



National Observatory of Athens (NOA)

INSTITUTE FOR ASTRONOMY, ASTROPHYSICS,  
SPACE APPLICATIONS & REMOTE SENSING  
(formerly INSTITUTE OF ASTRONOMY & ASTROPHYSICS)  
National Observatory of Athens

# COMESSEP Project : Space Weather Impact Forecasting

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Odstrcil, D.<sup>9,10</sup>, on behalf of the COMESSEP Consortium



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<sup>5</sup>*Technical University of Denmark, Denmark*

<sup>6</sup>*National Observatory of Athens, Greece*

<sup>7</sup>*University of Central Lancashire, UK*

<sup>8</sup>*Udaipur Solar Observatory, India*

<sup>9</sup>*CCMC, NASA Goddard Space Flight Center, USA*

<sup>10</sup>*George Mason University, Fairfax*

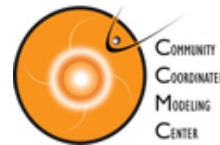
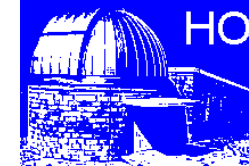
International Conference, SOLAR AND HELIOSPHERIC INFLUENCES ON THE  
GEOSPACE , Bucharest, Romania, 4 October 2012



## COMESEP: Coronal Mass Ejections and Solar Energetic Particles: Forecasting the Space Weather Impact



- ✓ The project is funded through the 7<sup>th</sup> Framework Programme of the EU (Contract No 263252) and coordinated by BIRA (Co-ordinator: Norma Crosby).
- ✓ It will combine data and knowledge from **7 European partners** and several collaborating parties from Europe and US.





# Team Members

## *Solar Energetic Particles [SEP] Teams:*

- **Institut d'Aeronomie Spatiale de Belgique, Belgium** [PI: Norma Crosby, Project Coordinator]
- **National Observatory of Athens, Greece** [PI: Olga Malandraki]
- **University of Central Lancashire, United Kingdom** [PI: Silvia Dalla]

## *Coronal Mass Ejections [CME] Teams:*

- **Universitaet Graz, Austria** [PI: Astrid Veronig]
- **Koninklijke Sterrenwacht van België, Belgium** [PI: Eva Robbrecht]
- **Hvar Observatory, Faculty of Geodesy, University of Zagreb, Croatia** [PI: Bojan Vrsnak]
- **Technical University of Denmark, Denmark** [PI: Susanne Vennerstrøm]



# External Collaborators

Associate Professor Dr. Nandita Srivastava, **Udaipur Solar Observatory, India.**

Dr. Michael Hesse, **Director of the “Community Coordinated Modeling Center (CCMC)” at NASA Goddard Space Flight Center, U.S.A.**

Dr. Dusan Odstrcil, **George Mason University, Fairfax – NASA Goddard Space Flight Center, U.S.A.**



# COMESSEP Overall Goal

To build an operational **“European Space Weather Alert system”** to forecast SEP radiation storms and magnetic storms based on risk analysis.

While many space weather forecasting projects end at the model stage, COMESSEP will go one step further by quantifying the model output in terms of magnetic storm and SEP radiation storm levels.



# COMESSEP

## BASIC SCIENCE

## MODELING

## ALERT

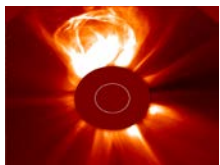
### WP1



leader **BIRA**

MANAGEMENT

### WP2



leader **HVAR**

CORONAL MASS EJECTIONS

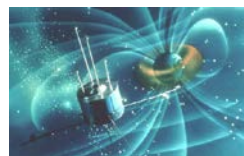
### WP3



leader **NOA**

SOLAR ENERGETIC PARTICLES

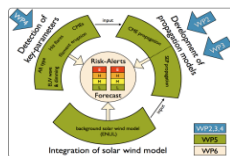
### WP4



leader **DTU**

SPACE WEATHER IMPACT

### WP5



leader **UCLan**

DEVELOPMENT OF FORECASTING METHODS

### WP6

Likelihood	Consequences				
	Minor	Minor	Major	Major	Catastrophic
Almost certain	+	+	+	+	+
Likely	+	+	+	+	+
Possible	L	+	+	+	+
Unlikely	L	L	+	+	+
Rare	L	L	L	+	+

leader **ROB**

SPACE WEATHER ALERT SYSTEM

✓ COMESSEP Project will develop a **European space weather alert system**. This will include:

- **Combination of basic research on space weather events**
  - **Optimization of the forecasting methods**
  - **Linked Alert with real-time automated CME detection**

✓ Resulting into an automated “start-to-end-service” system.



# COMESEP Overall Objectives

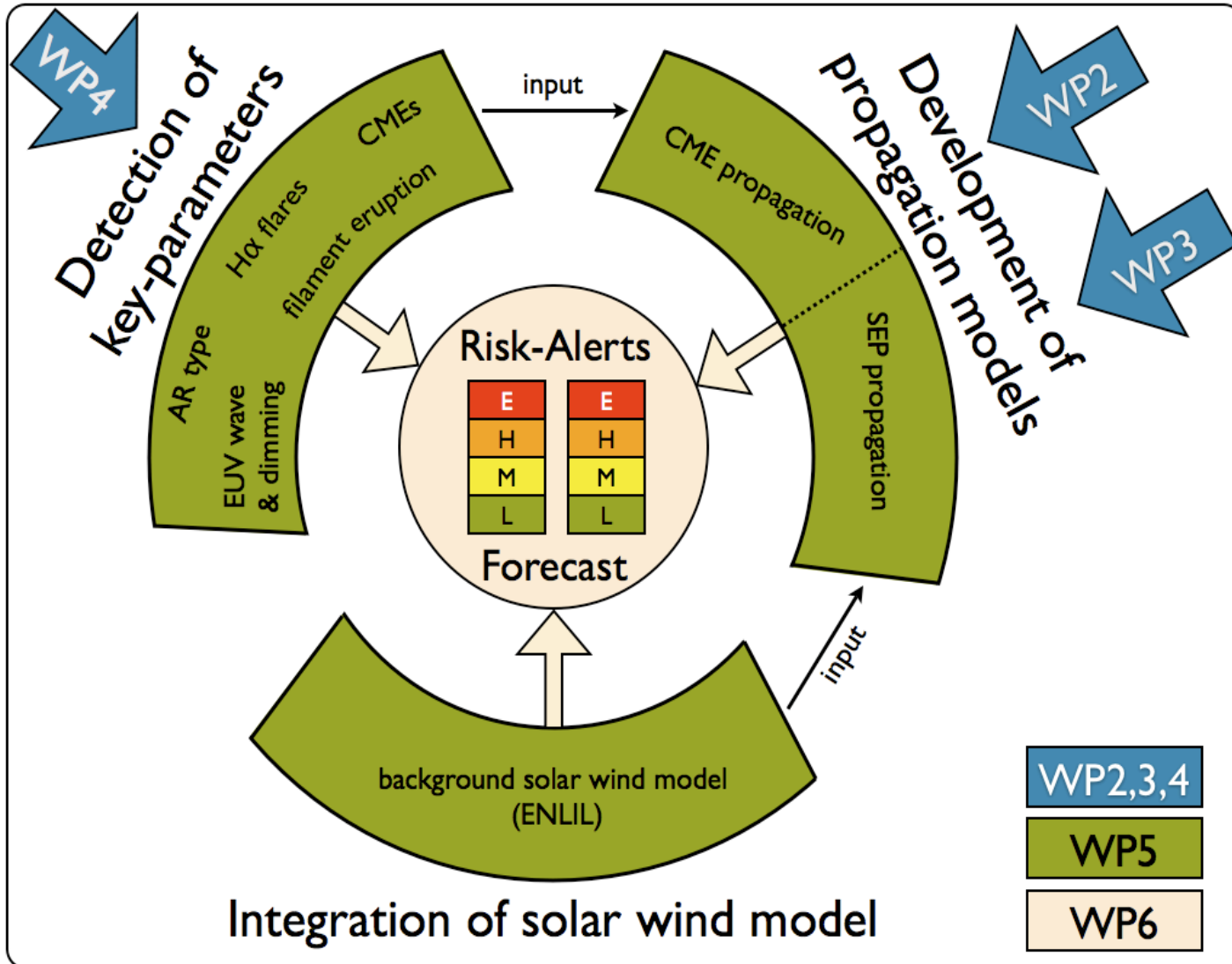
1. To develop new scientific understanding of the structure and propagation of interplanetary CMEs from the Sun to the Earth, and of the acceleration and interplanetary propagation of SEPs.
2. To carry out extensive analysis of existing data, both from solar cycle 23 and earlier.
3. To implement models of interplanetary CME and SEP propagation that capture the relevant physics (in connection with objective 1.) and are optimised for a space weather application.
4. To develop a system for automated detection of CMEs.



## COMESEP Overall Objectives *cont.*

5. To join the empirical understanding of 2.), models of objective 3.), and CME automated detection system from 4.), into a framework for space weather prediction of risks from geomagnetic and SEP storms.
6. To implement the prediction framework of 5.) into an operational space weather alert system.
7. To carry out quality assurance of the COMESEP alert system.
8. To be able to communicate between the various COMESEP automated data sources and models located at different Institutes.







## Facts & Figures:

✓ The project started in **February 2011** and will last **36 months**. The most significant milestones are planned as follows:

- **ICME and SEP forecasting tools will be implemented by August 2013**
- **Alert systems producing near real-time forecasts will be running in January 2014**
- **COMESSEP will be released in January 2014**

✓ The consortium will use the scientific results obtained in the project for the **optimization of the detection and forecasting methods for SEPs and ICMEs**.

✓ In addition the consortium will provide **SEP radiation storm and magnetic storm alerts** to the European space weather community.



## Services:

✓ **Geomagnetic and SEP radiation storm forecasts** based on the automated detection of solar activity and modeling of the evolution of the ICME and energetic particles.

✓ Illustration of the **Geomagnetic and SEP radiation storm alerts** based on the COMESEP definition of risk

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Severe
Almost certain	M	H	H	E	E
Likely	M	M	H	H	E
Possible	L	M	M	H	E
Unlikely	L	M	M	M	H
Rare	L	L	M	M	H




# COMESSEP Main Impacts

- Complement ESA Space Situational Awareness activities for security of space assets from space weather events.
- Provide a new service for vulnerable technologies in space and on the ground.
- **Cross-collaboration between the SEP, CME and terrestrial effects scientific communities.**
- Increase international and European collaboration on space weather research and forecast.
- Promote education and public outreach in space science.



# Development of the Project website

## <http://www.comesep.eu/>






You are here: [Home](#)

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### Home

## Welcome to COMESEP: forecasting the space weather impact

The FP7 COronal Mass Ejections and Solar Energetic Particles (COMESEP) project is developing tools for forecasting geomagnetic storms and solar energetic particle (SEP) radiation storms. By analysis of historical data, complemented by the extensive data coverage of solar cycle 23, the key ingredients that lead to magnetic storm and SEP events and the factors that are responsible for false alarms are being identified. To enhance our understanding of the 3D kinematics and interplanetary propagation of coronal mass ejections (CMEs), the structure, propagation and evolution of CMEs are being investigated. In parallel, the sources and propagation of SEPs are being examined and modeled. Based on the insights gained, and making use of algorithms for the automated detection of CMEs, forecasting tools for geomagnetic and SEP radiation storms will be developed and optimised. Validation and implementation of the produced tools into an operational Space Weather Alert system will be performed.

This work is receiving funding from the European Commission FP7 Project COMESEP (263252).

! - - New at Come Sep - - !



# 1<sup>st</sup> Year Progress Meeting at Athens

COMESSEP 1st Year Progress Meeting

Home Program Participants Venue Contact

## News

- FEBRUARY 6, 2012**  
The website of the COMESSEP 1st Year Progress Meeting has been launched.
- MARCH 27, 2012**  
The social program has been finalized and uploaded.
- APRIL 4, 2012**  
The COMESSEP 1st Year Progress Meeting Agenda has been finalized and uploaded.

## Relevant info

- FEBRUARY 6, 2012**  
Information on the Venue of the Meeting have been uploaded.
- FEBRUARY 8, 2012**  
Information on transport and accommodation have been uploaded today.



## COMESSEP 1st Year Progress Meeting

**ATHENS, FEBRUARY 6, 2012**  
Posted by A. Papaioannou

COMESSEP 1st Year Progress Meeting will be hosted by the Institute of Astronomy and Astrophysics at the National Observatory of Athens and it will take place in Athens from **17-20 April, 2012**. The organization of the meeting is undertaken by O.E. Malandraki and the Heliophysics Research Group.

COMESSEP project is developing tools for forecasting geomagnetic storms and solar energetic particle (SEP) radiation storms. This goal will be achieved by the analysis of historical data, the understanding of the 3D kinematics and the interplanetary propagation of coronal mass ejections (CMEs), the structure, propagation and evolution of CMEs and the development of algorithms for the automated detection of such phenomena together with forecasting tools for geomagnetic and SEP radiation storms. The implementation of the produced tools into an operational Space Weather Alert system is also foreseen.

COMESSEP is a collaborative project that brings together experts from seven European institutes and three external collaborators from U.S.A. and India. Further info can be found [here](#).

This project has been receiving funding from the European Commission FP7 Project COMESSEP (263252).

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## Co-operation with other projects/programmes

- **FP7 AFFECTS [Advanced Forecast For Ensuring Communications Through Space] project**
  - **FP7 SEPServer [Solar Energetic Particle Server] project**
  - **FP7 HELIO [Heliophysics Integrated Observatory] project**



## **Space Weather Research at NOA within the COMESEP FP7 Project: The Solar Energetic Particle Perspective**

- ✓ Impact of the large-scale IMF structure on SEP profiles  
Reflecting boundaries - Reservoir effect
- ✓ Consistency of path lengths traveled by solar e and ions in GLEs –  
possibility to predict the duration of high-energy proton events
  - ✓ First detailed examination of the elemental spectra and  
composition in ‘Reservoir’/‘Invariant Spectrum’ Regions
- ✓ Initial Fe/O enhancements in Large, Gradual, SEP events:  
Observations from Wind and Ulysses

**Invited talk, Thursday 11:00-11:30, Session 4**