

# A Space Weather Strategy for Europe

Meeting Convened by the

## Space Weather Working Team Steering Board

3<sup>rd</sup> October, 2007. ESA Headquarters, Paris

### Attendees

A. Glover, ESA, TEC-EES  
M. Hapgood, STFC/RAL (SWWT Chairman)  
D. Southwood, ESA, D/Sci  
M. Coradini, ESA, D/Sci  
R. Warnant, RMI  
D. Berghmans, ROB  
R. Van der Linden, ROB  
N. Crosby, BISA  
N. Parmentier, BISA  
W. Verschueren, BELSPO  
P. Roman, CDTI  
J. L. Bougeret, CNRS, Obs. Paris LESIA  
B. Sanahuja, Univ Barcelona  
S. Esteve, INTA  
P. Perol, ESA, TEC-E  
H. Opgenoorth, ESA, D/Sci  
R. Marsden, ESA D/Sci  
H. Koskinen, Univ Helsinki  
P. Brekke, Norwegian Space Centre  
A. Hilgers, ESA TEC-EES  
R. Horne, BAS  
R. Tremayne-Smith, BNSC  
A. Belehaki, NOA  
N. Jakowski, DLR  
R. Carter, UK Met Office  
J. J. Valette, CLS  
F. Alby, CNES  
J. Y. Prado, CNES  
M. Dinguirard, ONERA  
L. Eliasson, IRF  
H. Lundstedt, IRF  
L. Del Monte, ESA, DG-PS  
E. Duhammel, ESA, DG-PS  
V. Gomez, ESA, SCI-O

### Apologies

E. Daly, ESA, TEC-EES  
B. Arbesser-Rastburg, ESA, TEC-EEP  
R. Ecoffet, CNES  
G. Campan, CNES  
I. Daglis, NOA  
P. Gallagher, Trinity College Dublin  
T. Mendonca, IST Lisbon  
L. Nordh, SNSB  
J. Liliensten, LPGrenoble, COST724  
T. Howell, EC Space Policy Unit  
A. M. Johansson, EC Research Infrastructures

## 1. Welcome

D. Southwood welcomed attendees to the meeting and to ESA. M. Hapgood welcomed the group on behalf of the SWWT and explained the scope of the meeting as being to discuss possible future ESA action on Space Weather within the framework of Space Situational Awareness.

## 2. SW within a wider European Space Situation Awareness Programme – D. Southwood

D. Southwood presented the overall picture of Space Situational Awareness (SSA) within the Agency, describing this as a concept that has grown out of an increasing dependence on space systems in areas such as telecoms, navigation and surveillance. It was noted that SSA could be one way to provide a coherent framework through which existing Space Weather expertise and activities could be coordinated.

At the present time it is proposed to introduce a proposal for a new ESA Optional Programme for Space Situational Awareness at the next ESA Ministerial Council meeting in 2008.

Space Weather is currently seen as one of three main elements required for a SSA proposal:

- survey, tracking,
- imaging
- Space Weather (space environment monitoring)

It was noted that any Space Weather element must be coherent with the wider SSA proposal.

D. Southwood recalled that the aim of the meeting is to present this possible opportunity to the Space Weather community and gauge the level of support for including Space Weather as part of a wider SSA proposal.

## 3. Policy Discussion – Comments by L. del Monte.

Space Weather is not seen only as a separate element of a SSA activity, but is understood to also be integrated into the other elements of the proposal in terms of supporting data.

A prospective user representative group has been set up in order to advise ESA on the studies. It was agreed that the chairman of the SWWT would be invited to participate in the SSA user group. The user group is able to make recommendations to ESA, but it was stressed that national participation needs to be secured in parallel.

**AI/1 MAH Raise awareness of Space Weather issues within the SSA User Group**

It was noted that SSA is gaining momentum within Europe. An EU security meeting held in Berlin in June 2007 identified the need for an independent SSA capability in Europe. It was noted that the intention of the SSA activity as a whole is a re-grouping of existing assets with the aim of exceeding a critical mass for sustainability.

The ESA SSA activity is looking at SSA at a European level. During the December council meeting 2007, a document will be presented relating to SSA which includes an element of Space Weather. If the reaction is supportive, there will be a request in 2008 for the legal tool that will allow the creation of a Potential Participants' Board.

It was asked whether defence is the main driver of the SSA activity in Europe. L. del Monte commented that it is a community that is involved, but it is not the main driver.

#### 4. Current Space Weather Landscape – M. Hapgood

M. Hapgood gave a short review of the current Space Weather landscape. It was explained that the Space Weather Working Team is an open forum for experts working in the area of European Space Weather applications and related science with the key goals of information exchange, investigating requirements, services and underpinning R&D. They are also active in promoting the development of operational Space Weather capabilities in Europe. This meeting is convened by the SWWT Steering Board which consists of national representatives and has the task of advising ESA on the next steps to take in Space Weather. The role of other groups was discussed including European networks of centres such as the SEENoTC (Space Environments and Effects Network of Technical Competences) and COST actions. Key activities that currently support the community are the ESA Space Weather Applications Pilot Project SWENET network of services, COST Actions 724 and 296 together with the DIAS (Digital Upper Atmosphere Server) project and the European Space Weather Week annual conferences.

#### 5. The Space Weather Applications Pilot Project – A. Glover

A. Glover reported on the ESA Space Weather applications initiative and the recent Space Weather Applications Pilot Project. It was noted that the resulting SWENET (Space Weather European Network) service networking activity and web portal is currently operational (see: <http://www.esa-spaceweather.net/swenet>). Most individual service development activities that were developed in the context of the Space Weather pilot project have found additional non-ESA funding to continue in the short term and are also operational. In parallel, the independent cost and benefit analysis element of the pilot project concluded a positive business case for Space Weather services. An independent review of the study outcomes is currently planned.

W. Verschueren enquired as to the future prospects for the SWENET network. A. Glover replied that the network is currently operational and supported at a maintenance and limited development level. However, long term support needs to be identified.

## 6. COST Action 724. A. Belehaki

A. Belehaki reviewed the main goals and outputs of the COST Action 724: Developing the Scientific Basis for Monitoring, Modelling and Predicting Space Weather. It was noted that the existing COST action 724 is about to conclude. The final report will be available shortly.

It was noted that a proposal for a further Action focussed on Space Weather has been submitted to the COST office. This Action is expected to focus more towards developing Space Weather products and services in Europe with the title “Developing Space Weather Products and Services in Europe”.

Possible overlap between the proposed activities of the new COST action and those of the ESA Space Weather applications pilot project were discussed. A. Glover pointed out that there are a number of areas where the two activities could be complementary. The increased capacity to include service related activities in new EU Member States being a good example. A. Hilgers also noted that it wasn't possible to cover all service areas within the scope of the pilot project and new services and products are always needed. It was agreed that potential integration with SWENET will be discussed. A. Belehaki noted that, if the proposal is successful, all developments would be carried out with the agreement of the SWWT.

## 7. COST Action 296. A. Belehaki

The main areas of interest of this action focus on ionospheric monitoring and modelling, advanced terrestrial systems that rely on accurate characterisation of the ionosphere and ionospheric effects on space based systems. It was noted that the aim of this COST action is focussed scientific research.

## 8. Discussion

It was noted that any SSA proposal would clearly be applications oriented. Support would be associated with D/TEC and possibly another directorate within the agency.

It was noted that there are few long-term funding sources for work oriented towards end-user needs. COST Actions are finite term. This is also the case for ESA programmes that have funded a large part of the effort until now i.e. the General Studies Programme and the Technology Research Programme. It is clear that a long term solution is needed for the activity.

A number of short presentations were given on National activities as follows:

- Utilisation of the SWARM Mission for Space Weather - S. Vennerstrom
- Space Weather Activities in Spain - P. Roman Fernandez
- Space Weather Services, Belgian Assets - W. Verschueren

- Space Weather Related Research and Services in Germany - N. Jakowski
- Radiation Risks to Satellites - R. Horne
- International Space Environment Services, Space Weather Activities at IRF, Learned from the ESA GIC Pilot Project and WG 1.4 of COST 724 Space Weather Action – H. Lundstedt

Presentation material can be found in attachment. Owing to time constraints it was not possible to include a number of additional presentations. These can also be found in attachment.

M. Hapgood introduced the following topics for discussion:

- What are the European Needs for Space Weather Awareness?
- How to address Space Weather issues at the margins of the broader SSA definition (e.g. ground based services)?
- Are there gaps in the European landscape?
- What European Services already Exist?
- What capabilities exist in Europe to enhance current services and build new ones?
- What would be the responsibility of ESA as regards data provision for Space Weather applications: space based data plus ionospheric and ground based data?
- How to link measurements with value added services? What would be the role of ESA as a service provider (where does the service provision responsibility stop to allow external partners to generate value added products)?
- If a central node were to be established, what would be its role? i.e. what are the current coordination needs?
- Should there be links with research and user communities? How would these be developed and maintained?
- How could services be validated?

D. Southwood commented that the Space Weather element of an SSA proposal could be built around several main strands in order to help focus the approach. The activity could be structured around a number of core activities with other smaller activities running in parallel.

**AI/2 A. Glover & M. Hapgood: Identify target areas that a Space Weather element of a SSA proposal could focus on**

A. Glover agreed that user requirement documentation from the ESA Space Weather feasibility studies can be made available on request.

**AI/3 M. Hapgood: Circulate links to previous Space Weather study requirements documentation**

It was noted that ESA's role in any coordinated Space Weather activity would need to maintain a focus on space infrastructure.

The LOFAR array was discussed as a possible important ground based data provider and service user. There was some uncertainty as to whether the telescope would produce TEC data. No LOFAR representative was present at the meeting so it was agreed that contact would be made with the LOFAR group to determine what ionospheric products will be produced.

**AI/4 N. Jakowski & M. Hapgood: Contact LOFAR project to establish whether r-t TEC will be a produced.**

The required availability of a Space Weather service was discussed. Science based data sources are not necessarily able to provide a non-opportunistic level of service. It was agreed that a key target for a dedicated Space Weather service would be to provide a minimum level of 24/7 service.

It was asked whether any relationship could be foreseen between Space Weather and other organisations providing applications oriented services e.g. EUMETSAT.

M. Hapgood recalled discussions from previous SWWT meetings where it has been pointed out that contacts are needed with national weather agencies. EUMETSAT will act on Space Weather if there is sufficient interest from national weather agencies. A report was produced by FMI for the EUMETSAT Science Working Group in 2006.

**AI/5 A. Glover Investigate whether the FMI EUMETSAT report on Space Weather is available.**

It was asked whether manned exploration would form a large part of this activity. D. Southwood noted that, at present, Europe has no independent capacity to put humans in space and so it would be premature to make this a key driver of the activity.

It was stressed that the proposal needs to build on and strengthen ongoing activities. The concept of a small nucleus at ESA with on-site expertise was suggested.

N. Jakowski expressed support for the structure of a network based on different competence centres. Reliable services in a given area would then originate from one location in Europe. The EUMETSAT SAF (Satellite Application Facility) model was given as an example.

It was pointed out that any network would need well defined data exchange standards. The question of how to validate services was raised. It was pointed out that some limited validation work has begun within the framework of SWENET. In addition, ECSS is the agreed mechanism for certification of space standards. As part of the validation activity, a new Space Weather standard could be defined via ECSS.

R. Van der Linden expressed support for the concept of a network of competence centres. The central node should be included and should incorporate an element of real-time

service provision. J.-J. Valette pointed out that CLS does have the capacity to provide 24/7 services.

It was agreed that the SWWT would need to look at possible models and work these through into scenarios in advance of the next meeting which would take place as part of the Fourth European Space Weather Week to be held in Brussels in November.

**AI/6 M. Hapgood & A. Glover: Develop scenarios for possible Space Weather service models including e.g. proposed roles of a central node and competence centres**

It was noted that these scenarios should propose certain core data to be provided by the network. These data would then be built on as the network is elaborated.

SSA refers to monitoring space assets. A proposal would need to address the question of how to maintain data supply in the framework of a monitoring network.

The possible implications of a dual use approach for data availability were mentioned. A proposal would need to elaborate how a Space Weather service would deal with the issue. National data policies would need to be investigated.

**AI/7 M. Hapgood: Solicit input from SWWT SB members on national data policies and how these could impact a Space Weather element of a SSA proposal.**

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**Action list:**

**AI/1 M. Hapgood: Raise awareness of Space Weather issues within the SSA User Group**

**AI/2 A. Glover & M. Hapgood: Identify target areas that a Space Weather element of a SSA proposal could focus on**

**AI/3 M. Hapgood: Circulate links to previous Space Weather study requirements documentation**

**AI/4 N. Jakowski & M. Hapgood: Contact LOFAR project to establish whether r-t TEC will be a produced.**

**AI/5 A. Glover: Investigate whether the FMI EUMETSAT report on Space Weather is available.**

**AI/6 M. Hapgood & A. Glover: Develop scenarios for possible Space Weather service models including proposed roles of a central node and competence centres**

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