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# **PROGRESS**

## **PRediction Of Geospace Radiation Environment and Solar wind parameterS**

Project Overview

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# Overview

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- Status
- Deliverables/Milestones
- Dissemination
- Risks
- Amendment to DoA
- WP highlights

# Status summary

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## 2<sup>nd</sup> Review Meeting (2016-01-01 to 2016-12-31)

### Deviations from work plan

- There have been no deviations from the work plan
- No potential future deviations have been identified.
- Schedule proceeding as defined in DoA, no update is necessary

### Ethical issues

- No ethical issues were identified
- No ethical issues are expected to arise during the next reporting period

### IPR

- No IPR issues have been raised.

# Status summary

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## 2<sup>nd</sup> Review Meeting (2016-01-01 to 2016-12-31)

### Use of resources

- There have been no changes in the use of project resources
- As outlined in the DoA, UW did purchase a multiprocessor computer on which to develop/run the combined AWESoM/SWIFT solar wind model
- Permission was sought for attendance at conferences/workshops not listed in the DoA

### Dissemination/exploitation

- Project members have or are in the process of publishing 10 papers in peer reviewed scientific journals in the current reporting period (project total 22)
- 25 presentations at conferences/workshops have been made (total 55)

### Deliverables/milestones

- All deliveries made on time
- Current milestones met to some degree

### Risks

- No new risks were encountered
- One risk situation arose, participant changed institution
- None identified for next year

# Deliverables list (new)

- New deliverables submitted according to schedule in GA
- All deliverables available from
  - EC participant portal
  - Project web site (project only section)

	Title	Due	Delivered
D1.1	Minutes of first stakeholder meeting	2016-02-29	2016-02-25
D2.2	The coupling of the AWESoM and SWIFT models	2016-08-31	2016-08-31
D3.4	KP and Dst Models	2016-12-31	2016-12-25
D4.4	Final versions of statistical wave models	2016-12-31	2016-12-31
D5.2	Incorporation of VERB diffusion coefficients into IMPTAM	2016-12-31	2016-12-31
D8.2	Exploitation and dissemination plan	2016-12-31	2016-12-22

# Deliverables list (resubmitted)

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As a result of the first review meeting, some deliverables were requested to be updated. These changes were made according to the schedule set at that meeting.

D3.3, which was not delivered during the first reporting period (due date 2015-09-30) was finally delivered in February 2016.

All deliveries for the first reporting period (2015) have now been accepted.

	Title	Due	Delivered
D3.1	Existing KP, Dst , and AE models	2015-03-31	2016-02-29
D3.3	Model verification	2015-09-30	2106-02-29
D4.1	Data availability	2015-02-28	2016-02-29
D4.2	Database of emissions	2016-06-30	2016-02-29
D5.1	Solar wind driving of low energy electrons in the plasmashet	2015-12-31	2016-02-28

# Deliverables due soon

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## D1.2 Minutes of second stakeholder meeting

Participants: USFD

Due: Feb, 2017 (Month 26)

## D5.3 Report on VERB-IMPTAM low energy seed population provided to VERB radiation belts model

Participants: FMI, GFZ

Due: Feb, 2017 (Month 26)

## D6.2 Journal paper, ready for submission, on the results data assimilation technique incorporation into VERB code model

Participants: GFZ, FMI

Due: Feb, 2017 (Month 26)

## D3.5 TN on AE models

Participants: IRF, USFD, SRI

Due: Jun, 2017 (Month 30)

## D6.3 Journal paper, ready for submission, on the results VNC model and two methods of model couplings

Participants: USFD, GFZ, FMI

Due: Jun, 2017 (Month 30)

## D7.1 The results of individual forecasts of geomagnetic indices

Participants: USFD, IRF

Due: Jun, 2017 (Month 30)

## D7.3 Forecasts of the energetic electron populations along a user selected satellite orbit

Participants: USFD, GFZ, FMI

Due: Jun, 2017 (Month 30)

# Milestones

#	Title	WP	Due	Completed
MS1	NARMAX models for electrons at GEO	WP 6	M6	100% - Results available on web
MS2	Availability of models for Kp, Dst, and AE	WP 3	M18	60% Model results available on web
MS3	Statistical wave models	WP 4	M24	90% - Models on request
MS4	Fusion of VERB and IMPTAM	WP 5	M24	
MS5	Availability of AWSOM/ SWIFT for testing within the consortium.	WP 2	M20	100% - Models are available on request
MS6	Fusion of NARMAX and VERB	WP 6	M30	



# Dissemination

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## **There have been 9 papers published in high impact, peer-reviewed journals**

Nature Communications, J. Geophysical Research (Space Physics), J. Atmospheric and Solar Terrestrial Physics, and Space Weather.

## **Four accepted for publication**

Astrophysical Journal, Geophysical Research Letters

## **One under review**

Journal of Space Weather and Space Climate.

This brings the total number of journal publications to 23.

Papers are listed on the project web site

<https://ssg.group.shef.ac.uk/progress/html/dissemination.phtml> together with a link to publishers web site and usually a PDF.

# Dissemination

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There have also been 25 oral/poster presentations at scientific conferences.

**EGU General Assembly**, Vienna, Austria, 18-22 April 2016

**13th European Space Weather Week**, Oostende, Belgium, 14-18 November, 2016

**AGU Fall Meeting**, San Francisco, USA, 12-16 December 2016

**COSPAR** Turkey. However, this meeting was cancelled.

**Other conferences/workshops attended are as follows:**

**Dynamical Processes in Space Plasmas**, Ein Bokek, Israel, 3-10 April 2016.

**8th CCMC Community Workshop**, Annapolis, Maryland, USA, 11-15 April 2016

**SSA Space Weather Service Network Thematic Workshop**, 10 May 2016

**ISROSES III**, Golden Sands, Bulgaria, 11-16 September 2016

**4th Cluster and THEMIS workshop**, Palm Springs, California, 7-12 November, 2016

PDF file of presentations are listed on the project web site <https://ssg.group.shef.ac.uk/progress/html/dissemination.phtml>.

# Dissemination reminder

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## It is stated in the Grant agreement that

### 29.4 Information on EU funding — Obligation and right to use the EU emblem

Unless the *[Commission][Agency]* requests or agrees otherwise or unless it is impossible, any dissemination of results (in any form, including electronic) must:

- (a) display the EU emblem and
- (b) include the following text:

*“This project has received funding from the [European Union’s Horizon 2020 research and innovation programme][Euratom research and training programme 2014-2018] under grant agreement No [Number]”.*

e.g.

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 637302.

# Risks

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## Participant moves to a different institution (low)

- Participant at SkolTech moved to GFZ.
- Triggered 2 amendments
  - Termination of Skolkovo Institute of Science and Technology (completed)
  - New beneficiary GFZ (ongoing)

This has not interrupted the work schedule.

There were no late deliveries due to this move.

# Changes to DoA

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## 2<sup>nd</sup> change to the DoA

- Movement of participant (Y. Shprits) from Skolkovo to GFZ

## An amendment to the DoA is currently being

- Addition of new beneficiary – GFZ
- DoA Annex 1 Part B has been updated
- Budget for GFZ limited remainder of Skolkovo funding
- GFZ have proposed budget allocation that has been added
- Currently forwarded to Project Officer for comment.

# Feedback

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## External reviewer

- Following the first review meeting feedback was received from our external reviewer. All points raised were answered.
- Deliverables were updated based on specific comments

## Stakeholder Committee

- No specific points were received from the members of the Stakeholder committee who were present at the meeting
- Comments answered in meeting minutes of Stakeholder meeting

# WP highlights and achievements

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## WP 2

The thermal modelling of the lower corona was improved

- AWSoM by solving for reduced turbulence MHD model from 1 to 1.15 Solar radii.
- Thermal conduction used to predict MHD variables needed to simulate out to 30 Solar radii

Beyond ~30 Solar radii SWIFT takes over the modelling

- full super-stepping thermal conduction model (Spitzer-Harm conductivity)

Finally for 2016 the coupled AWSoM/SWIFT model has been run on historical GONG data to predict solar wind parameters at 1 A.U. The first samples of this data was presented in Deliverable D2.2 in August 2016.

# WP highlights and achievements

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## WP 3

- New forecast models for Kp and Dst are now available. Described in D3.4 finalized on Dec 23, 2016. (Reported in D3.4, delivered 22 December)
- Analysis and development of AE forecast model, also studying related AU and AL indices. Models will be complete by mid 2017 according to schedule.
- Database and REST service to access solar wind data and indices have been developed and implemented.



# WP highlights and achievements

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## WP 4

- New set of statistical wave models derived based on the result of previous tasks in this work package
- Reported in D4.4, delivered 31 December

# WP highlights and achievements

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## WP 5

- Diffusion coefficients (used in the VERB model) that characterise the electron environment of the radiation belts have been incorporated into IMPTAM.
- Reported in D5.2, delivered 31 December

# WP highlights and achievements

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## WP 6

- Data assimilation routines have been added to the VERB code
- A version of the VERB code is used in conjunction with the NARMAX flux predictions for forecasting the high energy electron environment is under development

# WP highlights and achievements

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## WP 7

- Current results for the forecast of electron fluxes based on NARMAX models (WP 6), IMPTAM (WP 5), and VERB (WP 6) have been included on the PROGRESS web site.
- The results from neural network based models for the forecast of the geomagnetic Kp and Dst indices have been included on the PROGRESS web site.
- Ongoing developments include
  - access to the statistical wave models (WP 4),
  - panel showing the current space weather conditions.Prototypes on the PROGRESS test web site.