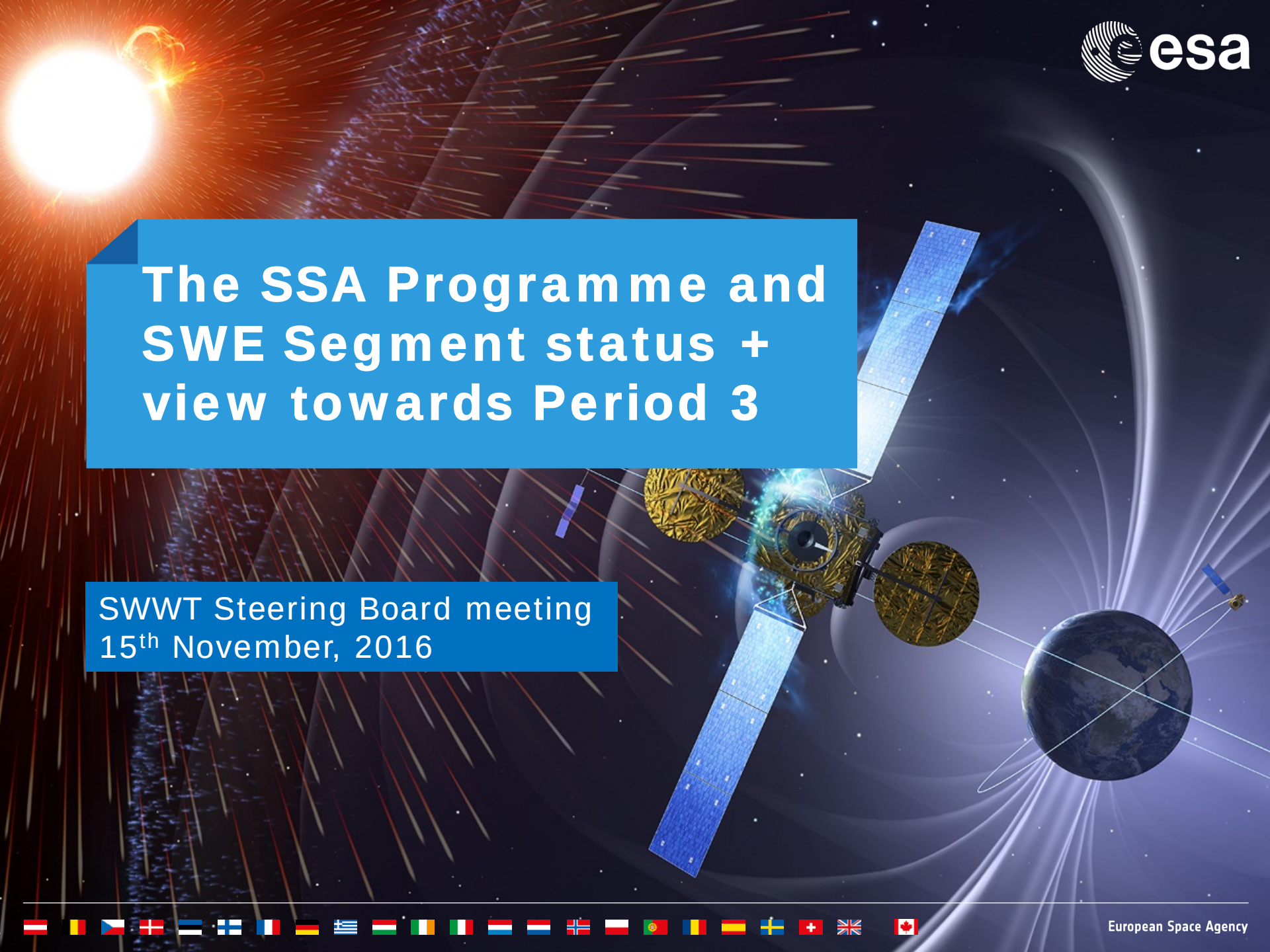
The SSA Programme and SWE Segment status + view towards Period 3

SWWT Steering Board meeting
15th November, 2016



ESA SSA Programme

- **Objective:**
  - Protection of space and ground assets against adverse effects from space
- **Three main areas or segments:**
  - Space Weather (SWE)
  - Near Earth Objects (NEO)
  - Technology R&D for Space Surveillance and Tracking (SST)
- **SSA Programme initiated in April 2008 (ESA Council, SSA Enabling Resolution)**
- **SSA Programme executed in Periods**
  - Period 1 decided at MC in November 2008 (Prep. Programme)
  - Period 2 decided at MC12 in November 2012
  - Period 3 to be decided in MC in 2016

SWE Segment Objectives for SSA Period 3

SWE Network Evolution

Continued networking:

- Pre-operational exploitation of the SWE System
- Integration of new groups and expertise
- Strengthened networking for products and data (including SLAs + KPIs)
- Verification, validation and enhancement of existing products
- New products & underpinning building blocks
- Transition towards an operational system
  => 8/5 + on-call support
- New ESC(s) TBC

Data archives

- SSA SWE Data Centre (Redu)
- Federated data repositories

SSA SWE Coordination Centre

- User Helpdesk
- Space Pole, Belgium

SWE Expert Service Centres (ESCs)

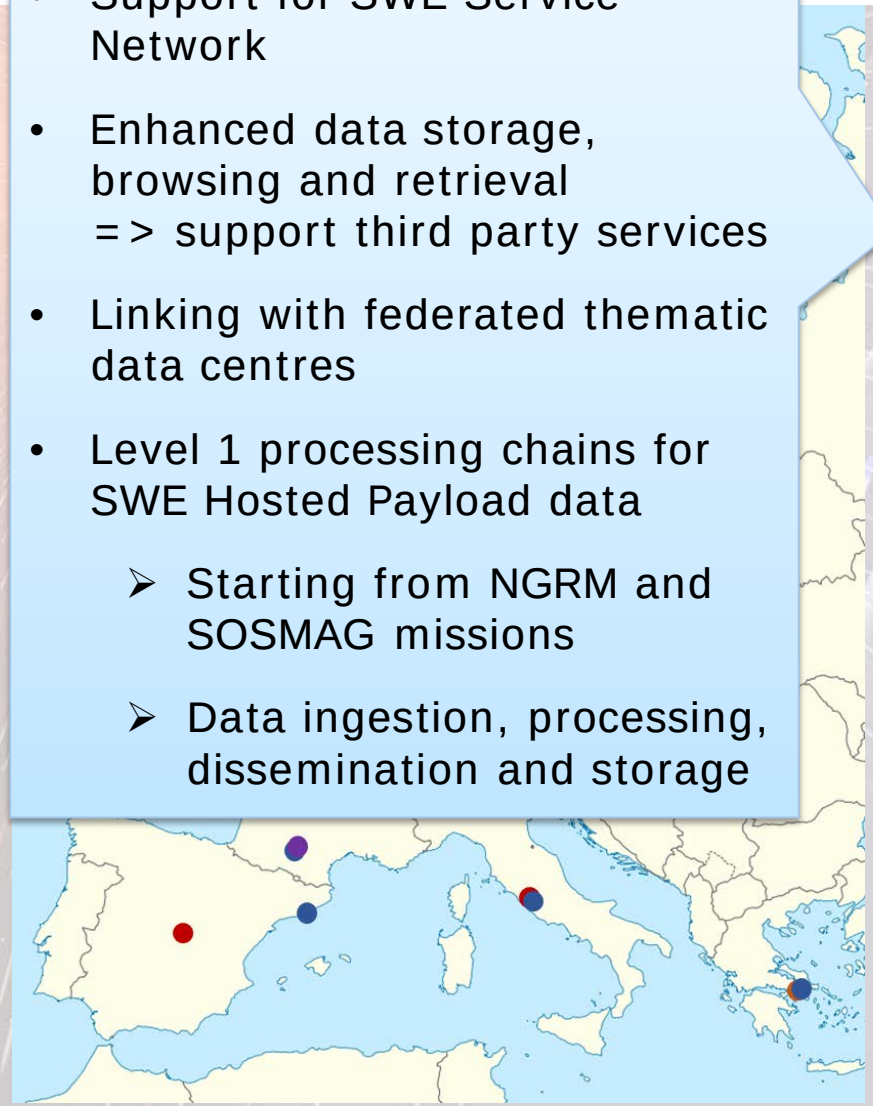
Solar Weather | Ionospheric Weather | Space Radiation | Geomagnetic Conditions | Heliospheric Weather

European expert groups and centres of excellence

Sensor systems

SWE Data Centre Enhancement

- Support for SWE Service Network
- Enhanced data storage, browsing and retrieval
  => support third party services
- Linking with federated thematic data centres
- Level 1 processing chains for SWE Hosted Payload data
  - ➢ Starting from NGRM and SOSMAG missions
  - ➢ Data ingestion, processing, dissemination and storage



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Sensor systems

SWE Data Utilisation

- Critical space & ground based data secured through SLAs
- Deployment of ground sensor to fill gaps in current networks
- Data from new missions (MTG, MetOp-SG,...)
- Agreements for data from international missions (e.g. GOES, ACE, DSCOVR, GK2A,...)
- Utilise SWE Data Centre at Redu as hub for data and product search throughout the federated network

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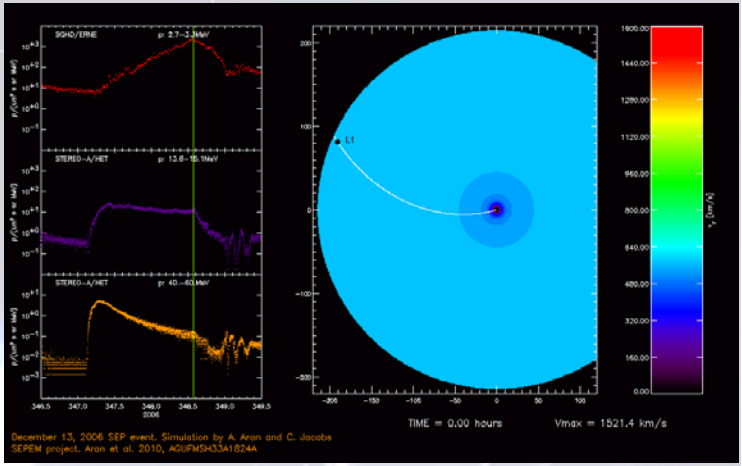
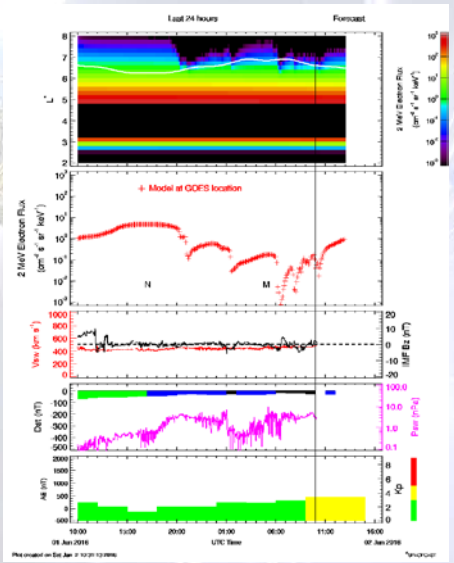
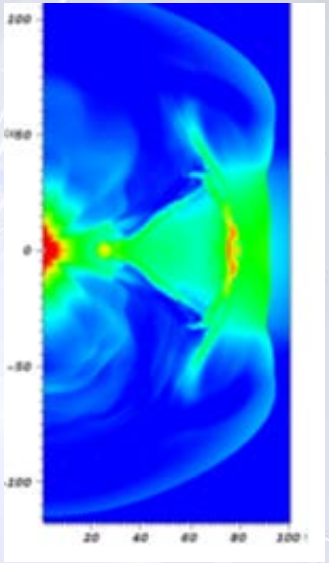
Sensor systems

SWE Service Improvements

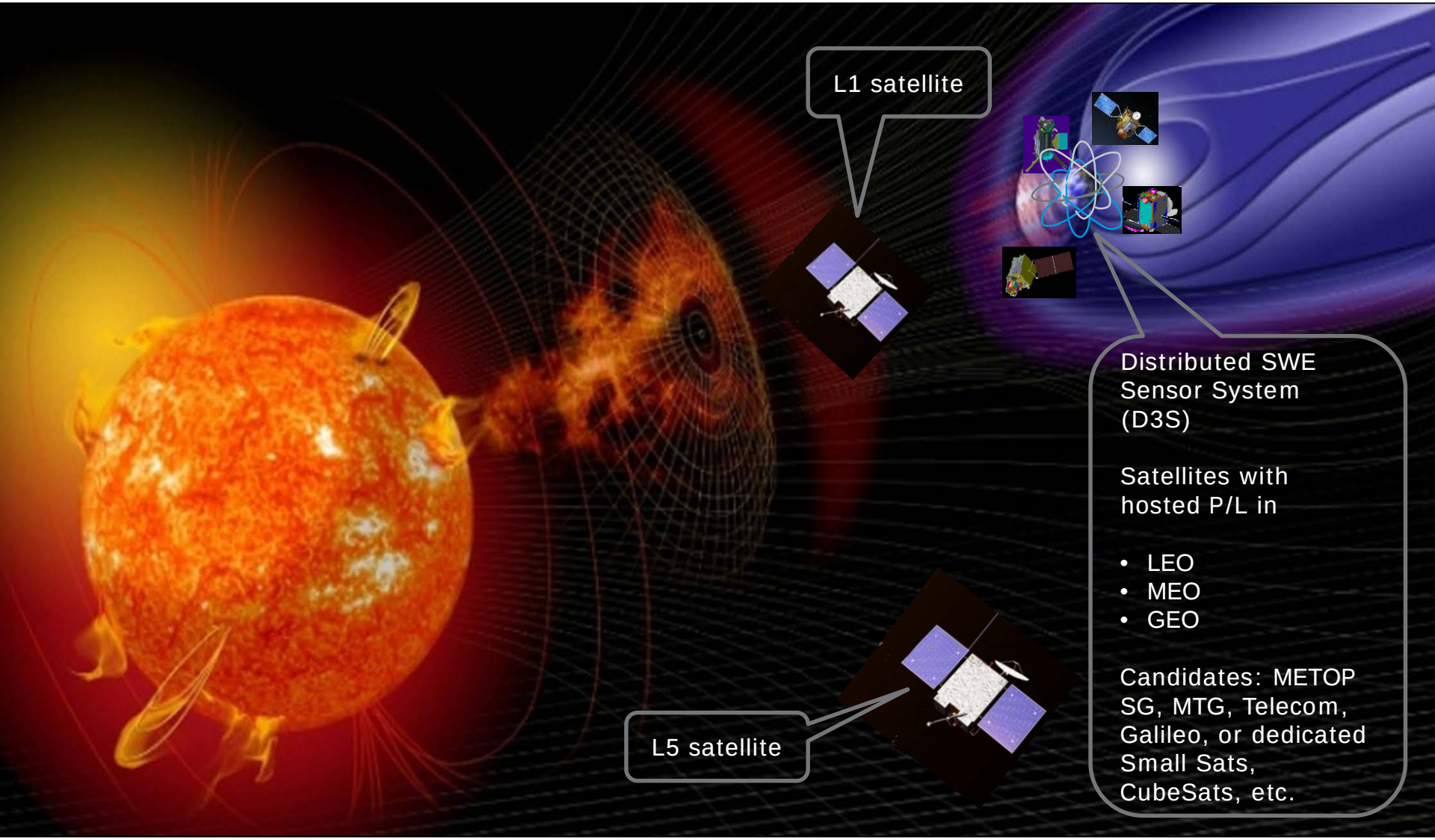
- New applications filling gaps in current service capability
- Focussed developments of services and physics-based models
  - e.g. heliospheric modelling, ionospheric scintillation
  - development of required models & tools utilising L5 mission data
  - focussed target domains and regions (e.g. power grids, Arctic region)
- ESC service benchmarking & validation
- Regular update of SWE Service Development Roadmaps





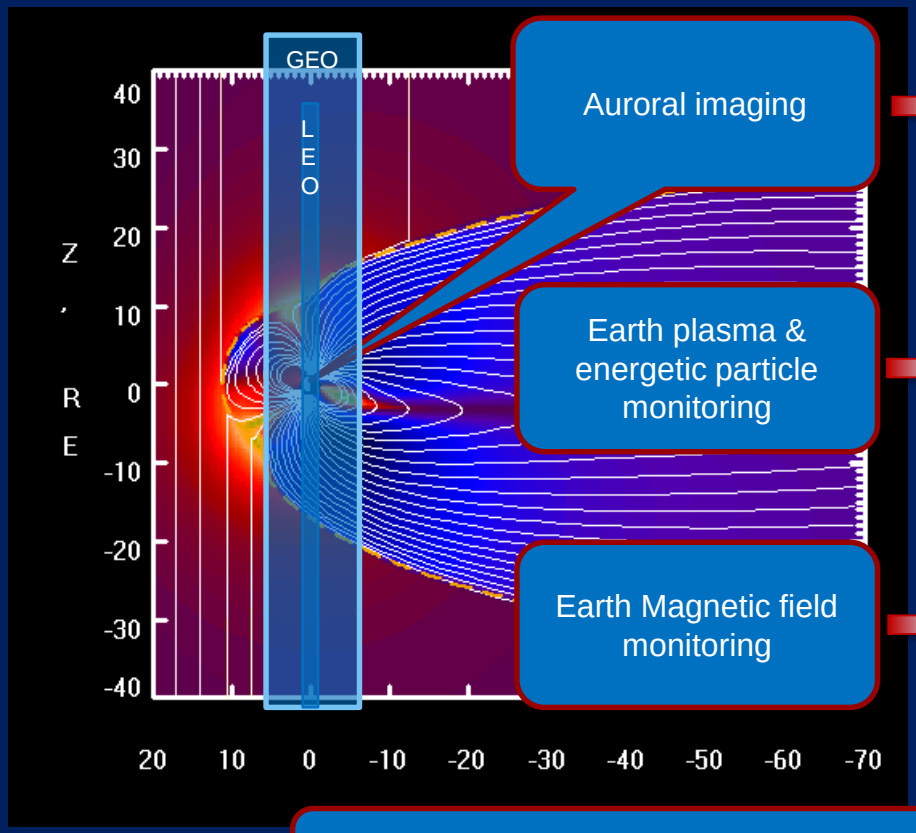


SSA SWE Space Segment architecture



SSA Distributed SWE Sensor System (D3S)

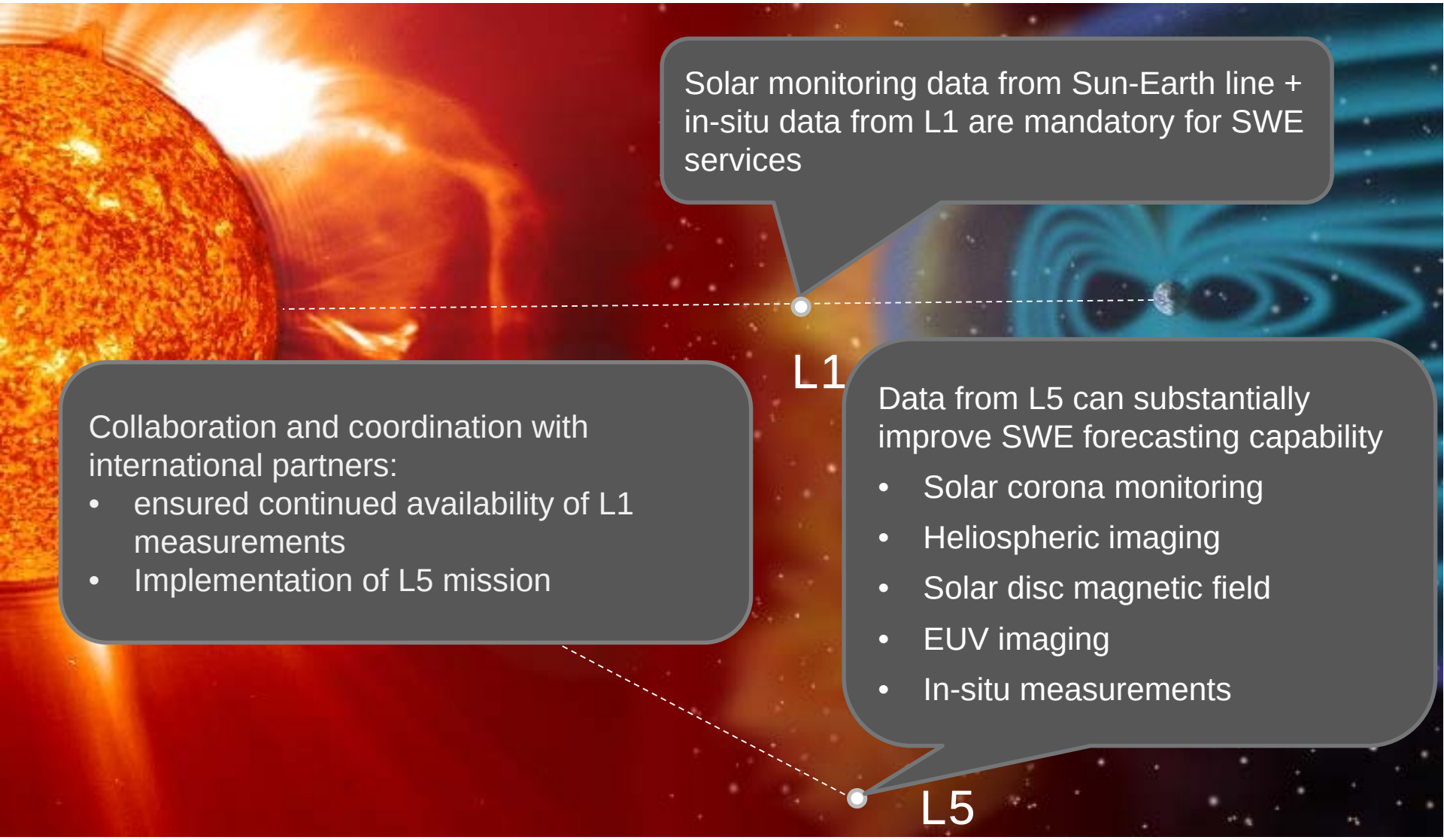
Monitoring of Earth-Sun interaction (animation used for scaling)	Observational points	D3S Sensors	D3S System Component
Auroral imaging	Polar orbit 1-2 sensor(s)	Auroral camera	MicroSat collaboration or H/P
Earth plasma & energetic particle monitoring	Multiple sensors Multiple observation positions (Airborne, LEO, MEO, GEO, HEO)	SOSMAG & NGRM MAGIC, miniature radiation monitor, GNSS receivers,... Dosimetry on aircrafts	H/P: EDRS, GK2A, MTG, METOP-SG, ELECTRA,... SWE env. mon. package on CubeSats, H/P, data from European missions Aircraft sensor system
Earth Magnetic field monitoring			



Other H/P sensors where opportune (depending on flight opportunities)
Operational D3S requires many sensors simultaneously in orbit

Development needed (mostly radiation hard)

SSA SWE Space Missions to Lagrange points



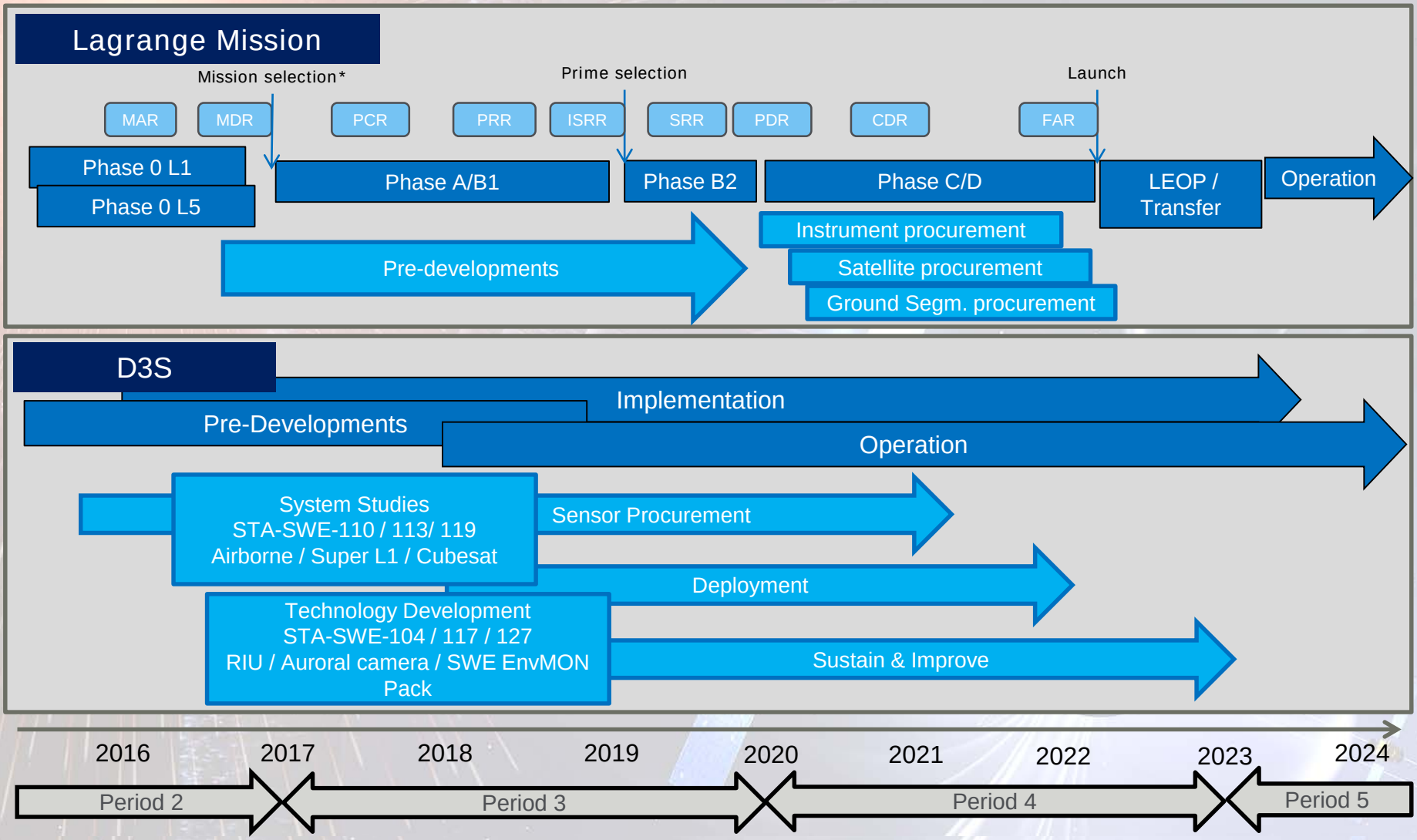
L1 and L5 Mission Mandatory Observations

L1 mission	L5 mission
• Interplanetary magnetic field	• Interplanetary magnetic field
• Solar wind plasma density, velocity and temperature	• Solar wind plasma density, velocity and temperature
• White-light images of the outer corona	• White-light images of the outer corona
• White-light heliospheric images for the tracking of Earth-directed events	• White-light heliospheric images for the tracking Earth-directed events
• Photospheric magnetic field maps	• Photospheric magnetic field maps
• Photospheric white-light images	• Photospheric white-light images
• EUV images of the chromosphere / low corona	• EUV images of the chromosphere/low corona
• Solar X-ray flux measurements	• Solar X-ray flux measurements
• In-situ fluxes of the energetic protons (1-10 MeV, >10 MeV)	
• In-situ fluxes of the low energy ions (30 keV/nuc – 1 MeV/nuc),	
• In-situ fluxes of the low energy electrons (30 keV-8 MeV)	

L1 and L5 Mission Enhancing Observations

L1 mission	L5 mission
• Solar Radio-spectrographic Observations	• Solar Radio-spectrographic Observations
	• In-situ fluxes of the low energy electrons (30 keV-8 MeV)
• Detection of 2 to 50 MeV Solar Wind Electrons	
• Measurement of 1 to 10 MeV/nuc Solar Wind Ions	
• Detection of >10 MeV/nuc Solar-wind Ions	

SSA SWE Space Segment Schedule Plan



SSA Period 3 Budget

Financial envelope	M€ (2016 e.c.)
SWE segment	76
NEO segment	30
SST segment	30
Lagrange Mission preparation	51
TOTAL	187.0

THANK YOU

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European Space Agency