



Delibera n. 16/2021

02 Marzo 2021

Allegato A al Verbale n. 01/2021

Oggetto: Ratifica Pegasus Consortium Agreement, sottoscritto in data 21 gennaio 2021.

### IL CONSIGLIO DI AMMINISTRAZIONE

VISTO il Decreto legislativo 29 settembre 1999, n. 381, concernente la costituzione dell'Istituto Nazionale di Geofisica e Vulcanologia (INGV);

VISTO il Decreto legislativo 25/11/2016, n. 218, concernente "Semplificazione delle attività degli Enti Pubblici di Ricerca ai sensi dell'art. 13 della Legge 7/08/2015, n. 124";

VISTO lo Statuto dell'INGV, approvato con Delibera del Consiglio di Amministrazione n. 114/2020 del 19 giugno 2020, emanato con Decreto del Presidente n. 78/2020 del 27/10/2020, pubblicato sul Sito WEB istituzionale – Avviso di emanazione di cui al Comunicato su Gazzetta Ufficiale della Repubblica Italiana - Serie generale - n. 264 del 24 ottobre 2020 e, in particolare, l'art. 7, comma 6, lett. c), il quale prevede che il Presidente: *"adotta provvedimenti di competenza del Consiglio di amministrazione nei casi di necessità e urgenza da sottoporre a ratifica nella prima riunione successiva del Consiglio stesso"*;

VISTO il Decreto del Ministro dell'Università e Ricerca n. 229/2021 del 19/02/2021, con il quale il Prof. Carlo DOGLIONI è stato nominato Presidente dell'INGV;

VISTO il Pegasus Consortium Agreement;

RAVVISATA la necessità di procedere alla sottoscrizione dell'Agreement in questione, finalizzato al perseguimento di obiettivi comuni alle parti;

TENUTO CONTO dell'urgenza a procedere;

su proposta del Presidente,

### DELIBERA

Di ratificare Pegasus Consortium Agreement, sottoscritto in data 21 gennaio 2021.

Il predetto Agreement è allegato alla presente Delibera, della quale costituisce parte integrante e sostanziale.

Firmato il 05/03/2021

Depositato presso la Segreteria del Consiglio in data 05/03/2021



ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

La segretaria verbalizzante  
(Dott.ssa Maria Valeria INTINI)

IL PRESIDENTE  
(Prof. Carlo DOGLIONI)



# **PECASUS**

## **Consortium Agreement**

Full title:

Partnership of Excellence for Civil Aviation Space weather User  
Services Consortium Agreement



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## CONSORTIUM AGREEMENT

THIS CONSORTIUM AGREEMENT is based upon

ICAO State Letter AN 10/1-IND/17/11, a subsequent Electronic Bulletin EB 2017/45 to provide a space weather information service for international air navigation, as well as the final council decisions of the 215<sup>th</sup> ICAO Council session documented by document C-DEC 215/7 dated 16 November 2018, and is made effective on 31 Jan 2021 hereinafter referred to as the Effective Date.

### BETWEEN:

1. Ilmatieteen laitos (FMI), Finland, the Lead Organization
2. Belgian The Royal Observatory of Belgium, acting for the Solar Terrestrial Centre of Excellence (STCE) as its coordinator, Belgium
3. Met Office, for and on behalf of the SECRETARY OF STATE FOR BUSINESS, ENERGY AND INDUSTRIAL STRATEGY OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, UK
4. Centrum Badań Kosmicznych Polskiej Akademii Nauk (SRC), Poland
5. The Deutsches Zentrum für Luft- und Raumfahrt e. V. (DLR) - German Aerospace Center, Germany
6. Istituto Nazionale di Geofisica e Vulcanologia (INGV), Italy
7. Royal Netherlands Meteorological Institute (KNMI), Netherlands
8. Seibersdorf Labor GmbH (SL), Austria
9. Cyprus Department of Meteorology (CDM), Cyprus
10. South African National Space Agency (SANSA), South Africa

hereinafter, jointly or individually, referred to as "Parties" or "Party"  
relating to the action entitled

**Partnership of Excellence for Civil Aviation Space weather User Services**

in short

### PECASUS

hereinafter referred to as "Consortium"

### WHEREAS:

The Parties, having considerable experience in the field concerned, have joined forces and established the PECASUS Consortium providing global space weather services to aviation industry through ICAO.

The Parties wish to specify that this agreement will be binding commitments among themselves after ICAO has nominated them to be the provider of the Global Aviation Space Weather Service.

The Parties are aware that this Consortium Agreement is based upon the DESCA model consortium agreement.

NOW, THEREFORE, IT IS HEREBY AGREED AS FOLLOWS:

## **SECTION 1: Definitions**

The following specific definitions apply:

- Access Rights means permission to use and further develop software, procedures, products, documents whose Intellectual Property Right belongs to another party in the Consortium.
- Affiliated Entity means a Party that is willing to collaborate with PECASUS Parties but has not joined the Consortium according to the entering procedure described in this Consortium Agreement.
- Breach means an act of breaking the agreements made among the PECASUS Consortium or failing to fulfill obligations in provision of space weather information for ICAO service.
- Consortium Body means any management body described in the Governance Structure section of this Consortium Agreement.
- Consortium Office refers to the Customer services (Aviation and Defence group) of the Finnish Meteorological Institute.
- Consortium Party is an entity that has signed this Consortium Agreement.
- Defaulting Party means a Party, which the Steering Group has identified to be in Breach of this Consortium Agreement and/or the Service Level Agreement signed by that Party and the Lead Organization.
- Force majeure is considered an event that prevents or renders unreasonably difficult the completion of the obligations in ICAO space weather service provision within the schedule. These types of events include war, insurgencies, natural disasters, general interruptions in the supply of energy, fires, restrictions imposed by the national budget or by government's actions on a Party's activity, strikes, blockades or other significant and extraordinary events beyond the control of the Parties to the contract.
- Lead Organization means Finnish Meteorological Institute.
- Pilot Phase means the period when ICAO space weather service operations will be supported through Consortium members' own expense. As to current knowledge the Pilot Phase ends in November 2022.
- Steering Group is the main supervisory body for the execution of the Consortium activities.

## **SECTION 2: Purpose**

The purpose of this Consortium Agreement is to specify with respect to the Consortium the relationship among the Parties, in particular concerning the organisation of the work between the Parties, the management of the Consortium and the rights and obligations of the Parties concerning inter alia liability, Access Rights and dispute resolution.





## **SECTION 3: Entry into force, duration and termination**

### **3.1 Entry into force**

An entity becomes a Party to this Consortium Agreement upon signature of this Consortium Agreement by a duly authorised representative.

This Consortium Agreement shall have effect from the Effective Date identified at the beginning of this Consortium Agreement.

### **3.2 Duration and termination**

This Consortium Agreement shall continue in full force and effect during the Pilot Phase ending no later than 30<sup>th</sup> November 2022, or as long as the Consortium members unanimously agree to continue their cooperation as a space weather service provider with a written agreement. The Consortium anticipates that after the Pilot Phase a new Agreement will be compiled building on this Agreement.

Where a Consortium member wishes to terminate their participation in the Consortium, they shall give not less than 6 months' formal notice in writing to the Steering Group after which time they shall cease to be a Consortium member and this Consortium Agreement shall be amended accordingly to remove the Consortium member.

### **3.3 Survival of rights and obligations**

The provisions relating to Access Rights and Confidentiality, for the time period mentioned therein, as well as for Liability, Applicable law and Settlement of disputes shall survive the expiration or termination of this Consortium Agreement.

Termination shall not affect any rights or obligations of a Party leaving the Consortium incurred prior to the date of termination. This includes the obligation to provide all input, deliverables and documents for the period of its participation.



## **SECTION 4: Responsibilities of Parties**

### **4.1 General principles**

Each Party undertakes to take part in the efficient implementation of duties of the Consortium, and to cooperate, perform and fulfil, promptly and on time, all of its obligations under this Consortium Agreement as may be reasonably required from it and in a manner of good faith as prescribed by Swiss law.

Each Party undertakes to notify promptly, in accordance with the governance structure of the Consortium, any significant information, fact, problem or delay likely to affect the Consortium.

Each Party shall promptly provide all information reasonably required by a Consortium Body or by the Lead Organization to carry out its tasks.

The Lead Organization shall make bi-lateral Service Level Agreements (SLA) with all Parties. The SLAs contain terms and conditions for the information and services that the Party has to provide to PECASUS for common use to make space weather services (SWX). The Lead Organization shall provide the SLAs to the Steering Group for review and acceptance.

Each Party shall take reasonable measures to ensure the accuracy of any information or materials it supplies to the other Parties.

### **4.2 Breach**

In the event that a Consortium Body identifies a Breach by a Party of its obligations under this Consortium Agreement the Lead Organization or, if the Lead Organization is in Breach of its obligations, the Party appointed by the Steering Group (defined in Chapter 5), will give formal notice to such Party requiring that such Breach will be remedied within 30 calendar days.

If such Breach is substantial and is not remedied within that period or is not capable of remedy, the Steering Group may decide to declare the Party to be a Defaulting Party and to decide on the consequences thereof which may include termination of its participation.

### **4.3 New Parties Entering the Consortium**

Only those entities who have undergone a dedicated audit for Space Weather service provision by ICAO/WMO or other entity assigned by the Steering Group shall be considered as eligible to join the Consortium. The acceptance process is as follows:

- A new party wishing to join PECASUS will approach Consortium Office with a request and informal application with qualifications suggesting to join the PECASUS Consortium.
- Consortium Office considers the application, and in case Consortium Office considers the new party beneficial for PECASUS and the application is feasible, the Consortium Office will notify the PECASUS Parties about the application.
- Unless eligibility has been ascertained via ICAO/WMO audit, an audit shall be carried out by an entity designated by the Steering Group at the expense of the new party.
- PECASUS Parties will consider the application and audit outcomes and will make their decision, which will be documented in the minutes of the Steering Group meeting.
- Consortium Office will inform the applicant of the decision of the Steering Group, where it is agreed by the PECASUS Parties that the new party may join the Consortium, an amendment to this Consortium Agreement will be made according to Section 9.3 to include the new party.
- The new party will be granted similar status inside the Consortium as the existing full members during the Pilot Phase (i.e. during the eligibility of this Consortium Agreement).
-



#### 4.4 Involvement of third parties

A Party that enters into a subcontract or otherwise involves third parties in the Consortium remains responsible for carrying out its relevant part of the Consortium and for such third party's compliance with the provisions of this Consortium Agreement. It has to ensure that the involvement of third parties does not affect the rights and obligations of the other Parties under this Consortium Agreement.





## **SECTION 5: Liability towards each other**

### **5.1 Warranties and responsibility**

In respect of any information or materials (incl. Results and Background) supplied by one Party to another under the Program, no warranty or representation of any kind is made, given or implied as to the sufficiency or fitness for purpose. Therefore, the recipient Party shall to this respect be in all cases entirely and solely liable for the use to which it puts such information and materials. Each disclosing Party assumes responsibility that the use of information or materials supplied by the disclosing Party to a recipient Party under the Program constitutes no infringement of any proprietary rights of third parties.

### **5.2 Limitations of contractual liability**

No Consortium Party shall be responsible to any other Consortium Party for any indirect or consequential loss or similar damage such as, but not limited to, loss of profit, loss of revenue or loss of contracts, provided such damage was not caused by a wilful act or by breaking of confidentiality. The terms of this Consortium Agreement shall not be construed to amend or limit any Party's statutory liability.

For any remaining contractual liability, a Party's aggregate liability towards the other Parties collectively shall be limited to the sum of 100 000 Euros provided such damage was not caused by a wilful act or gross negligence.

Each Party shall be solely liable for any loss, damage or injury to third parties resulting from the performance of the said Party's obligations by it or on its behalf under this Consortium Agreement.

Nevertheless, the Consortium and its Parties when issuing information and advisories for international air navigation are not liable for the use of that information of third parties based on ICAO Annex 3 and 79, paragraphs 2.2.7 and 2.2.8 :

Para 2.2.7 Owing to the variability of meteorological elements in space and time, to limitations of observing techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a report shall be understood by the recipient to be the best approximation of the actual conditions at the time of observation.

*Note.— Guidance on the operationally desirable accuracy of measurement or observation is given in Attachment A.*

Para 2.2.8 Owing to the variability of meteorological elements in space and time, to limitations of forecasting techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a forecast shall be understood by the recipient to be the most probable value which the element is likely to assume during the period of the forecast. Similarly, when the time of occurrence or change of an element is given in a forecast, this time shall be understood to be the most probable time.

### **5.3 Force Majeure**

No Party shall be considered to be in contravention of this Consortium Agreement if it is prevented from fulfilling its obligations under the Consortium Agreement by Force Majeure.

Each Party will notify the Steering Group of any Force Majeure without undue delay. If the consequences of Force Majeure for the Consortium are not overcome within 6 weeks after such notification, the transfer of tasks - if any - shall be decided by the Consortium Bodies.





#### **5.4 Products to be Delivered for use of the Consortium**

In order to achieve Consortium goals and maximum performance, Parties have agreed to provide predefined Products for the use of Consortium. Detailed product descriptions and quality assurance are described in the SLAs and their attachments.

Scientific products delivered, including the content and purpose, may be updated/modified/abolished by the mutual agreement of all Consortium Parties. Also any new product that will be used by Consortium will be added into the relevant SLA.



## **SECTION 6: Operational and governance structure**

### **6.1 Operational structure**

The Consortium has three major hubs, which are a) Main Hub (FMI), b) Advisories Hub (STCE) and c) Resilient Hub (UK Met Office). Furthermore, there are thematic Expert Groups (EG) that provide the major hubs with appropriate data products, user feedback and validation. The Main Hub will coordinate the actions with ICAO and will transmit the advisories to ICAO channels, as well as managing the Consortium. Advisories Hub will collect all the available SWX information and will generate the content of SWX Advisories. Resilient Hub offers a redundant possibility to transmit the advisories to ICAO as well as is capable of generating the advisories.

A major part of the work supporting PECASUS operations is done at the Expert Groups, which perform the functions of, e.g. Flight Radiation domain services, HF user domain services, GNSS user domain services, and Aviation feedback function.

### **6.2 Governance structure**

All the PECASUS operations are managed by the Consortium Office (CO) located at the Main Hub (Lead organization). CO will direct all the operational work of the Consortium on a day-to-day basis to timely deliver the Space Weather (SWX) advisories to ICAO. CO is also responsible for implementing any decisions made by the Steering Group (SG), and will report to the SG. The members of the CO are Chief Operations Officer, Chief Science Officer, Quality Manager and Consortium Coordinator, and they will be appointed by the Lead Organization.

The Chief Operations Officer will oversee and direct the CO operations, and is responsible for the timely delivery of the SWX advisories to ICAO as well as the required documentation. The Chief Operations Officer is the Consortium's prime contact towards ICAO.

Chief Science Officer will manage the generation of sufficient SWX information for the generation and delivery of the SWX advisories, and coordinate further the development of the SWX scientific capability of the Consortium.

Quality Manager will manage the overall Consortium quality procedures by supervising all the Consortium actions defined by the SLAs. She/He will be supported by persons in the Lead Organization who have appropriate expertise in the operations of each Party.

The Consortium Coordinator is the official representative of the PECASUS Consortium. The Consortium Coordinator is also responsible for monitoring the overall compliance of the Parties with their obligations.

The Consortium Steering Group (SG) is the main supervisory body for the execution of the Consortium activities. Each Party can nominate a member in the SG. The Lead Organisation serves as the Chair of SG. The Consortium Coordinator and Chief Operations Officer represent the CO at the Consortium Steering Group.

The Science Group (SciG) coordinates research and development work for advancements in the PECASUS services for ICAO. The Chief Science Officer of PECASUS serves as the Chair of SciG. The Group shall consist of scientific experts (hereinafter Science Group Members) who will be invited to the board jointly by SG. Each Party should have a representative in the Science Group. The invited members should be familiar with the field in which the Party contributes to PECASUS activities.

The Advisory Board (AB) counsels and advises the whole Consortium Management especially on the scientific and operational service aspects. Unlike the Steering Group, the Advisory Board does not have authority to decide on Consortium matters, nor a legal fiduciary responsibility regarding the success of the Program. The AB members will be invited by the SG. Consortium Coordinator and Chief science Officer will always be members of AB to ensure proper and tight connection to the CO.





The User Assembly (UA) is a larger research community workshop to be organized regularly in order to bring together the Consortium team, potential SWX and other scientific users and any other interested party. The User Assembly (UA) has a key role in ensuring that the results of the multi-disciplinary research is effectively taken into account when generating the ICAO SWX advisories.

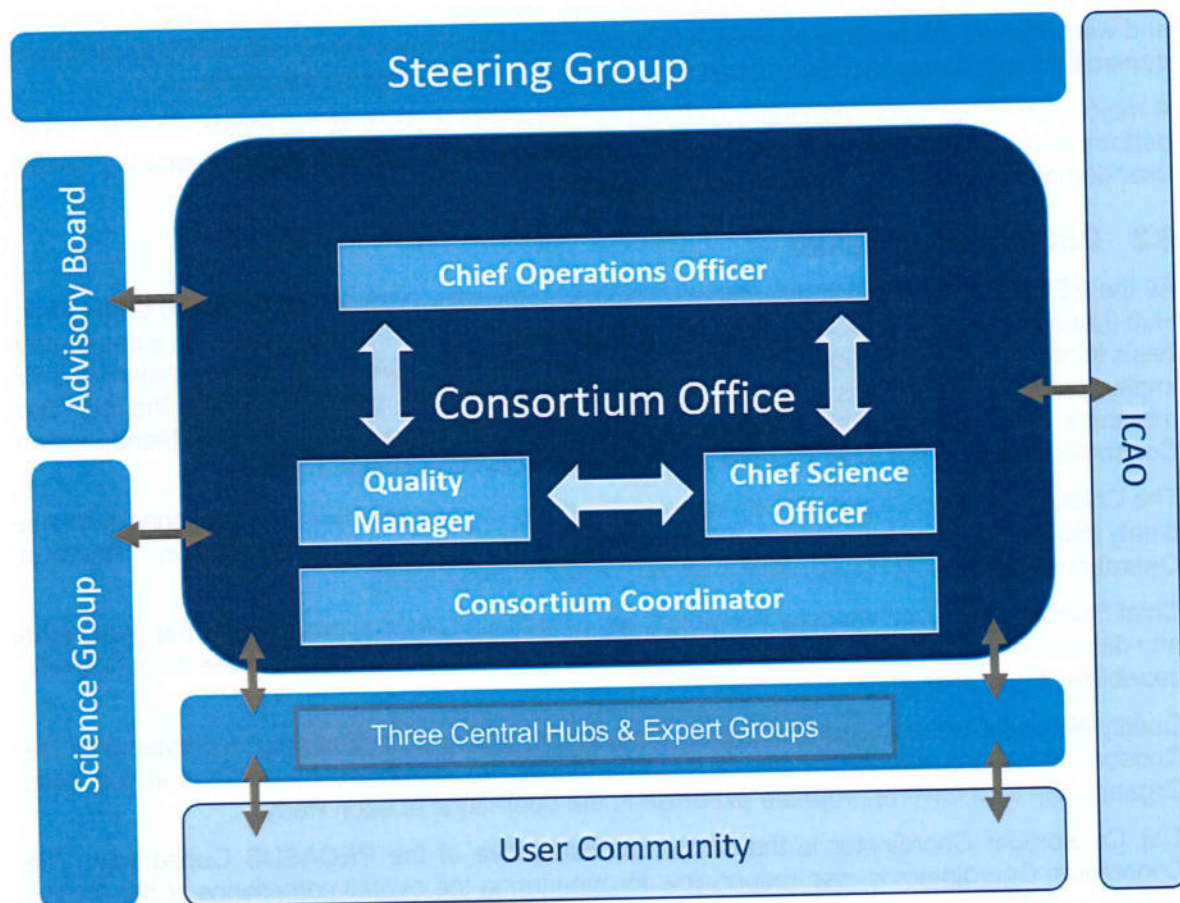


Figure 1. Consortium bodies and governance structure.

### 6.3 Operational procedures for all Consortium Bodies

#### 6.3.1 Representation in meetings

Any Party which is a member of a Consortium Body

- should be represented at any meeting of such Consortium Body;
- may appoint a substitute or a proxy to attend and vote at any meeting; and shall participate in a cooperative manner in the meetings.

#### 6.3.2 Preparation and organisation of meetings

##### 6.3.2.1 Convening meetings:

The chairperson of a Consortium Body shall convene and lead the meetings of that Consortium Body according to the schedule given below:

	Ordinary meeting	Extraordinary meeting
Advisory Board Meeting	At least once a year	At any time upon written request by the Steering Group, or 2/3 of the Members of the Advisory Board
Steering Group Meeting	At least once a year	At any time upon written request by the Advisory Board, or 2/3 of the Members of the Steering Group.
User Assembly	Regularly, e.g. once per year	

#### 6.3.2.2 Notice of a meeting:

The chairperson of a Consortium Body shall give notice in writing of a meeting to each Member of that Consortium Body as soon as possible and no later than the minimum number of days preceding the meeting as indicated below.

	Ordinary meeting	Extraordinary meeting
Advisory Board Meeting	45 calendar days	14 calendar days
Steering Group Meeting	45 calendar days	14 calendar days

#### 6.3.2.3 Dissemination of the agenda:

The chairperson of a Consortium Body shall prepare and send each Member of that Consortium Body a written (original) agenda no later than the minimum number of days preceding the meeting as indicated below.

Advisory Board Meeting	14 calendar days, 7 calendar days for an extraordinary meeting
Steering Group Meeting	14 calendar days, 7 calendar days for an extraordinary meeting

#### 6.3.2.4 Adding agenda items:

Any agenda item requiring a decision by the Members of a Consortium Body must be identified as such on the agenda.

Any Member of a Consortium Body may add an item to the original agenda by written notification to all of the other Members of that Consortium Body up to the minimum number of days preceding the meeting as indicated below.

Advisory Board Meeting	7 calendar days, 4 calendar days for an extraordinary meeting
Steering Group Meeting	7 calendar days, 4 calendar days for an extraordinary meeting



6.3.2.5 During a meeting the Members of a Consortium Body present or represented can unanimously agree to add a new item to the original agenda.

6.3.2.6 Any decision may also be taken without a meeting if the Chair of the relevant Consortium Body circulates to all Members of the Consortium Body a written document which is then agreed by the defined majority according to the voting rules (see below). Such document shall include the deadline for responses.

6.3.2.7 Meetings of each Consortium Body may also be held by teleconference or other telecommunication means.

6.3.2.8 Decisions will only be binding once the relevant part of the Minutes has been accepted by meeting participants.

### 6.3.3 Voting rules and quorum

6.3.3.1 Each Consortium Body shall not deliberate and decide validly unless two-thirds (2/3) of its Members are present or represented (quorum).

If the quorum is not reached, the chairperson of the Consortium Body shall convene another ordinary meeting within 14 calendar days. If in this meeting the quorum is not reached once more, the chairperson shall convene an extraordinary meeting which shall be entitled to decide even if less than the quorum of Members are present or represented.

6.3.3.2 Each Member of a Consortium Body present or represented in the meeting shall have one vote. Notwithstanding the above a Party shall only have one vote regardless of the number of persons of that Party represented in a Consortium Body.

6.3.3.3 Defaulting Parties may not vote, nor shall their presence account for the necessary quorum.

6.3.3.4 Decisions shall be taken by a majority of two-thirds (2/3) of the votes cast.

### 6.3.4 Veto rights

6.3.4.1 A Member which can show that its own work, time for performance, costs, liabilities, intellectual property rights or other legitimate interests would be severely affected by a decision of a Consortium Body may exercise a veto with respect to the corresponding decision or relevant part of the decision.

6.3.4.2 When the decision is foreseen on the original agenda, a Member may veto such a decision during the meeting only.

6.3.4.3 When a decision has been taken on a new item added to the agenda before or during the meeting, a Member may veto such decision during the meeting and within 14 calendar days after the draft minutes of the meeting are sent.

6.3.4.4 In case of exercise of veto, the Members of the related Consortium Body shall make every effort to resolve the matter which occasioned the veto to the general satisfaction of all its Members.

6.3.4.5 A Party may not veto decisions relating to its identification as a Defaulting Party. The Defaulting Party may not veto decisions relating to its participation and termination in the consortium or the consequences of them.

6.3.4.6 A Party requesting to leave the consortium may not veto decisions relating thereto.

### 6.3.5 Minutes of meetings

6.3.5.1 The chairperson of a Consortium Body shall ensure that written minutes are taken in each meeting, which shall be the formal record of all decisions taken. He/She shall send the draft minutes to all Members within 14 calendar days of the meeting.

6.3.5.2 The minutes shall be considered as accepted if, within 14 calendar days from sending, no Member has sent an objection in writing to the chairperson with respect to the accuracy of the draft of the minutes.

6.3.5.3 The chairperson shall send the accepted minutes to all the Members of the Consortium Body and to the Consortium Office, who shall safeguard them.

If requested the Consortium Office shall provide authenticated duplicates to Parties.

## **6.4 Specific operational procedures for the Consortium Bodies**

### **6.4.1 Steering Group**

#### **6.4.1.1 Members**

The Steering Group (SG) shall consist of representatives from all Partners of this Agreement (typically one representative per Partner). The representatives in SG shall have an authorization from their home institutes to make decisions on resources to be allocated for investments and work to provide global space weather services in the ICAO framework.

The Consortium Coordinator shall chair all meetings of SG, unless decided otherwise by a majority of two-thirds of the Advisory Board Members.

#### **6.4.1.2 Tasks and Decisions**

The Steering Group shall be free to act on its own initiative to formulate proposals and take decisions in accordance with the procedures set out herein. In addition, all proposals made by the Advisory Board shall also be considered and decided upon by the Steering Group.

The following tasks/decisions are among the ones to be taken by the Steering Group:

- Changes to the Consortium Agreement and the following attachments:
  - o Modifications to the possibly included Background.
  - o Modifications to the List of Third Parties
- Evolution of the Consortium
  - o Entry of a new Party to the Consortium and approval of the settlement on the conditions of the accession of such a new Party
  - o Withdrawal of a Party from the Consortium and the approval of the settlement on the conditions of the withdrawal
  - o Identification of a Breach by a Party of its obligations under this Consortium Agreement
- Appointment of the Advisory Board and Science Group Members

### **6.4.2 Advisory Board**

#### **6.4.2.1 Members**

The Advisory Board (AB) shall consist of group of 3-7 experts (hereinafter Advisory Board Members) who will be invited to the board jointly by SG. The invited members should be familiar



with the field of the PECASUS Consortium and they should represent both scientific and organizational expertise.

The Consortium Coordinator, or as a deputy the Chief Science Officer, shall chair all meetings of the Advisory Board, unless decided otherwise by a majority of two-thirds of the Advisory Board Members.

#### 6.4.2.2 Minutes of meetings

The chair of AB ensures that the AB meetings are minuted.

Minutes of Advisory Board meetings, once accepted, shall be sent promptly by the Chair, to the Steering Group Members for information.

#### 6.4.2.3 Tasks

The Advisory Board follows the general trends in space weather services and research and based on that it will make recommendations and give guidance to CO and SG for potential modifications in the Consortium's activities. In addition, it will support the Consortium in preparing meetings with ICAO and in preparing PECASUS related information and documentation. In the case of abolished tasks as a result of a decision of the Steering Group, the Advisory Board shall assist, counsel, and advise the Steering Group on ways to rearrange tasks of the Parties concerned. Such rearrangement shall take into consideration the legitimate commitments taken prior to the decisions, which cannot be cancelled.

### 6.4.3 Science Group

#### 6.4.3.1 Members

The Science Group (SciG) shall consist of scientific experts (hereinafter Science Group Members) who will be invited to the board jointly by SG. Each Party should have a representative in the Science Group. The invited members should be familiar with the field in which the Party contributes to PECASUS activities.

The Chief Science Officer, shall chair all meetings of the Science Group, unless decided otherwise by a majority of two-thirds of the Science Group Members.

#### 6.4.3.2 Minutes of meetings

The chair of (SciG) ensures that the SCiG meetings are minuted.

Minutes of SciG meetings, once accepted, shall be sent promptly by the Chair, to the Steering Group Members for information.

#### 6.4.3.3 Tasks

The Science Group monitors the scientific quality of PECASUS services with continuous ambition for improvements in their performance. As its first tasks SCiG will compose a vision for PECASUS scientific work and a roadmap to reach that vision. These documents will be updated recurrently with a cadence agreed by SCiG. In coordination with AB it will make recommendations and give guidance to CO and SG for potential modifications in the Consortium's activities. In addition, SCiG will be the coordinating body in PECASUS joint efforts for research funding or for major outreach and training activities.





## **SECTION 7: Access Rights**

### **7.1 Background Intellectual Property included**

Background intellectual property is pre-existing intellectual property that a party brings to a research project. In Attachment 1, the Parties have identified and agreed on the Background Intellectual Property Rights (BIPR) for the Consortium and have also, where relevant, informed each other that Access Rights to specific Background are subject to legal restrictions or limits.

Anything not identified in Attachment 1 shall not be the object of Access Right obligations regarding Background.

Any Party can propose to the Steering Group to modify its Background in Attachment 1.

### **7.2 Intellectual property rights management**

All BIPR on software, procedures, products, documents developed before signing of this agreement remains at the institute of origin. The intellectual property of new developments to BIPR (of software, procedures, products, documents) made specifically for PECASUS are owned by the institute of origin of the BIPR and subject to the Access Rights described below. Developments to BIPR shall be added to the relevant Party's Background set out in Attachment 1. The exception shall be in the case of BIPR which is software where a Party develops a module made specifically for PECASUS which can interface with the software but is not an integral part of the software in which case the intellectual property rights in that module shall be owned by the Party which developed it and the developing party shall grant a license to all PECASUS partners as described below.

The intellectual property of new developments (of software, procedures, products, documents) made specifically for PECASUS but which are not new developments on BIPR, are owned by the Party creating or developing those rights. In the case of any intellectual property rights created jointly by two or more Parties, the Parties should agree among themselves on the leading party to which the intellectual property relates and the relevant intellectual property rights shall be owned by the leading party. All PECASUS partners obtain a license to get access to such intellectual property within their institutes. This license shall be free of charge and it shall cover exclusively the work for the ICAO space weather services during the validity period of this Consortium Agreement.

The intellectual property of the software, procedures and documents utilized in PECASUS products also remains at the institutes of origin but all PECASUS partners obtain a license to get access to these assets within their institutes in order to support the space weather services for ICAO. Using these products in any other services requires agreements with the originating/contributing institutes. Conditions for such special arrangements will be negotiated on case-by-case basis among the partners concerned.

PECASUS partners are free to publish scientifically (papers, talks, posters) or publicly (outreach, press) their own results/contributions to the PECASUS networks. However, presentations or publications on performance or functioning of the PECASUS overall concept or its individual products cannot be published without agreement with the Lead Organization and with the individual PECASUS partners concerned.



### **7.3 General Principles on Access Rights Sharing**

Each Party shall implement its tasks in accordance with the SLAs and shall bear sole responsibility for ensuring that its acts within the Consortium do not knowingly infringe third party property rights.

Any Access Rights granted explicitly excludes any rights to sublicense unless explicitly stated otherwise or agreed otherwise in writing by all the Parties concerned.

Access Rights shall be free of any administrative transfer costs.

Access Rights are granted on a non-exclusive basis.

Results and Background shall be used only for the purposes for which Access Rights to it have been granted.

All agreements on Access Rights shall be made in writing.

The requesting Party must show that the Access Rights are necessary for the ICAO space weather service tasks.

### **7.4 Access Rights for Research Exploitation**

Access rights to Results for internal research activities shall be granted on a royalty-free basis.

### **7.5 Access Rights for Affiliated Entities**

Access Rights for Affiliated Entities may be granted on case-by-case basis.

### **7.6 Access Rights for a leaving Party**

Access Rights granted to a Defaulting Party and such Party's right to request Access Rights shall cease immediately upon receipt by the Defaulting Party of the formal notice of the decision of the Steering Group to terminate its participation in the consortium.

A non-defaulting Party leaving voluntarily and with the other Parties' consent shall have Access Rights to the Results developed until the date of the termination of its participation. A request for Access Rights can be made up to twelve months after the end of the Consortium Agreement or after the termination of the requesting Party's participation in the Consortium.





## **SECTION 8: Non-disclosure of information**

### **8.1 Confidentiality**

All information in whatever form or mode of communication, which is disclosed by a Party (the "Disclosing Party") to any other Party (the "Recipient") in connection with the Consortium during its implementation (including the work of Consortium Bodies), and which has been explicitly marked as "confidential" at the time of disclosure, or when disclosed orally has been identified as confidential at the time of disclosure and has been confirmed and designated in writing within 15 calendar days from oral disclosure at the latest as confidential information by the Disclosing Party, is "Confidential Information".

The Recipients hereby undertake in addition and without prejudice to any commitment of non-disclosure for a period of 10 years after the end of the ICAO space weather service:

- not to use Confidential Information otherwise than for the purpose for which it was disclosed;
- not to disclose Confidential Information to any third party without the prior written consent by the Disclosing Party;
- to ensure that internal distribution of Confidential Information by a Recipient shall take place on a strict need-to-know basis; and
- to return to the Disclosing Party on demand all Confidential Information which has been supplied to or acquired by the Recipients including all copies thereof and to delete all information stored in a machine readable form. The Recipients may keep a copy to the extent it is required to keep, archive or store such Confidential Information because of compliance with applicable laws and regulations or for the proof of on-going obligations provided that the Recipient comply with the confidentiality obligations herein contained with respect to such copy for as long as the copy is retained.

The Consortium will fully comply with the (EU) 2016/679 General Data Protection Regulation (GDPR).

### **8.2 Fulfilling obligations**

The Recipients shall be responsible for the fulfilment of the above obligations on the part of their employees or third parties involved in the Consortium and shall ensure that they remain so obliged, as far as legally possible, during and after the end of the Consortium and/or after the termination of the contractual relationship with the employee or third party.

The above shall not apply for disclosure or use of Confidential Information, if and in so far as the Recipient can show that:

- the Confidential Information becomes publicly available by means other than breaking of the Recipient's confidentiality obligations;
- the Disclosing Party subsequently informs the Recipient that the Confidential Information is no longer confidential;
- the Confidential Information is communicated to the Recipient without any obligation of confidence by a third party who is to the best knowledge of the Recipient in lawful possession thereof and under no obligation of confidence to the Disclosing Party;
- the Confidential Information, at any time, was developed by the Recipient completely independently of any such disclosure by the Disclosing Party;
- the Confidential Information was already known to the Recipient prior to disclosure, or



- the Recipient is required to disclose the Confidential Information in order to comply with applicable laws or regulations or with a court or administrative order.

### 8.3 Reciprocal confidentiality

The Recipient shall apply the same degree of care with regard to the Confidential Information disclosed within the scope of the Consortium as with its own confidential and/or proprietary information, but in no case less than reasonable care.

Each Party shall promptly advise the other Party in writing of any unauthorised disclosure, misappropriation or misuse of Confidential Information after it becomes aware of such unauthorised disclosure, misappropriation or misuse.

### 8.4 Disclosing confidential information

If any Party becomes aware that it will be required, or is likely to be required, to disclose Confidential Information in order to comply with applicable laws or regulations or with a court or administrative order, it shall, to the extent it is lawfully able to do so, prior to any such disclosure

- notify the Disclosing Party, and
- comply with the Disclosing Party's reasonable instructions to protect the confidentiality of the information.

## SECTION 9: Miscellaneous

The descriptions of the products and services generated by this Consortium to the ICAO space weather service are stored in a specific portfolio being known and accessible to all Consortium Parties.

The specifications of the obligations of each Consortium Party are documented in specific SLAs stored and maintained by the Consortium Office.

### 9.1 Attachments, inconsistencies and severability

This Consortium Agreement consists of this core text and

- Attachment 1 (Background included). Updates to Attachment 1 are allowed with SG acceptance without renewing the signing procedure of this Agreement.

Should any provision of this Consortium Agreement become invalid, illegal or unenforceable, it shall not affect the validity of the remaining provisions of this Consortium Agreement. In such a case, the Parties concerned shall be entitled to request that a valid and practicable provision will be negotiated which fulfils the purpose of the original provision.

The collaboration among the PECASUS Parties shall be performed in accordance with the following documents, listed in order of precedence, in case of conflict:

- Annex 3 to the Convention in International Civil Aviation by ICAO
- This Consortium Agreement with its Annexes
- Service Level Agreements





## **9.2 Notices and other communication**

Any notice to be given under this Consortium Agreement shall be in writing to the addresses and recipients as listed in the most current address list kept by the Consortium Office.

## **9.3 Assignment and amendments**

No rights or obligations of the Parties arising from this Consortium Agreement may be assigned or transferred, in whole or in part, to any third party without the other Parties' prior formal approval.

Amendments and modifications to the text of this Consortium Agreement require a separate agreement between all Parties.

## **9.4 Mandatory national law**

Nothing in this Consortium Agreement shall be deemed to require a Party to violate any mandatory statutory law under which the Party is operating.

## **9.5 Language**

This Consortium Agreement is drawn up in English, which language shall govern all documents, notices, meetings, arbitral proceedings and processes relative thereto.

## **9.6 Applicable law**

This Consortium Agreement shall be construed in accordance with and governed by the laws of Switzerland excluding its rules on conflict of laws.

## **9.7 Settlement of disputes**

The Parties shall endeavour to settle their disputes amicably.

All disputes arising out of or in connection with this Consortium Agreement, which cannot be solved amicably, shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one or more arbitrators appointed in accordance with the said Rules.

The place of arbitration shall be Stockholm (Sweden) if not otherwise agreed by the conflicting Parties. The language of the arbitration shall be English.

The award of the arbitration will be final and binding upon the Parties.

Nothing in this Consortium Agreement shall limit the Parties' right to seek injunctive relief in any applicable competent court.



## SECTION 10: Signatures

### AS WITNESS:

The Parties have caused this Consortium Agreement to be duly signed by the undersigned authorised representatives in separate signature pages the day and year first above written.



### ILMATIETEEN LAITOS

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

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Name of legally authorised  
representative:

Signature

Jussi Kaurola

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Role in organisation of legally  
authorised representative:

Director General

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**THE ROYAL OBSERVATORY OF BELGIUM, acting as coordinator of the (Belgian) SOLAR TERRESTIAL CENTRE of EXCELLENCE**

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

---

Name of legally authorised  
representative:

Signature

Ronald Van der Linden

---

Role in organisation of legally  
authorised representative:

Director General

---



**UK MET OFFICE for and on behalf of the SECRETARY OF STATE FOR BUSINESS, ENERGY AND INDUSTRIAL STRATEGY OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, UK**

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

Name of legally authorised  
representative:

Signature

Victoria Latham

Role in organisation of legally  
authorised representative:

Legal Manager (Contracts)



## CENTRUM BADAŃ KOSMICZNYCH POLSKIEJ AKADEMII NAUK

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Reprezentowany przez swojego upoważnionego przedstawiciela, niniejszym wyraża zgodę na uzyskanie statusu beneficjenta Umowy Konsorcjum PECASUS i przyjmuje zgodnie z postanowieniami ww. Umowy Konsorcjum wszystkie prawa i obowiązki beneficjenta.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

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Name of legally authorised  
representative:

Signature

Prof. Iwona Stanislawska

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Role in organisation of legally  
authorised representative:

Director Centrum Badan Kosmicznych  
PAN

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## The DLR

Represented by their authorised representatives, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

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Name of legally authorised  
representative:

Prof. Markus Rapp

Signature

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Role in organisation of legally  
authorised representative:

Director, Solar-Terrestrial Institute of  
DLR

---

Date:

---

Name of legally authorised  
representative:

Kristina Dünner

Signature

---

Role in organisation of legally  
authorised representative:

InHous Consulting Space R&D for DLR  
Legal Department

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## ISTITUTO NAZIONALE di GEOFISICA e VULCANOLOGIA

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date: **21 GEN. 2021**

Name of legally authorised  
representative:

Carlo Doglioni

Signature



IL PRESIDENTE  
(Prof. Carlo DOGLIONI)

Role in organisation of legally  
authorised representative:

President



**ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE,**

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

Name of legally authorised  
representative:

Signature

Jan Dekker

Role in organisation of legally  
authorised representative:

Strategic Business Manager



## SEIBERSDOFRF LABOR GmbH (SL), AUSTRIA

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

Name of legally authorised  
representative:

Signature

Dr. Martina Schwaiger

Role in organisation of legally  
authorised representative:

Managing Director

Date:

Name of legally authorised  
representative:

Signature

Dr. Peter Beck

Role in organisation of legally  
authorised representative:

Head of Business Unit Radiation  
Protection Dosimetry





**CYPRUS DEPARTMENT of METEOROLOGY**

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date:

\_\_\_\_\_  
Name of legally authorised  
representative:

Signature

\_\_\_\_\_  
Role in organisation of legally  
authorised representative:



**SOUTH AFRICAN NATIONAL SPACE AGENCY (SANSA)**

Represented by their authorised representative, hereby consents to become a beneficiary to the PECASUS Consortium Agreement and accepts in accordance with the provisions of the aforementioned Consortium Agreement all the rights and obligations of a beneficiary.

Done in one original copy, which shall be kept by the Lead Organization.

Date: \_\_\_\_\_

Name of legally authorised representative:	Signature
Dr Lee-Anne McKinnell	_____

Role in organisation of legally authorised representative:
Managing Director Space Science, South African National Space Agency
_____



## Attachment 1: Background included

Background is defined as "data, know-how or information (...) that is needed to implement the action or exploit the results". Because of this need, Access Rights have to be granted in principle, but parties must identify and agree amongst them on the Background for the Program.

This is the purpose of this attachment.

### ILMATIETEEN LAITOS

As to ILMATIETEEN LAITOS (FMI), it is agreed between the parties that, to the best of their knowledge,

FMI makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

This represents the status at the time of signature of the Consortium Agreement.

- The software used to create official ICAO SWX advisories in TAC and IWXXM formats and the routines for disseminating the advisories in the AFTN network.
- The software used to run the FMI dashboard and repository for PECASUS products.
- Space weather models, inversion tools and simulations owned and maintained by FMI (GUMICS, IMPTAM and TomoScand)
- Observations by FMI ground-based instrumentation with their data processing and visualization tools:
  - Riometer data
  - Magnetometer data
  - Auroral camera data
  - Ionospheric tomography receiver data

### SOLAR TERRESTIAL CENTRE of EXCELLENCE

As to SOLAR TERRESTIAL CENTRE of EXCELLENCE (STCE), it is agreed between the parties that, to the best of their knowledge,

STCE makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

This represents the status at the time of signature of the Consortium Agreement.

Exact name of BIPR Item	Owner	Description	Patent # or Ref. / Issue / Revision / Version #	Contract / Funding Details under which the IPR was created	Date of creation of the version of the BIPR listed here
SIDC internal Event Data Base including the database structure definition and the	Royal Observatory of Belgium	An event focused database package including a general and database structure definition and specific content as well as the software providing application interfaces and the software providing a human graphical interface to create and manipulate database elements. (i.a. the ICAO Advisory elements are maintained within this	11/2020	Belgian government funding	11/2020





content as well as the software providing application interfaces and the software providing a human graphical interface to create and manipulate database elements.		Database)			
SILSO ISSN forecasting methods	Royal Observatory of Belgium	Various forecasts methods and implementation to forecast the International Sunspot number Observatory of Belgium	11/2 020	Belgian government funding	11/2 020
SPoCA solar image processing software	Royal Observatory of Belgium	A software package to process SDO images in order to automatically recognize certain features (in particular coronal holes)	11/2 020	Belgian government funding (SIDC Data exploitation programme)	11/2 020
USET data processing routines (including but not limited to automatized sunspot area calculation)	Royal Observatory of Belgium	USET data processing routines (including but not limited to automatized sunspot area calculation)	11/2 020	Belgian government funding	11/2 020
HUMAIN station data processing routines (including but not limited to burst detection algorithms)	Royal Observatory of Belgium	HUMAIN station data processing routines (including but not limited to burst detection algorithms)	11/2 020	Belgian government funding	11/2 020
SILSO International sunspot number production software	Royal Observatory of Belgium	SILSO International sunspot number production software	11/2 020	Belgian government funding	11/2 020
SIDC solar forecast/alert/event/bulletin production software (including but not limited to PreviWeb/Master)	Royal Observatory of Belgium	Solar forecast/alert/event/bulletin production software (including but not limited to PreviWeb = forecaster interface including dashboard presentations; and Previmaster = workflow manager dealing with automated data-import and data-management as well as automated production steps) (This includes the Advisory editor to compose and submit ICAO Advisories, the dashboards as well as the software to generate the PECASUS daily briefing and handover briefing)	11/2 020	Belgian government funding	11/2 020
Cactus CME detection software	Royal Observatory of Belgium	CME detection software algorithms	11/2 020	Belgian government funding	11/2 020
Solar Demon software	Royal Observatory of Belgium	Solar Demon software routines for the detection of flares, dimmings and EUV waves in EUV images	11/2 020	(FP7/2 007-2013) nr. 263506 [AFFE CTS] and nr.	11/2 020



				263252 [COME SEP]	
SIDC SDO data centre	Royal Observ atory of Belgiu m	Synchronisation and datamanagement routines for the SIDC SDO data mirror	11/2 020	Belgian govern ment funding (SIDC Data exploita tion progra mme)	11/2 020
Solarmap Interface	Royal Observ atory of Belgiu m	The interface that allows to navigate in time and to specify the choosen options for display of annotated Solarmap images.	11/2 020	FP7/So teria and Belgian govern ment funding	11/2 020
LYRA – GOES cross calibration routines	Royal Observ atory of Belgiu m	LYRA – GOES cross calibration routines	11/2 020	Belgian govern ment funding (SIDC Data exploita tion progra mme)	11/2 020
Annotated Solarmap Images	Royal Observ atory of Belgiu m	The jpeg2000 Solarmap images with region annotations	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
USET Halpha Solar images	Royal Observ atory of Belgiu m	USET Halpha Solar images and corresponding visualisations	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
USET White light Solar images	Royal Observ atory of Belgiu m	USET White light Solar images and corresponding visualisations	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
SIDC Humain Callisto Solar radio spectrograms	Royal Observ atory of Belgiu m	SIDC Humain Callisto Solar radio spectrogram data and corresponding visualisations	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
SIDC Automated Solar radio burst detections	Royal Observ atory of Belgiu m	SIDC Automated Solar radio burst detection data and corresponding visualisations	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
SIDC/Humain Solar radio light curves	Royal Observ atory of	SIDC/Humain Solar radio light curve data and corresponding visualisations	N/A (cont inuo	N/A (interna l	N/A (cont inuo



	Belgium		us generation)	operation)	us generation)
ROB/SIDC SDO/AIA Quicklook images and movies	Royal Observatory of Belgium	ROB/SIDC SDO/AIA Quicklook images and movies	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC/SILSO International sunspot number	Royal Observatory of Belgium and all contributing observers	SIDC/SILSO International sunspot number data and corresponding visualisations	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC/SILSO Sunspot number forecasts	Royal Observatory of Belgium and all contributing observers	SIDC/SILSO Sunspot number forecast data and corresponding visualisations	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC 10.7cm Solar radio flux (F10.7) forecasts	Royal Observatory of Belgium	SIDC 10.7cm Solar radio flux (F10.7) forecast data	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC Solar flare forecasts	Royal Observatory of Belgium	SIDC Solar flare forecast data	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC Daily space weather bulletin	Royal Observatory of Belgium	SIDC Daily space weather bulletin content	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC/CACTus CME detection data	Royal Observatory of Belgium	SIDC/CACTus CME detection data and corresponding visualisations	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC GOES-flare alert	Royal Observatory of Belgium	SIDC GOES-flare alert data	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
SIDC/CACTus Alerts	Royal Observ	SIDC/CACTus Alert data	N/A (cont	N/A (internal	N/A (cont





	atory of Belgiu m		inuo us gene ratio n)	I operati on)	inuo us gene ratio n)
SIDC Presto messages	Royal Observ atory of Belgiu m	SIDC Presto message data	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
SIDC All Quiet notifications	Royal Observ atory of Belgiu m	SIDC All Quiet notification data	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
USET Sunspot group characteristics	Royal Observ atory of Belgiu m	USET Sunspot group characteristics	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
SIDC/SPOCA Coronal hole detections	Royal Observ atory of Belgiu m	SIDC/SPOCA Coronal hole detection data	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
Solar Demon EUV flare detections	Royal Observ atory of Belgiu m	The Solar Demon EUV flare detection data	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
SIDC Moderated events	Royal Observ atory of Belgiu m	Event moderation data	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
SIDC internal service data products	Royal Observ atory of Belgiu m	SIDC internal service data products	N/A (cont inuo us gene ratio n)	N/A (interna l operati on)	N/A (cont inuo us gene ratio n)
COMESSEP Alert System	Royal Belgian Institut e for Space Aerono my (BIRA-I ASB)	Software, see <a href="http://www.comesep.eu/">http://www.comesep.eu/</a>		FP7 project No. 26325 2	
SEPForecast tool	Royal Belgian Institut e for Space	Software component of COMESSEP, providing a forecast of the probability and strength for >10MeV and >60MeV protons events for every observed M and X class flare. It includes also CME and GLE information when available. The SEP Forecast tool uses as input GOES X-ray		FP7 project No. 26325	



	Aeronomy (BIRA-IASB)	data, SDO/AIA data, SOHO/LASCO data, and GLE Alert Plus. In addition COMSEP also produces a risk level for CME induced geomagnetic storms.		2	
<a href="#">COMSEP json file (ongoing alerts yymmdd_hhmm.json)</a>	Royal Belgian Institute for Space Aeronomy (BIRA-IASB)	The json file is generated from the COMSEP database, hosted at the BIRA server, whereby re-triving the following fields: alert.alertId, alert.received_at, alert.emitter, alert.emitter_href, alert.emitter_version, alert.subject, alert.subjectTopic, alert.target, alert.atEarliest, alert.mostProbable, alert.atLatest, impact.impact_type, impact.severity, impact.probability, impact.confidence. When these data are not available from the database, the status "available" is set to -1.	N/A (continuous generation)	N/A (internal operation)	
GLE alert+ service	National and Kapodistrian University of Athens (NKUA)	Alerts for ground level enhancement (GLE) events are provided by GLE Alert Plus. This system produces every minute a General GLE Alert Graph and station alert graphs for all the stations participating in the network.		Special Re-search Account of Athens University (70/4/5803).	
GLE alert json file	Royal Belgian Institute for Space Aeronomy (BIRA-IASB)	The json file is generated from the file ( <a href="https://glealertplus.phys.uoa.gr/last_status.php">https://glealertplus.phys.uoa.gr/last_status.php</a> ) that contains one line with the fields: server_date_time, stations_count (= nr of stations in alert mode), stations_names (if stations_count > 0), gle_status (= general gle alert status). The information of the individual stations is retrieved from their raw data. The alert and gle status is given by an index i.e. 0=quiet, 1= watch, 2= warning, 3= alert, -1= unavailable	N/A (continuous generation)	N/A (internal operation)	
Multi-station neutron monitor data	National and Kapodistrian University of Athens (NKUA)	The multi-station Neutron Monitor data provides continuous measurements of galactic cosmic rays from neutron monitors located around the world.		FP7 Project No. 213007	
Neutron Monitor world map	Royal Belgian Institute for Space Aeronomy (BIRA-IASB)	Near real-time world map is built on the raw data of the individual stations, showing the geographical position of the NMs in the network with their status (offline, quiet, active).	N/A (continuous generation)	N/A (internal operation)	
HESPERIA UMASEP 500	National Observatory of Athens / Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing	The HESPERIA UMASEP 500 system correlates X-ray flux with each of the differential proton fluxes measured by the GOES satellites, and with each of the neutron density fluxes collected by neutron monitor stations around the world. When the correlation estimation surpasses a threshold, and the associated flare is greater than a specific X-ray peak flux, a >500 MeV SEP forecast is issued		Horizon 2020 project No 637324	





	g (NOA/I AASAR S)				
Ionosonde data from Dourbes	Royal Meteorological Institute Belgium	SAO files containing automatically scaled ionogram characteristics from the DPS4D operated in Dourbes, Belgium (ursi code DB049).	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
Cosmic Ray data from Dourbes	Royal Meteorological Institute Belgium	Cosmic ray counts from the NM64 neutron monitor operated in Dourbes (code DRBS)	N/A (continuous generation)	N/A (internal operation)	N/A (continuous generation)
Solar Radio Burst warning	Royal Observatory of Belgium	Real-time alert of degradation of GNSS signal during a solar radio burst	N/A (continuous generation)	Belgian government funding	N/A (continuous generation)
Ionospheric maps over Europe	Royal Observatory of Belgium	Real-time ionospheric maps over Europe in IONEX format.	N/A (continuous generation)	Belgian government funding	N/A (continuous generation)

**UK MET OFFICE for and on behalf of the SECRETARY OF STATE FOR BUSINESS, ENERGY AND INDUSTRIAL STRATEGY OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, UK**

As to UK MET OFFICE (UKMO), it is agreed between the parties that, to the best of their knowledge, UKMO makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

This represents the status at the time of signature of the Consortium Agreement.

- DRAP - The D Region Absorption Predictions model provides real-time predictions of the global absorption conditions of the D-region (50-90km) in the ionosphere
- WSA Enlil -solar wind and CME prediction model. Models solar wind speed & density from Sun to Earth. Predicts CME arrival times at Earth using parameters calculated from CME analysis tool.
- Ovation-Prime – model to predict the auroral oval in the northern and southern hemispheres
- MO Space Weather Data Assimilation Service – system for collecting, checking, gap-filling and processing of space weather remote and in-situ data
- MO Space Weather Alert Service – service for the generation and distribution of space weather alerts





## CENTRUM BADAŃ KOSMICZNYCH POLSKIEJ AKADEMII NAUK

As to CENTRUM BADAŃ KOSMICZNYCH POLSKIEJ AKADEMII NAUK (SRC), it is agreed between the parties that, to the best of their knowledge, SRC makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

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Name of BIPR	Owner	Description	Funding	Year of creation
Mapping of foF2 depression and warning nowcast	CBK PAN	<p>The software was developed for calculating the foF2 depression and warnings global maps. Depression is calculated relative to 30-days median values that are estimated by experimental (if number of experimental data is more than 20 within previous 30 days) or by NeQuick-Galileo model data. The result is visualized in the polygons according to ICAO recommendations (15° longitude × 30° latitude). If ionosondes are absent at the polygon, the value of foF2 depression estimated by ionosonde located not far than 10 angle degrees from the border of polygon. If more than one ionosonde impact on the polygon, the certain logic is used to determine the value of depression there.</p> <p>Global warning maps show the polygons where depression levels have exceeded the alert threshold (yellow color for MOD warnings, and red color for SEV ones).</p> <p><i>Zalizovski et al. (2000). PECASUS service for monitoring the global distribution of foF2 and generating the warnings about its depression. URSI GASS 2020, Rome, Italy, 29 August - 5 September 2020. Paper G08-03.</i></p>	CBK PAN funds	2019
Real time ionograms measured by MZ152 ionosonde	CBK PAN	CBK PAN provides the original ionograms in near real time base obtained by VISRC2 ionosonde of own production with automatic scaling based on AUTOSCALA (profile every 15 minutes). Ionosonde located in Warsaw at the territory of CBK PAN (52.2° N, 21.1°E). The electron density profile and SAO files are produced.	CBK PAN funds	20**
W index maps nowcast	CBK PAN	<p>W index for European area based on correction messages EGNOS. The European Geostationary Navigation Overlay Service, EGNOS, provides online the regional maps of the vertical total electron content in timely, continuous regime. The data are obtained from EDAS FTP service. Space resolution 5° latitude × 5° longitude, update rate 60 min, integration time 2 min.</p> <p><i>Stanislawski and Gulyaeva (2015) Ionospheric W Index Based on GNSS TEC in the Operational Use for Navigation Systems. In book: Satellite Positioning - Methods, Models and Applications. DOI: 10.5772/59902</i></p>		
LUF nowcast maps	CBK PAN			

## The DLR

As to the DLR, it is agreed between the parties that, to the best of their knowledge, DLR makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

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BIPR Item	Owner	Description	Patent# or Ref./Issue/Revision/ Version#	Contract/ Funding details	Date of creation of BIPR version	Affected deliverable with comments  (if applicable: "to be delivered")
DIMS PSM	DLR/ WERU M	Workflow management and archiving system*)	Version 2.12.1	DLR internal programmatic development	19.12.2019	Processing of all products delivered via SWACI or IMPC
DIMS PL	DLR/ WERU M	Product library to archive processed IMPC/SWACI products on HDDs and tape	Version 12.15.5.1	DLR internal programmatic development	09.11.2019	Archiving of all products delivered via SWACI or IMPC
DIMS OT	DLR/ WERU M	Operator tool to configure and control DIMS processing pipelines	Version 2.10.2	DLR internal programmatic development	05.12.2019	Processing of all products delivered via SWACI or IMPC
Space Weather Application Center Ionosphere (SWACI)	DLR	Online integration-, test- and dissemination platform	Version 1.0	supported by the state government of Mecklenburg-Vorpommern	01.08.2011	Online dissemination of all products delivered from DLR
Ionosphere Monitoring and Prediction Center (IMPC)	DLR	Online integration-, test- and dissemination platform and ACE/DSCOVR receiving facilities	Version 1.0	Supported by DLR technology Marketing and DLR internal programmatic development	11.03.2015	Successor of SWACI, Online dissemination of all products delivered from DLR
TEC processing system	DLR	System for processing GNSS data streams, deriving estimations of the Total Electron Content (TEC), producing ROTI maps, TEC	Version 0.9.6	Supported by DLR technology Marketing and DLR internal programmatic development	31.08.2018	Processing of NRT products (e.g. TEC, ROTI products).





		maps and its derivatives.				
Scintillation processing system	DLR	System for processing high-rate GNSS data and deriving scintillation indices.	Revision 12628	DLR internal programmatic development	18.04.2019	Data from additional receiver will be processed by this system. Upgrade of Software infrastructure. Delivery of the products Scintillation indices S4, sigma phi.
EVnet	DLR	The Experimentation and Verification Network (EVnet) is a near real-time facility capable of acquisition, processing and distribution of GNSS as well as GNSS-related data.	V2008.07.25	DLR internal programmatic development	25.07.2008	Data from additional receiver will be processed by this system. Upgrade and Deployment of software and hardware. Delivery of the products Scintillation indices S4, sigma phi.

\*) [http://www.dlr.de/eoc/desktopdefault.aspx/tabid-6888/11391\\_read-22881/](http://www.dlr.de/eoc/desktopdefault.aspx/tabid-6888/11391_read-22881/)

## ISTITUTO NAZIONALE di GEOFISICA e VULCANOLOGIA

As to ISTITUTO NAZIONALE di GEOFISICA e VULCANOLOGIA (INGV), it is agreed between the parties that, to the best of their knowledge, INGV makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

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Name of BIPR	Owner	Description	Funding	Year of creation
Mapping of TEC and (nowcast forecast)	INGV	TEC Maps are created by using a large number of GNSS. Calibration of TEC was made by applying the technique introduced by Ciralo et al. (2007). This method is based on the so-called leveling procedure. The calibrated slant-TEC values are then verticalized (vTEC). To produce TEC maps, vTEC values from all stations were interpolated to create grid points (0.1° latitude × 0.1° longitude) by using the natural neighbor technique. As demonstrated by Cesaroni et al. (2015), this method gives a reliable estimate of the TEC distribution when regional datasets are considered.	INGV funds	2015
Mapping of	INGV	The MUF(3000)F2 near real-time maps are estimated every 15	INGV	2018





MUF(3000)F2 Nowcast		minutes from real-time ionosonde data recorded at several stations over Europe. Such measurements are integrated into the International Reference Ionosphere (IRI) background model, which is upgraded starting from the relative deviations at the stations. Kriging techniques are then applied for spatial interpolation. Then MUF(3000)F2/ MUF(3000)F2 <sub>[background]</sub> maps are generated. Sabbagh et al. (2019), American Geophysical Union, Fall Meeting 2019, abstract #SA33D-3171	funds	
Mapping of MUF(3000)F2 Forecast	INGV	The method used to forecast MUF(3000)F2 is an empirical model EUROMAP (Mikhailov and Perrone, 2014). It is based on: foF2 observations; predicted kp planetary index. EUROMAP includes two types of prediction models: regression models based on the analyses of historical observations, and training models based on current foF2 observations. EUROMAP has been applied to Europe where there are ionospheric stations with long (for some solar cycles) historical data and current real-time foF2 observations.  Then MUF(3000)F2/ MUF(3000)F2 <sub>[background]</sub> maps are generated. Mikhailov and Perrone, Radio Sci., 2014, DOI: 10.1002/2014RS005373	INGV funds	2018
GBSC Ground Based Scintillation on Climatology (Software)	INGV	The technique provides the occurrence probability of GNSS retrieved parameters as function of the geospatial environment and can be customized in order to highlight the ionospheric features of interest depending on the area, lat/long, season, time of the day. The algorithm is developed in MATLAB.	N/A	2016
eSWua electronic Space Weather upper atmosphere	INGV	Data repository and data base, used to access data, feed models and/or to study the ionosphere dynamics	N/A	2008

## ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE

As to ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE (KNMI), it is agreed between the parties that, to the best of their knowledge, KNMI makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

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- The software and tools used for PECASUS system performance verification.
- The software and (visualization) tools used for PECASUS Advisory validation.
- Scintillation data from the stations in the Caribbean maintained by KNMI with their data processing and visualization tools.

## SEIBERSDORF LABOR GMBH (SL)

As to SEIBERSDORF LABOR GMBH (SL), it is agreed between the parties that, to the best of their knowledge, SL makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

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- AVIDOS software and all algorithms and procedures used for nowcast, forecast and historical assessment of radiation exposure in atmosphere due to solar events and galactic cosmic radiation. That includes also algorithms and procedures used for manipulation of all third party input data for the above purposes, and all algorithms and procedures used for visualisations

### **CYPRUS DEPARTMENT of METEOROLOGY**

As to CYPRUS DEPARTMENT of METEOROLOGY (CDM), it is agreed between the parties that, to the best of their knowledge, CDM makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

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- Ionosonde data and their processing and visualization tools from the stations maintained by Fredricks University

### **SOUTH AFRICAN NATIONAL SPACE AGENCY**

As to SOUTH AFRICAN NATIONAL SPACE AGENCY (SANSA), it is agreed between the parties that, to the best of their knowledge, SANSA makes available that part of its background information, limited to the partners of the PECASUS Consortium, which is necessary to perform efficiently the PECASUS Program. The Access Rights are granted for the purposes of the PECASUS Consortium only.

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- Ionosonde data and their processing and visualization tools from the stations maintained by SANSA