



SSA PROGRAMME
SPACE WEATHER ELEMENT

“The objective of the Space Situational Awareness (SSA) programme is to support the **European independent utilisation** of, and **access to, space** for research or services, through the **provision of timely and quality data**, information, services and knowledge regarding the **space environment**, the **threats** and the sustainable exploitation of the outer space **surrounding our planet Earth.**”



- **ESA Ministerial Council
November 2008**

2009 – 2011

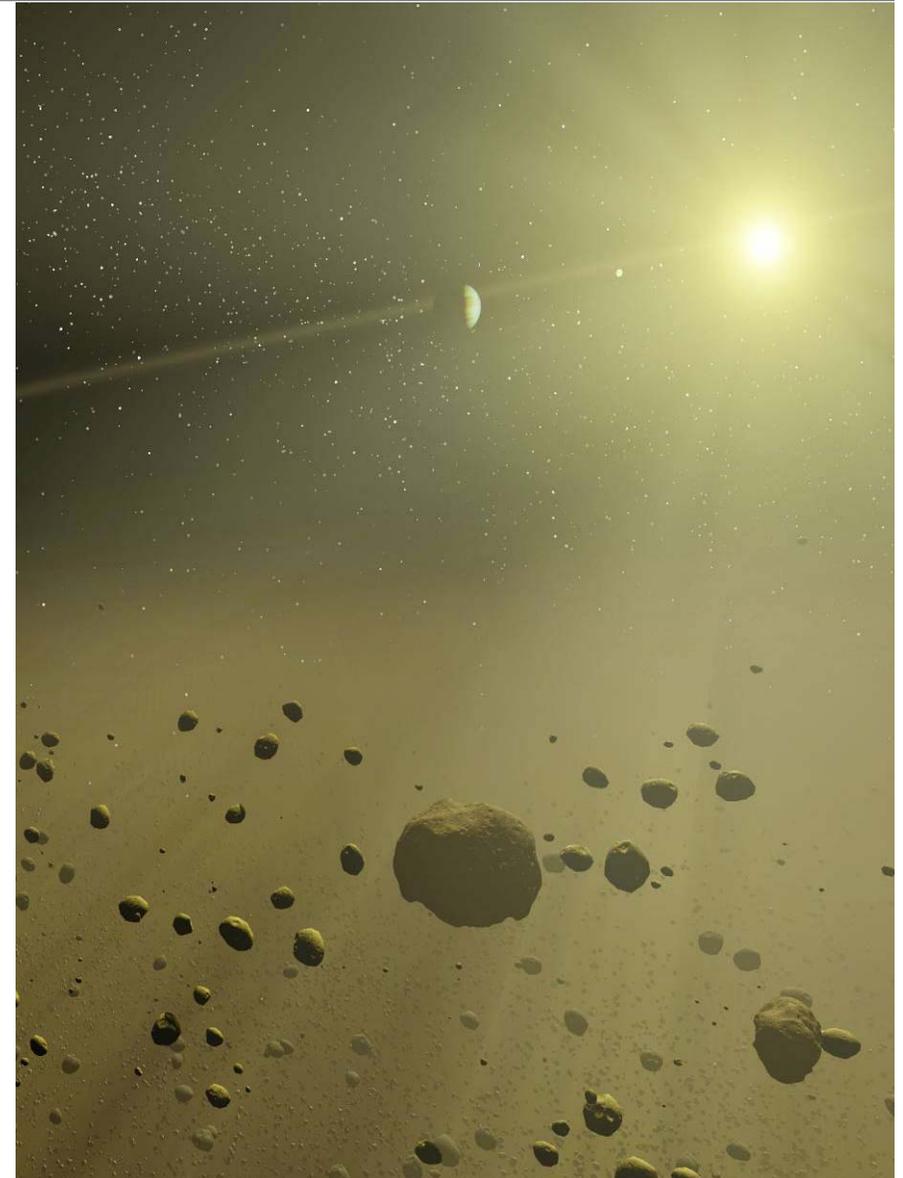
• **Preparatory Programme**

- Governance Definition
- Data Policy
- Architecture
- Federation
- Precursor Services
- Radar Breadboard
- Pilot Data Centres

2011 – 2019

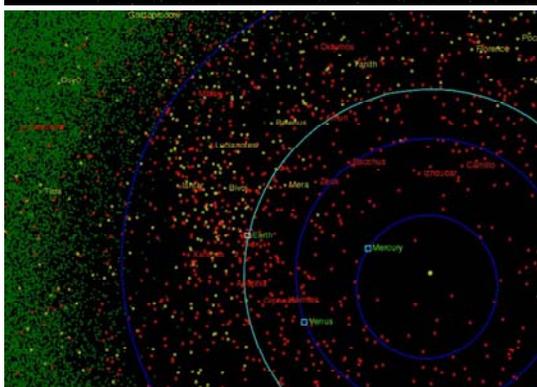
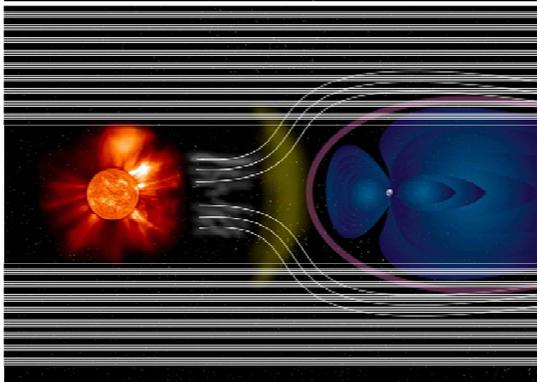
• **Operational Programme**

- Implementation of operational system



INTRODUCTION

European SSA System Elements



Space Surveillance and Tracking (SST)

- Maintain catalogue of man-made objects in Earth Orbit
- Detection, tracking, correlation and characterisation of all objects above a given size threshold for a given orbit region
- Covers LEO, MEO and GEO
- Prediction and warning of collisions and re-entry events
- Detection of on-orbit explosions, collisions and manoeuvres

Space Weather (SWE)

- Detection and forecasting of Space Weather and its effects
- Monitoring of the sun, solar wind, magnetosphere, radiation belts, ionosphere and disturbances in the geomagnetic field
- Provide SWE effect related services for designers, operators and users of spaceborne and ground based infrastructures
- Statistical monitoring of micro particles of natural or human origin

Near Earth Objects (NEOs)

- Solar system objects with orbits bringing them into close proximity with the Earth
- Includes a few thousand Near Earth Asteroids, Near Earth Comets, solar orbiting spacecraft and larger meteoroids
- Determination of the orbit state and physical parameters
- Identification and ranking of NEO collision risk with the Earth

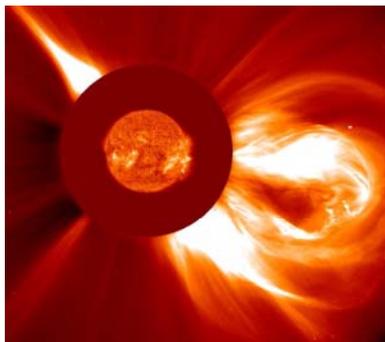
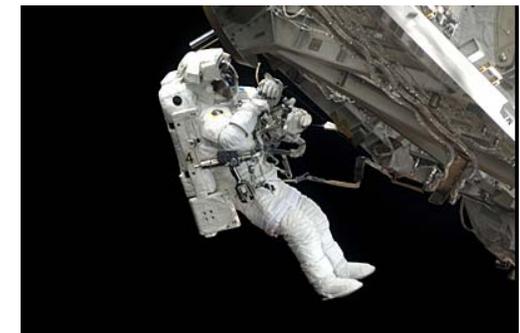
SSA SPACE WEATHER ELEMENT

Objectives



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

- Comprehensive knowledge, understanding and maintained awareness of the natural space environment
- Detection and forecasting of SWE and its effects
- Detection and understanding of interferences due to SWE
- prediction and/or detection of permanent or temporary disruption of mission and/or service capabilities
- provision of predicted local spacecraft and launcher radiation, plasma and electromagnetic environment data



1. Spacecraft designers

- Environment specification and post event analysis

2. Spacecraft operators

- In orbit environment and effects monitoring/forecasting, post event analysis, mission analysis

3. Human space flights

- In flight and cumulative crew radiation exposure, increased crew radiation exposure risk

4. Launch operators

- In flight monitoring, estimates and forecasts of radiation effects in electronics, atmospheric density forecasts

5. Transionospheric radio link users

- Real-time and forecast TEC maps, scintillation maps, ionospheric disturbances monitoring

6. Survey and tracking

- Atmospheric estimates, geomagnetic and solar indices archives and forecast for drag calculation

7. Data services

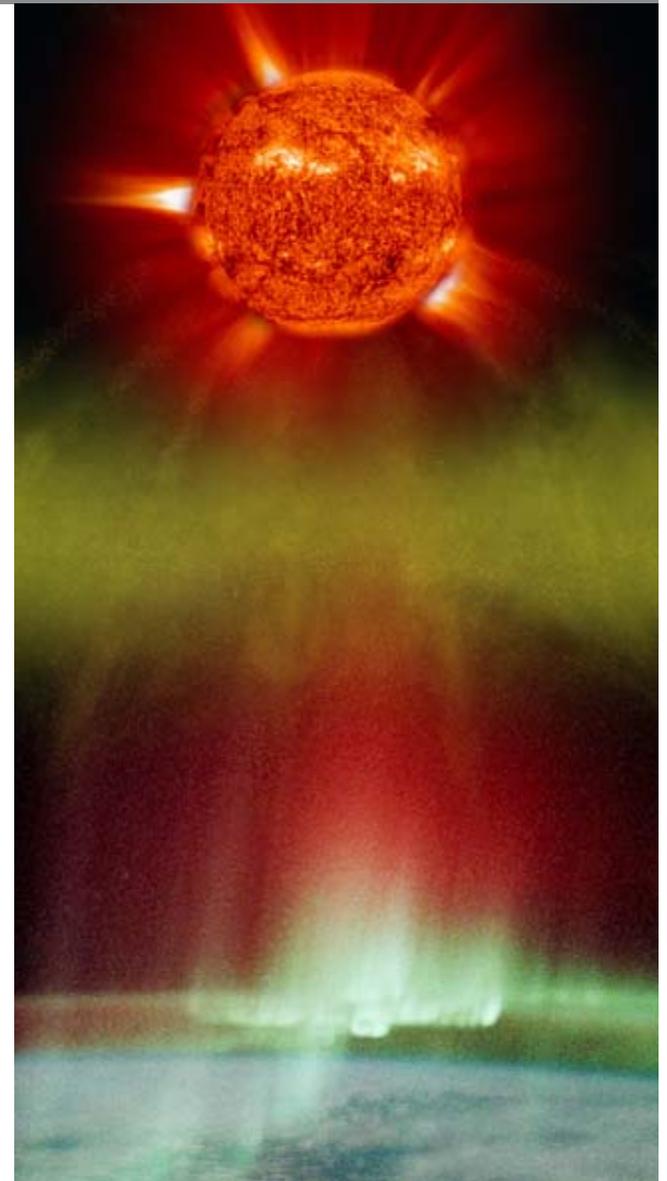
- Space weather data archive, event based alarms

8. Non Space Systems Operators

- Power systems and pipeline operators, airlines, resource exploitation system operators, auroral tourism sector

- Next solar maximum in 2013
 - New infrastructure and unprecedented number of users
 - Potential to forecast, observe and mitigate SWE events (TBS)
- Existing venues for international collaboration
 - WMO - ISES, UNCOPUOS – ISWI, ILWS
 - Space Weather Workshop, European Space Weather Week
- ESA is already working with NOAA and NASA e.g. for SOHO and ACE missions
- A winning formula (?)
 - Collaboration: Observation systems and programs, data, verification and validation campaigns, lessons learned
 - Competition: Scientific excellence, forecasting skills, model performance

=> Optimising resources, driving space weather forward





THANK YOU

European Space Agency