SUBCONTRACT on performance of enhanced solar radiation nowcasting based on geostationary satellite data ("Subcontract")

Nr. 2022-005

between

Solargis s.r.o.
Bottova 2A
811 09 Bratislava, Slovak Republic
IČO: 45 354 766
IČ DPH: SK2022962766
represented by its Managing director, Mr. Marcel Šúri, PhD,

(hereinafter called the "**Contractor**" or "**Solargis**"),

and

Geografický ústav Slovenskej akadémie vied, verejná výskumná inštitúcia (Institute of Geography, Slovak Academy of Sciences)
Štefánikova 49
814 73 Bratislava, Slovak Republic
IČO: 00 166 545
DIČ: 2021189841
represented by its Director, Daniel Michniak, PhD,
The Subcontractor is not a VAT payer.

(hereinafter called the "**Subcontractor**" or "**IG SAS**"),

WHEREAS:

A. Solargis entered on 3 February 2022 into a Contract No. 4000137045/22/NL/SC/hm ("**ESA Contract**") with The EUROPEAN SPACE AGENCY ("**Agency**" or "**ESA**") related to performance of enhanced solar radiation nowcasting based on geostationary satellite data ("**Work**"),

B. ESA Contract is a principal framework contract which governs the Work to be created and delivered to the Agency by the Contractor with help of the Subcontractor,

C. It is important that the terms and conditions of ESA Contract are acknowledged and followed also by Subcontractor to the extent it interferes with this Subcontract and/or with Work,

the following Subcontract has been agreed between the Contractor and Subcontractor, hereinafter also referred to individually as "**Party**" and collectively as the "**Parties**":

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005

DEFINITIONS

Expression used in this Subcontract with capital letters, unless expressly defined here, will have the same meaning as attributed to them in the ESA Contract.

ARTICLE 1 - SUBJECT OF THE SUBCONTRACT; GENERAL TERMS

1.1.   The main objective of ESA Contract is to improve the existing solar radiation nowcast solution for the solar industry operated by the prime, Solargis, via development of more accurate cloud motion vectors algorithms by (i) implementing additional data inputs including spectral channels and data from numerical weather models, (ii) increasing spatial and temporal resolutions, and (iii) integrating apriori geographical data describing effects of geographical barriers. The following tasks will be undertaken in order to deliver the Work and to achieve the main objective:
1. Increasing the temporal resolution of the Solargis nowcasting model,
2. Enhancing Solargis algorithms for cloud identification in early morning hours,
3. Improving cloud motion prediction by incorporating the effects of orographic barriers (hereinafter as "**Tasks**").

1.2.   In the view of the foregoing, Subcontractor undertakes to perform the works and services assigned by Contractor based on Tasks with the aim to successfully deliver the Work to ESA pursuant to ESA Contract and this Subcontract. Subcontractor´s main work under the Subcontract shall consists of leading or collaborating on the following tasks (including but not limited to):

- Leading the WP3: Improving cloud motion prediction by incorporating the effects of orographic barriers (IG SAS is leading WP):
    - Task 3.1 Global identification and characterisation of relevant orographic barriers
    - Task 3.2 Adaptation of existing nowcast model to incorporate multiple cloud height levels and the orographic barrier dataset
    - Task 3.3 Parameterisation of the barrier effect model
    - Task 3.4 Validation of nowcast algorithm that includes modelling of cloud height and orographic barrier effects,
- Collaborating on the WP2: Improving service availability by cloud identification in early morning hours,
- All other tasks resulting from this Subcontract, its annexes and/or instructed by Solargis in the view of Work´s performance and its successful delivery to ESA.

(hereinafter together as "**Subcontract Assignments**").

1.3.   The Subcontractor undertakes to perform the Subcontract Assignments in accordance with this Subcontract, Contractor´s instructions and the provisions and conditions stated in the following applicable documents ("**Applicable Documents**"):

    a)   ESA Contract, including its annexes, not attached hereto but known to both Parties;

b) The signed Minutes of the Negotiation Meeting held on 18 November 2021, reference "SK6_04_MoM_v2", not attached hereto but known to both Parties;

c) The Contractor's Proposal, reference "01/2021", dated 9 March 2021, not attached hereto but known to both Parties.

1.4. General Terms

1.4.1 The Subcontractor's own sales conditions shall not apply.

1.4.2 The language of this Subcontract and of all communications hereunder shall be English. The substantive law according to which this Subcontract shall be construed is the law of Slovakia.

1.4.3 The Parties shall use their best endeavours to amicably settle any dispute arising out of the Subcontract. Failing an attempt towards an amicable settlement, all disputes shall be finally settled in accordance with the Rules of Arbitration of the International Chamber of Commerce by one arbitrator designated in conformity with such Rules. The Arbitration Tribunal shall sit in Bratislava, Slovakia. The Tribunal's award shall be final, binding on the Parties and no appeal shall lie against it. The enforcement of the award shall be governed by the rules of procedure in force in the state/country in which the award is to be executed.

1.4.4 The Subcontractor shall be fully responsible towards the Contractor for the proper execution of the Subcontract Assignments or any part of it assigned to Subcontractor. Subcontractor is not allowed to engage any other subcontractor for the Subcontract Assignments or any part of it.

Should the Subcontractor encounter serious difficulties in the process leading to:

(i) timely payment of due invoices (i.e. related to a milestone already achieved) to be made by Solargis (i.e. not ESA),

(ii) contractual coverage of activities already kicked-off,

the Subcontractor may directly contact the Agency at: indirectpayments@esa.int.

In doing so, Subcontractor shall attach the Standard Contact Form available at: http://emits.sso.esa.int/emits-doc/ESTEC/Indirect-Payments-Query-Form.docx properly filled in or provide the same information in the body of the email.

1.4.5 Any publicity material prepared by the Subcontractor related to an activity performed by the Subcontractor in the context of this Subcontract shall acknowledge that the activity is/was carried out "under a programme of, and funded by the Agency. It shall display the ESA logo if the Agency so requires. It shall also carry a disclaimer stating that the view expressed in such publications can in no way be taken to reflect the official opinion of the European Space Agency.

1.4.6 The Subcontractor shall, in accordance with the Agency's Policy on the Prevention, Detection and Investigation of Fraud, cooperate with the Agency's investigation team in any investigation of fraud initiated by the Agency and inform its personnel of their obligation to cooperate accordingly.

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005

ARTICLE 2 - DELIVERY REQUIREMENTS AND OTHER OBLIGATIONS

2.1   General

2.1.1   Subcontractor shall deliver any and all Subcontract Assignments duly and on time in accordance with Contractor´s instruction and agreed time schedule pursuant to this Subcontract and Applicable Documents. Subcontractor acknowledges that the Contractor can deliver duly and on time the Work to the Agency only with duly and timely delivery of Subcontract Assignments by the Subcontractor. Delivery under this Subcontract shall have final effects only when the relevant deliverable items are in the final Agency's possession.

2.1.2   Should it seem likely that the originally specified delivery dates may be exceeded, the Subcontractor shall immediately notify the Contractor in writing and provide a detailed justification for the delay.

2.1.3   Should the Contractor conclude that the delays in delivery of any results of the Subcontract Assignments have impaired the intended objectives of the Work, the provisions of Article 5.4 below shall apply.

2.1.4   The provisions of Article 2.1.5 of ESA Contract shall apply accordingly also on the Subcontractor, taking into account the specifics of this Subcontract.

2.1.5   Contractor is obliged to provide the Subcontractor with all necessary assistance which may be reasonably expected or required in order to achieve the objectives of this Subcontract.

2.2   Acceptance and Rejection

The acceptance by the Agency of the deliverables under ESA Contract is considered to be the acceptance by the Contractor of the deliverables and the Subcontract Assignments from the Subcontractor. The acceptance shall be declared upon verification, by the Agency, that the Work or the respective part of it has been performed in compliance with the Agency's requirements and that the required results have been achieved. The said deliverables shall be considered as accepted in the absence of an explicit reaction in respect to the same, by the Agency, within one (1) calendar month counting from the time of submission for acceptance. The Contractor is obliged to inform the Subcontractor about the time of submission for acceptance hereunder. Provisions of Article 5.5 below shall apply in this respect.

2.3   Deliverable Documents

The Subcontractor shall, during the performance of this Subcontract, deliver all documentation and reports specified in the Applicable Documents and requested from him, in the format specified therein and in accordance with the Contractor´s instructions. If Subcontractor´s input or assistance is required with respect to the preparation of Progress Reports, Final Report, Executive Summary Report, Contract Closure Documentation or all other documents specified in the Article 1.2 of the Subcontract, Subcontractor undertakes to do so in the required extent and in accordance with Contractor's instructions. The Parties shall closely and regularly cooperate to this end in order to duly fulfil all the requirements of Applicable Documents and of other mentioned related documents.

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005

2.4   Other Deliverables

The Subcontractor shall provide any necessary assistance, which may be requested from him, in order to fulfil the provision of Article 2.4 of ESA Contract.

2.5   Security obligation of Subcontractor

Provided the Contractor creates for the Subcontractor access to its information and software systems, for the purposes of performance of Subcontract Assignments, the Subcontractor undertakes and guarantees that this access will be used exclusively for fulfilling the Subcontract Assignments under this Subcontract and that all security and other measures are and will be complied with, otherwise the Subcontractor is liable for damage caused to the Contractor by violation of this provision.

ARTICLE 3 - PRICE

3.1   The total price of this Subcontract amounts to:
53.992 EURO,
(fifty three thousands nine hundred ninety two Euro),

The abovementioned price is hereby defined as a firm fixed price and as such, it shall not be subject to any adjustment or revision by reason of the actual costs incurred by the Subcontractor in the performance of this Subcontract.

3.2   The price furthermore includes all costs relative to the Subcontractor's obligations under Article 2 above.

ARTICLE 4 - PAYMENTS AND INVOICING

4.1   Subcontractor shall be entitled to obtain the payment of the price hereunder or any part thereof only when the Contractor obtains the respective payment from ESA. Contractor will inform the Subcontractor immediately after receiving any payment from ESA. Subcontractor acknowledges that the Contractor must strictly follow provisions of Article 4.1 of ESA Contract including, but not limited to:
(i) Any requests for payments from ESA, submitted by the Contractor, must be accompanied by the documentation that shall justify the actual achievement of the milestone(s) as defined in the ESA Contract;
(ii) delivery, and acceptance by the Agency, of all due items and fulfilment of all other obligations in accordance with the terms of the ESA Contract is the prerequisite for the release of payment from ESA to the Contractor;
(iii) the Agency shall be afforded all the necessary visibility, whether remotely or by means of inspection of the Contractor's and Subcontractor's premises, in order to ascertain the progress of the Work prior to authorising the relevant payment.

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005

4.2 Contractor will pay any due amount to which the Subcontractor is or will be entitled according to this Subcontract within fifteen (15) days as of issuance of the invoice by the Subcontractor. Only invoices issued in Slovak language, and adhering to all accounting rules and legislation of the Slovak Republic shall be accepted and paid by the Contractor.

4.3 Payments shall be made to the Subcontractor in EURO to the account specified in the invoice. Such account information shall clearly indicate the IBAN (International Bank Account Number).

4.4 The following payment plan applies to the Subcontractor:

Milestone (MS) Description	Payment schedule	Payments to Subcontractor (Euro, VAT excluded)
Progress Payment (MS1): Upon successful completion of WP1 and Tasks 2.2 and 3.2, and successful review and acceptance by the Agency of deliverable items TN1, TN2 and TN3.	September 2022	26 023.00
Progress Payment (MS2): Upon successful completion of WP2 and WP3 and successful review and acceptance by the Agency of deliverable items TN4 and TN5.	March 2023	21 814.00
Final Settlement (MS3): Upon the Agency's acceptance of all deliverable items due under the Contract and the Contractor's fulfilment of all other contractual obligations including submission of the Contract Closure Documentation.	August 2023	6 155.00
TOTAL SUBCONTRACT PRICE		**53 992.00**

4.5 Any special charges related to the execution of payments shall be borne by the Subcontractor.

4.6. Any questions concerning the latest status of due invoices can be addressed to invoices@solargis.com.

ARTICLE 5- SPECIFIC PROVISIONS

5.1 <u>Representatives of the Parties during Subcontract Execution</u>

5.1.2 Contractor's Representatives:

- Technical Officer: Mr Tomáš Cebecauer (tomas.cebecauer@solargis.com) for technical matters, or a person duly authorised;
- Contracts Officer: Mr Marcel Šúri (company@solargis.com) for contractual or administrative matters, or a person duly authorised;
- Project manager: Mr. Konštantín Rosina (konstantin.rosina@solargis.com)

All correspondence for the Contractor shall be addressed as follows:
Solargis s.r.o.
Bottova 2/A, 811 09 Bratislava
Slovakia

5.1.3   The Subcontractor´s representatives are:

- Technical officer: Mr. Miloš Rusnák (milos.rusnak@savba.sk)
- Project administrator: Ms Monika Kopecká (monika.kopecka@savba.sk)

All correspondence for the Subcontractor shall be addressed as follows:
Geografický ústav SAV, v. v. i.
Štefánikova 49, 814 73 Bratislava
Slovakia

5.1.4   Communications related to the Subcontract affecting its terms and conditions shall only bind the Parties, if signed by the Contractor's and Subcontractor's duly authorised representatives.

The Parties agree that electronic signature of this Subcontract shall have the same force and effect as hand-signed originals and shall be binding on both Parties to this Subcontract.

5.2   Infringement of the Law – Infringement of third party rights

5.2.1   In the event of a reasonable suspicion of infringement of any Intellectual Property Rights of third parties, the Subcontract Assignments or any part thereof being performed under this Subcontract shall be stopped immediately. Assessment of the suspicion shall be performed by the Contractor and if confirmed, both Parties shall agree on a new approach to achieve the objectives of this Subcontract, either by obtaining the applicable licence(s) from third party(ies) by the Subcontractor and/or by signing an amendment to this Subcontract agreed upon between both Parties, in order to avoid the infringement. The purpose of the amendment shall be either to restart the Subcontract Assignments or a part thereof, if plausible due under the changed circumstances; or to terminate the Subcontract, if the infringement cannot be avoided in which case the provision of Article 5.4.3 shall apply accordingly and at the same time all this shall be in inseparable relationship with the ESA Contract and its conditions.

Notwithstanding the above, the Subcontractor shall indemnify the Contractor from and against all claims, proceedings, damages, costs and expenses arising from infringement or alleged infringement of any patent rights and other Intellectual Property Rights of third parties with respect to the Subcontract Assignments or any part of it under this Subcontract. This obligation does not extend to infringements resulting from the use of documents, patterns, drawings or items supplied by the Contractor or from a modification or combination of the deliverables due hereunder made by the Contractor after their acceptance.

5.3   Liabilities

5.3.1   Claims for damage caused by the Subcontractor to Contractor shall be settled in accordance with the law governing the Subcontract. The liability of the Subcontractor for damage, except

in cases of gross negligence or wilful misconduct, shall however not exceed the amount which is quoted in the Subcontract as the total Subcontract price.

5.3.2   Except in case of gross negligence and wilful misconduct, the Parties shall not be liable towards each other for consequential damages sustained by the Parties, arising from and during the execution of the Subcontract. For the sake of clarity and as an example, consequential damages include, but are not limited to: loss of contract; income or revenue; loss of profit or interests; loss of financing; loss of customer; loss of availability and use of facilities; loss of availability and use of employees' productivity or loss of services of such persons; loss of opportunity; loss of rental expenses.

5.4   Contractor's Rights in Case of Subcontractor's Under-Performance

5.4.1.   Should any of the results of the Subcontract Assignments fail to meet the agreed requirements and/or specifications, the Contractor reserves the right to reject such results and require their resubmission following an iteration of the relevant work by the Subcontractor at no additional charge.

5.4.2   Should any of the results of the Subcontract Assignments fail to meet any of the agreed requirements and/or specifications to such an extent as to seriously jeopardise the performance of this Subcontract and/or ESA Contract and/or to defeat their objectives, the Contractor reserves the right to terminate this Subcontract.

5.4.3   Termination of this Subcontract as specified above shall entail no compensation being due to the Subcontractor other than the amounts corresponding to the Milestone Payments already made hereunder at the time of serving of the termination notice.

5.5   Termination without fault of the Subcontractor

5.5.1   According to ESA Contract the Agency shall have the right at any time to terminate the ESA Contract either wholly or in part by giving written notice by registered mail. In the case of termination of ESA Contract by the Agency without fault of the Contractor, the Contractor shall on receipt of the Agency's instructions, forthwith take the necessary steps to implement them. Upon occurrence of such situation, Contractor shall have the same right to terminate the Subcontract by giving written notice to Subcontractor by registered mail. The Parties shall use their best efforts to mitigate the consequences of the termination. The period to be allowed to implement them shall be agreed between the Parties but shall not exceed three (3) months.

5.5.2   Subject to the Subcontractor conforming with the instructions referred in Article 5.5.1, the Contractor shall take over from the Subcontractor at a fair and reasonable price all finished parts not yet delivered to the Contractor by Subcontractor provided the Contractor has agreed on the same with the Agency.

5.5.3   In case the Agency has indemnified the Contractor against part of any loss of profit as is attributable to the termination of the Contract and against any damage resulting from the termination of the Contract, the Contractor has the right to indemnify with appropriate compensation the Subcontractor, while the amount of compensation payable under this Article, if any, shall be fixed on the basis of evidence produced by the Subcontractor and

accepted by the Contractor. It shall take account of the proportion of the Subcontract and ESA Contract completed and shall be consistent with the provisions of Article 5.5.4.

5.5.4   The Contractor shall in no circumstances be liable to pay any sum which, when added to the other sums paid, due or becoming due to the Subcontractor under the Subcontract, exceeds the total price for the work set forth in the Subcontract.

5.6   Changes to this Contract

5.6.1   Contractor reserves the right to request a change of this Subcontract, following the request from the Agency, as far as Agency reserves the right at any time to request a change to the requirements covered by the ESA Contract. The cost impact relative to such changes, resulting from a request by the Agency, shall be borne by the Agency.

ARTICLE 6 – CONFIDENTIALITY AND INTELLECTUAL PROPERTY RIGHTS

6.1   Confidentiality agreement

6.1.1   Information, data, reports and results arising from or related to Subcontract Assignments as delivered by Subcontractor shall belong to the Contractor, for the purpose of fulfilment of ESA Contract. Subcontractor acknowledges that the Agency shall have the right to make some information, data, reports and results related to Work (and thereby also to Subcontract Assignments) available to the Participating States in the Programme and any Persons and Bodies under their jurisdiction in accordance with ESA Contract.

6.1.2   For the purpose of this Subcontract "Proprietary Sensitive Information" shall mean information corresponding to business related information (e.g. business plans, know-how, analysis, reports, studies, data, databases, etc.) and/or Intellectual Property Rights of each Party, the uncontrolled dissemination of which is likely to impair the Party's long-term ability to use and exploit the aforesaid and/or to maintain a competitive advantage and/or to cause damage to such Party.

The Subcontractor shall not mark any (electronic) documentation as Proprietary Sensitive Information, unless agreed in advance with the Contractor. Any request from the Subcontractor shall be submitted in writing accompanied by an appropriate justification.

6.1.3   Neither Party shall disclose any Proprietary Sensitive Information related to the other Party or any documentation obtained from the other Party which both Parties recognise as being confidential without the other Party's previous written authorisation. Without prejudice to the foregoing and limited to the purpose and scope of this Subcontract, both Parties may circulate such documentation to their employees or contractual collaborators that require the said documentation for the sole purpose of complying with, or inspecting the progress of, this Subcontract.

6.1.4   The obligations provided in Articles 6.1.2 and 6.1.3 shall not apply to documentation:

- which at the time of circulation has already entered in public domain or which after circulation enter in public domain other than through a breach of the Subcontract;

- which at the time of circulation is already known by the receiving party and is not hindered by any obligation not to circulate;

- which is later acquired by the receiving party from another source and is not hindered by any obligation not to circulate;

- which is required to be circulated by law or order of a court of competent jurisdiction.

6.2 Intellectual Property Rights

6.2.1 The existing solar radiation nowcast model, including the data delivery system ("**Solargis Model**") is intellectual property of the Contractor protected by copyright and trade secret. Contractor executes in its name and on its account all Intellectual Property Rights to Solargis Model in accordance with the valid Act No 185/2015 Copyright Act, as amended ("**Slovak Copyright Act**"). The Subcontractor acknowledges that by provision of his services and assigned tasks and works under the Subcontract all the above copyright proprietary rights of the Contractor shall remain unaffected.

6.2.2 Subcontractor acknowledges that the Intellectual Property Rights arising from or related to the results of the Subcontractor Assignments shall be transferred to the Contractor who, based on ESA Contract, shall make it available to the Agency according to the conditions of the ESA Contract.

6.2.3 Based on the Subcontract, the Subcontractor will provide the services and works in relation to Solargis Model and with respect to Subcontractor Assignments exclusively through its employees and therefore Subcontractor confirms that he will be executing at the moment of work performance all copyright proprietary rights to any creations and works falling under copyright protection of employees work of the Slovak Copyright Act with the right to give subsequent licenses or to transfer the copyright to such work to the Contractor.

6.2.4 In the event that the work protected by copyright is created as part of the provision of work or services provided by the Subcontractor within the Subcontract Assignments, the Subcontractor hereby licenses/assigns the copyright proprietary rights, in accordance with the § 90 of the Slovak Copyright Act, to the Contractor in the entire foreseeable extent with unlimited time and territory, including the right to use such work, to process, change, translate and adapt the work in the usual manner in its business activities and to give sub-licenses to third parties at Contractor´s discretion. The license is considered granted / exercise of proprietary rights as assigned to the same extent also in the case of work in progress at that stage or in the variant of solutions, even if the work is not completed and also in cases where the performance is not marked as a work, but the author's work is. The Subcontractor is not entitled to grant the rights corresponding to the license to any other third party and is also obliged to refrain from exercising the right to use the works within the scope of the license hereunder. Whenever applicable the Subcontractor will deliver to Contractor also the

source code after each termination of the service or work under which the protected work was created.

6.2.5 The Subcontractor acknowledges that the Contractor will use each copyrighted work created under this Subcontract on the basis of a license and/or assigned proprietary rights exclusively by itself and its designation under the name Solargis will correspond to this. The Parties declare that any marking of the results of creative intellectual activity of natural persons, which the Subcontractor used to create such work, is not possible neither usual for this type of works.

6.2.6 The Parties understand and agree that the remuneration for the provided license/assigned proprietary rights has already been included in the agreed price under this Subcontract for the Subcontract Assignments within which the copyright work was created. For the avoidance of doubt, the Parties have agreed that the Contractor is entitled to the copyright work immediately upon the moment of its creation or just after taking over such work, whatever happens earlier and/or is applicable on the given type of work, even if the price for the respective Subcontract Assignments of which the work was a part has not yet been paid.

6.2.7 In the event of termination of this Subcontract in any way, the already granted license or transferred proprietary rights or part thereof does not expire. The rights from the license as well as the rights to exercise proprietary rights pass also to the legal successor of the Contractor.

ARTICLE 7 – FINAL PROVISIONS

7.1 The Subcontract is concluded for the same period as ESA Contract.

7.2 The English version of the Subcontract shall always prevail. Any and all communication between the Parties shall be in English.

7.3 In the event one or more provisions hereunder is or should become legally invalid, this shall not affect the remaining Subcontract's validity.

7.4 The Subcontract is executed by the duly authorised representatives of each of the Parties in two (2) originals. The Subcontract comes into effect on the day of its signing.

7.5 The inseparable part of this Agreement are the following annexes:
Annex 1: Table of Deliverables
Annex 2: Time schedule of the project

7.6 The Parties declare that they have thoroughly read the content of this Subcontract, that it corresponds with the expressions of their will, it has been concluded freely, seriously, definitely and intelligibly, not in distress and under noticeably unfavourable conditions, approve the Subcontract and in accordance with its content, the Parties have signed the Subcontract electronically or by hand.

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005
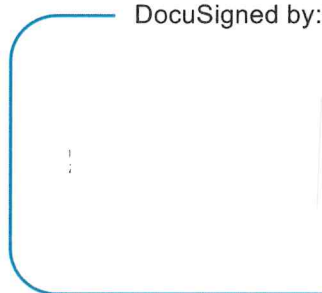
In Bratislava, on 25 February 2022

For Solargis s.r.o.,

For Institute of Geography, SAV

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Mr. Marcel Šúri, PhD.
Managing director

Mr. Daniel Michniak, PhD.
Director

DocuSigned by:

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005

ANNEX 1: Table of Deliverables

ID	Title	Milestone / MPP	Description of documents
TN1	Theoretical base and state of the art for cloud identification in early morning hours	End of Task 2.1 (Month 3) / MS1	Document describing the theoretical background of the developed methods, procedures, and algorithms for automatic cloud detection from infrared images.
TN2	Theoretical base and state of the art for the effects of orographic barriers to cloud motion	End of Task 3.1 (Month 3) / MS1	Document describing the theoretical background of the cloud motion prediction adapted to simulate the effects of orographic barriers.
TN3	Algorithms and report documenting the improvements of solar radiation nowcasting given by the increased temporal resolution	End of WP1 (Month 8) / MS1	Document describing upgrade of the data production, cloud motion tracking optimisation for enhanced time resolution and adaptation of the algorithms for storage and computation capacities. The document will report on verification and validation of the proposed approach.
TN4	Solar radiation nowcast model with blended procedures for night/morning/daytime cloud detection and experimental data sets for WP3	End of WP2 (Month 12) / MS2	Document with the description of the cloud detection algorithm and classification procedure of infrared spectral images, process of cloud height detection and blending development between early morning and daytime versions of the solar radiation nowcast model. The document will contain the results of verification and validation.
TN5	Orographic barriers data set, and improved cloud motion model respecting barriers for different cloud heights.	End of WP3 (Month 14) / MS2	Document will describe preparation of the global gridded dataset and new algorithm for applying the barrier effect for individual height levels of cloud motion vectors. TN includes the orographic barriers dataset. Document will contain the results of verification and validation
TN6	Validation and implementation summary	End of WP4 (Month 17) / MS3	Document will summarize and extend on the partial validation reports of TN 3-5. The results of validation will be specified by statistical indicators comparing the new and original versions of the model at selected project sites. The new nowcast model will be demonstrated on two types of solar radiation time series data: (i) 1-minute ground measurements and (ii) 10-15 minute data from satellite-based solar model. Implementation of the improvements into operational production will be discussed.
TDP	Technical Data Package with validation at customers projects	Final Review	As defined in section 1.5 of Appendix 1 to the Draft Contract
ESR	Executive Summary Report	Final Review	See above
FR	Final Report	Final Review	See above
CCD	Contract Closure Documentation	Contract Closure	See above
FP	Final Presentation	Final Review	Presentation of the achieved project results

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005

Other Deliverables

Item	Title	Milestone	Format / Description
SA1	Service Access to public nowcast API trial version / License or access key for ESA review (online)	Contract closure	• Updated API posted at https://solargis.com/products/api/data-delivery-web-service/overview • The pages include documentation and technical description of the models. • They allow trial access for customer-selected projects, trial is used for adapting the customers' projects to their needs and it is offered for 3 months (to potential commercial customers). • The access for ESA will be ensured for a period of 12 months at the end of the activity.

Subcontract between Solargis s.r.o. and Institute of Geography SAV on performance of enhanced solar radiation nowcasting based on geostationary satellite data No. 2022-005

ANNEX 2: Time schedule of the project

WP	Task	Duration (months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.1	3																		
	1.2	4																		
	1.3	4						ER1		TN3										
2	2.1	3			TN1															
	2.2	6																		
	2.3	3																		
	2.4	4										ER2		TN4						
3	3.1	3			TN2															
	3.2	6																		
	3.3	6																		
	3.4	6												ER3		TN5				
4	4.1	5																		
	4.2	5																		
	4.3	6																	TN6	TDP, FR
5	5.1	18						PR1					PR2							FP
	5.2	18																		ESR
Meeting plan			KM			PM1			PM2			PM3		PM4			PM5			FM
Milestone plan										MS1						MS2				MS3
Budget Plan (%)										48						40				12

KM – kick-off meeting, PM – progress meeting, FM - final meeting, PR – progress report, MS – milestone

ER – engineering review, FR – final report, FP – final presentation, ESR – executive summary report, TDP – technical data package