

<b>GENERAL COLLABORATION AGREEMENT</b>
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BETWEEN

**COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES,**

A French State –owned research entity having a scientific, technical and industrial nature, duly organised under the laws of France and having its registered office located at Bâtiment « Le Ponant D » - 25 rue Leblanc – 75015 Paris (France) and declared at the Register of commerce and companies of Paris ("*Registre du Commerce et des Sociétés de Paris*") under the following registration number 775 685 019,

Represented by Ms Elsa CORTIJO acting as Head of the Fundamental Research Division and duly authorised for the purposes hereof,

Hereinafter referred to as the « **CEA** »,

CEA acting on its own name and on behalf of CNRS and UVSQ, as State bodies responsible for "LSCE",

On the one hand,

AND

**UNIVERSIDADE FEDERAL DE SANTA MARIA,**

A public institution of higher education, legal entity governed by public law, having its registered office located Estado do Rio Grande do Sul, Brazil, under the following registration number (CNPJ) 95.591.764/0001-05,

Represented by Mr Luciano SCHUCH acting as legal representative and duly authorised for the purposes hereof,

Represented by Mr Jean Paolo Gomes Minella acting as professor of higher education (Class D - Associate - Level 3) authorised for the purposes hereof,

Hereinafter referred to as "**UFSM**",

On the other hand,

UFSM, CEA, CNRS and UVSQ are hereinafter referred to individually as a "Party", or collectively as the "Parties".

## **WHEREAS**

- **LSCE** is a large laboratory that pulls together personnels from CEA and two other national research centers, namely CNRS ("Centre National de la Recherche Scientifique" and the Versailles-St-Quentin University ("UVSQ"). There are about 300 people working at LSCE, 150 of which hold permanent positions and several tens are working on a PhD. Since January 2015, LSCE is organized around 3 main scientific themes that regroup 4 to 7 teams working on similar subjects or with the same tools:
  - Archives and tracers
  - Biogeochemical cycles and transfers in the environment
  - Climate and cycles: Modeling the variability and their interactions.

The current agreement will focus on research activities conducted in the framework of the theme "Biogeochemical cycles and transfers in the environment" and, more specifically in the "Geochemistry of Impacts" team. This team uses geochemistry (e.g. stable and radioactive isotopes, elemental composition) to investigate the impact of human activities on material transfers (e.g. sediment and soil particles along with contaminants/chemicals associated with these particles).

- **UFSM** is a higher education institution with research and extension activities. The UFSM, through Graduate Programs (Master's and Ph.D degrees), act in the researchers training as well as in the generation of scientific products. The GP's of Soil Science, Environmental Engineering and Meteorology collaborate jointly in researches of monitoring and modelling of erosive processes in experimental catchments. The main actions that characterize the interaction between the three groups are:

- Hydrological and erosive monitoring of experimental catchments for the improvement of soil and water conservation practices in rural catchments;
- Mathematical modelling;
- Hydrology and ecotechnologies.

In this agreement, the research group works on the understanding and modelling of hydrological and erosive processes in rural catchments to evaluate the transfer processes of surface runoff and sediments eroded from the sources towards the drainage network with the aim of developing better land management techniques.

- The CEA and UFSM are willing to collaborate on the research topics common with the main scientific focuses of the « Geochemistry of Impacts » team.

## **NOW, THEREFORE THE PARTIES HAVE AGREED AS FOLLOWS:**

### **ARTICLE 1: DEFINITIONS**

In this Agreement, unless the context clearly dictates otherwise, the following capitalized words shall have the following meanings:

- 1.1 **AGREEMENT:** the body of this Agreement as well as any and all Attachments joint to it. The Attachments to this AGREEMENT form an integral part hereof.
- 1.2 **BACKGROUND:** any information and technical and/or scientific knowledge whether patentable or not, patented or not, held by and/or owned by a Party prior to the effective date of this AGREEMENT or developed by a Party independently of the PROJECT when implementing said PROJECT and that it has the right to dispose of, and which is necessary or useful to the fulfilment of the PROJECT, as listed in Attachment II,

completed if and where need be for a PROJECT, by the corresponding SPECIFIC AGREEMENT.

**1.3** The “**CONFIDENTIAL INFORMATION**” covered by this AGREEMENT includes:

- the BACKGROUND of each of the Parties;
- the FOREGROUND;
- any information that one of the Parties may receive or discover during a visit(s) to the offices, facilities and/or laboratories of the other Party or during its discussions with that other Party.

**1.4 FOREGROUND:** all results and knowledge, either patented or not, either patentable or not, including know-how, trade secrets, software, databases, or any other type of information in any form whatsoever that is developed jointly by the Parties in the context of the PROGRAMME and each PROJECT.

**1.5 NEW PATENTS:** any and all patent applications and corresponding granted patents claiming or embedding a FOREGROUND.

**1.6 PROJECT:** each specific R&D project governed by the AGREEMENT as implemented through an agreement (“SPECIFIC AGREEMENT”) built on the basis of the template enclosed in Attachment III.

**1.7 PROGRAMME:** all R&D works performed by the Parties pursuant to the AGREEMENT. The scientific themes of the PROGRAMME are enlisted in Attachment I. The PROGRAMME is divided into PROJECTS.

In this AGREEMENT and its Attachments, it is specified that whenever the context so allows, the singular shall comprise the plural and vice versa.

## **ARTICLE 2: PURPOSE OF THE AGREEMENT**

This AGREEMENT has for the purpose to determine:

- the general conditions under which the Parties shall implement the PROGRAMME and related PROJECTS as per the arrangements defined in Attachment I, and
- the intellectual and industrial property regime applicable to the FOREGROUND.

## **ARTICLE 3: EXECUTION OF THE PROGRAMME AND PROJECTS**

### **3.1 Purpose of the PROGRAMME**

The objective of the PROGRAMME and its technical description are described in Attachment I.

Each implementing PROJECT shall be enacted in a SPECIFIC AGREEMENT ruled by the AGREEMENT and that shall provide the specifications of the PROJECT such as its technical description, its duration, the location of its performance, its costs and budget, the tasks to be performed, the schedule, the name of the researchers involved.

### **3.2 Place of the execution of the PROJECTS**

The PROJECTS shall be implemented on the premises of the Parties:

- **for CEA/LSCE:** at LSCE's premises at Saclay, using among others the facilities of the Paris-Saclay Geoscience Analytical Platform (PANOPLY; <https://panoply-geops.lsce.ipsl.fr/index.php/en/>);
- **for UFSM:** at Graduate Programs of Soil Science in the Center of Rural Science.

It is understood that the specific location of performance of each PROJECT shall be identified in the corresponding SPECIFIC AGREEMENT

### **3.3 Reception of staff**

For the purposes of implementation of the PROGRAMME, the Parties may visit their laboratories respectively. The visiting scientists (hereinafter called the "**Visiting Scientists**") shall remain under the scientific and technical auspices of Parties' Principal Investigator identified in Article 4 and retain the status granted by their original entity, which manages them in accordance with its own rules and procedures. Accordingly, the employer of the Visiting Scientists shall continue to assume its responsibility as employer, especially with regard to vocational education, labor action, medical monitoring and occupational diseases.

Likewise, the employer of the Visiting Scientists remains the only authority with disciplinary power. The welcoming Party will inform the employer of the Visiting Scientists, of any breaches of discipline made by the Visiting Scientists, as soon as it becomes aware of them.

The Parties shall vouch for their Visiting Scientists with regard to the fulfilment of all obligations stemming from the AGREEMENT, especially those relating to confidentiality.

Each Visiting Scientist shall comply with the policy ("*règlement intérieur*") and instructions notified by the manager of the hosting Party.

Each Party is prohibited from paying any of the other Party's staff members.

### **3.4 Making available of Equipment**

For the purpose of carrying out the PROGRAMME, a Party may make available to the other Party some equipment (hereinafter "**Equipment**") as identified under Appendix IV - A.

It is understood that any use of an Equipment of one Party ("the **Supplier**") by the other one ("the **Beneficiary**") shall respect the following principles:

- The Equipment transferred and made available by the Supplier to the Beneficiary remains the Supplier's property;
- No right to market the Equipment is granted to the Beneficiary without prior consent of the Supplier;
- The Beneficiary agrees that the Equipment shall be:
  - used exclusively in the execution of its share of a PROJECT;
  - not transmitted to any third party;
  - used exclusively by its employees, its persons under its authority or its control.
- the Beneficiary undertakes to inform the Supplier of FOREGROUND obtained from the Equipment and not to file directly or indirectly a request for NEW PATENT or other industrial property titles relating to the Equipment;
- The transfer and the making available of an Equipment shall not be construed as an assignment of such Equipment. The terms and conditions for the availability of the Equipment shall be specified in a separate document, if necessary.

Any derogation shall be subject to the prior written consent of the Supplier;

In any case of Equipment transfer, Parties shall sign an Equipment Transfer Form provided in Appendix IV-B hereafter. The Equipment Transfer Form is a proof of the actual receipt of the Equipment. It shall be signed by both Parties within three (3) days of the receipt of the Equipment.

The Parties expressly acknowledge that any Equipment is experimental in nature, that it is transmitted "as is" without warranty - except that it has the right to transfer the Equipment -, express or implied, as to its commercial nature or compliance with a specific use or with regard to its novelty, safety or compliance or that it does not infringe any intellectual property rights of third parties.

## **4 GOVERNANCE**

### **4.1 Management of PROGRAMME and Principal Investigators**

The PROGRAMME shall be conducted under the scientific and technical responsibility of the "Principal Investigators":

- **For CEA: Olivier EVRARD ; and**
- **For UFSM: Jean Paolo Gomes MINELLA.**

Principal Investigators' duties consist of:

- validating the content of the PROJECTS, their financing and the distribution of the corresponding work between the Parties,
- validating the progress of the PROJECTS, which will be prepared and presented by the PROJECT Leaders and giving an opinion on all questions raised to it relating to the PROJECTS (problems of resources, priorities...);
- giving an opinion on all non-technical questions referred to it by the PROJECT Leaders (questions relating to intellectual property, communication, etc.) and to refer the matter to the competent department for arbitration;
- validating the FOREGROUND and the list of NEW PATENTS and ensuring the traceability of the FOREGROUND;
- coordinating the communication and publication actions decided by the Parties in the framework of the AGREEMENT;
- promoting the exchange of information between the Parties in the context of the PROJECTS; the purpose of this exchange is to facilitate the possible consequent modification of the content and/or scope of the PROJECTS;
- deciding on the extension of the collaboration to other research areas of the PROGRAMME;
- facilitating the settlement of difficulties and disputes between the Parties during the term of the AGREEMENT.

In order to do, Principal Investigators shall meet at least once a year and as often as one PROJECT requires it upon request of a PROJECT Leader.

### **4.2 Management of each PROJECT and PROJECT Leaders**

Each PROJECT shall be performed under the scientific supervision of a scientist of each Party ("PROJECT Leader"), duly identified in each SPECIFIC AGREEMENT.

PROJECT Leaders are in charge of the technical performance of the PROJECT they supervise, and as such, shall:

- regularly review the progress of their PROJECT, ensuring that the planned costs and deadlines are met, and to manage its implementation;
- propose to Principal Investigators any extension, modification or reorientation of the PROJECT which may prove necessary to achieve the objectives of the said PROJECT, it being specified that any modification of any kind whatsoever must be the subject of an amendment duly signed by the representatives of the Parties;
- deal with intellectual property issues relating to the AGREEMENT and in particular to assess the relevance of filing NEW PATENTS or to keep secret certain patentable or unpatentable FOREGROUND;
- refer to the Principal Investigators all non-technical questions as well as all difficulties or disputes which may arise between the Parties in the course of the performance of the PROJECT they monitor.

#### **ARTICLE 5: FINANCIAL PROVISIONS**

Unless provided differently in a SPECIFIC AGREEMENT, each Party shall bear its own costs incurred by the performance of each PROJECT.

#### **ARTICLE 6: CONFIDENTIALITY**

6.1 Each Party agrees to respect and maintain strict confidentiality regarding any or all of the CONFIDENTIAL INFORMATION communicated by the other Party, and not to disclose it to any third party without the prior written authorization of that Party.

Each Party shall only use the CONFIDENTIAL INFORMATION in view of the advancement of any PROJECT, and not for any other purpose whatsoever, commercial or otherwise, without the prior written authorization of the concerned Party.

Each Party shall restrict the circulation of CONFIDENTIAL INFORMATION to only those members of its staff and/or persons participating in the implementation of any PROJECT.

Each Party shall inform the persons concerned of its obligations under this AGREEMENT, and warrants the non-disclosure of CONFIDENTIAL INFORMATION by those persons to third parties.

The obligations of the Parties hereunder shall not extend to CONFIDENTIAL INFORMATION in respect of which the receiving Party can prove that:

- it was disclosed after obtaining the other Party's prior written authorization or was disclosed by the said other Party;
- was accessible to the public at the time of communication by the other Party, or became known to the public after this communication without any breach on its part;
- was lawfully received from a third party not under any duty of confidentiality;
- on the date of its communication by the other Party, was already in its possession;
- disclosure was required in application of a mandatory legal or regulatory provision, final decision of a court or arbitral decision. The Party under such duty of disclosure is required, to the fullest extent feasible, to previously notify the other Party thereof, and,

as applicable, to seek implementation of all applicable measures or procedures protecting confidentiality.

The foregoing exceptions are not cumulative.

6.3 Notwithstanding any provision of this AGREEMENT, the non-disclosure obligation shall not prevent the protection of the FOREGROUND by the Parties pursuant to an industrial property title or their exploitation in accordance with the provisions hereof.

6.4 The provisions of Article 6 apply to all Equipment that the Parties may supply each other under the conditions set forth in Article 3.

6.5 This duty of non-disclosure shall remain in force throughout the entire term of this AGREEMENT and shall survive for five (5) years after its termination or expiration.

6.6 Upon expiration or termination of this AGREEMENT, each Party agrees to return to the other or, at the latter's request, to destroy, within 15 (fifteen) days from said date of expiration or termination, any and all CONFIDENTIAL INFORMATION and biological or other Equipment, as well as all copies, excerpts or reproductions thereof that are still in its possession on that date.

In the event destruction of the foregoing is requested, the Party responsible for the destruction is required to promptly send the other a certificate of destruction.

#### **ARTICLE 7: PUBLICATIONS – COMMUNICATIONS**

7.1 Subject to the other provisions of this article, each Party may carry out publications or give conferences concerning research carried out in the context of any PROJECT.

These publications or communications shall clearly display the following notice: "*Collaboration between UFSM and CEA*", and quote the name of the researchers of the Parties having contributed to the implementation of the PROJECT, as well as the source of the Equipment used where reference is made thereto.

7.2 However, any Party wishing to proceed to such a publication or communication is required to submit the written text of its contemplated disclosure at least 1 (one) month before the date of submission to the publishing entity or of the communication for authorization by the other Party. The latter shall have 15 (fifteen) days from receipt thereof in which to make known its observations and/or give its authorization.

7.3 The Party thus consulted may remove or modify certain information whose disclosure it considers as liable to hinder the future industrial and commercial exploitation of the FOREGROUND, and/or compromise its interests. Any such removals or modifications may not, however, adversely affect the scientific value of the publication.

Failing a response by the consulted Party within the imparted time, authorization of publication or communication shall be deemed as granted.

This duty to consult the other Party so as to obtain authorization shall survive for 1 (one) year after this AGREEMENT's expiration or termination.

7.4 In the event the Parties decide to protect the FOREGROUND with an industrial property title, they shall maintain secrecy in connection therewith until the filing of the application for such title.

The filing of an application for an intellectual property title is nonetheless required to be promptly effected by the Parties when all of the necessary elements required for protection of the invention have been met, within a maximum of 6 (six) months from the date of the decision to protect the said FOREGROUND.

7.5 In any event, subject to the necessary provisions being taken in view of maintaining the secrecy of the CONFIDENTIAL INFORMATION, the provisions of this article may not defeat:

- either the duty upon each of the persons participating in the PROJECT to produce an activity report for the Party to which it reports; or
- the protection of the FOREGROUND pursuant to an intellectual property title; or
- the legal obligation for researchers to declare their inventions to their employer pursuant to their national law or the submission of a PhD thesis by researchers or any other academic diploma that is in relation with a PROJECT. The defence of any such dissertation shall be held in private whenever necessary to guarantee the confidentiality of the FOREGROUND.

## **ARTICLE 8: INDUSTRIAL PROPERTY**

### **8.1 BACKGROUND**

8.1.1 Each of the Parties shall retain the rights held by it over its BACKGROUND upon the effective date of this AGREEMENT.

8.1.2 Except as expressly indicated in this AGREEMENT, nothing herein may be construed as conferring on any of the Parties any intellectual property right, license, title or interest whatsoever in or to the other Party's BACKGROUND for any use other than execution of a PROJECT.

### **8.2 FOREGROUND**

FOREGROUND shall be equally owned by UFSM and LSCE (i.e. 50% for UFSM and 50% for LSCE).

The co-owners of the FOREGROUND shall jointly decide the terms under which they will apply to obtain and/or maintain the relevant intellectual and industrial property rights and shall strive to set up among themselves a co-ownership agreement. This co-ownership agreement shall specify, inter alia, the applicable arrangements in case of the extension of rights as well as those applicable to the allocation and assumption of expenses in connection with the requested protection.

### **8.3 MANAGEMENT OF INDUSTRIAL PROPERTY TITLES**

8.3.1 The Parties entrust the Principal Investigators with the task of determining, pursuant to the responsibilities attributed to it by Article 4, whether all or part of FOREGROUND require protection by an industrial property title.

It is acknowledged that CEA shall be appointed to perform, on behalf of the and in the joint names of the Parties (hereinafter the "**Representative**"), any and all formalities in connection with the filing, accomplishment of filing procedures and maintenance of the validity of NEW PATENTS, it being understood that:

- i. any application for a NEW PATENT in respect of FOREGROUND shall be filed by the Representative in the name and on behalf of the Parties, in their joint names.
- ii. UFSM agrees to provide the Representative with all of the documents and signatures necessary to enable it to accomplish its task;
- iii. the Parties shall meet in a timely manner so as to jointly agree upon the list of countries where the Representative shall file, in the joint names of the Parties, patent applications corresponding to the priority patent applications jointly held by them. However, should UFSM be unable to advise the Representative of its position on a given issue



sufficiently in advance so as to allow the said Representative to accomplish or have accomplished the administrative act concerned, the latter shall take the decision he deems most appropriate on his own, and the other Party shall not have any recourse against him on that basis.

- iv. the cost of filing, obtaining and maintaining the said patents shall be borne by CEA (on behalf of CNRS and UVSQ) and UFSM according to their shares of ownership in Article 8.2 above, upon direct presentation of the invoices by the common representative.
- v. if one of the Parties decides not to file, or pursue a procedure for the delivery or the maintenance of one or more patents issuing under this AGREEMENT in France or abroad, it shall so inform the other in a timely manner such as to allow the latter, should it so desire, to proceed with the filing in its own name, or pursue the procedure for delivery or maintenance to its sole benefit. The Party thus refraining agrees to sign or have signed all documents necessary to enable the other to become the sole owner of the concerned patent or patents.

8.3.2 Every patent application filed in application of the provisions of Article 8.3.1 above shall be the subject of joint ownership rules which the Parties agree to negotiate in good faith in the best timely manner following the Principal Investigators' decision to protect FOREGROUND.

8.3.3 The Parties further agree:

- that the names of the inventors shall be cited (except in case of opposition by the latter) whenever such indication is compatible with the legislation of the country where a patent is applied for, subject to a commitment by the said inventors to sign and deliver all documents necessary for the proper accomplishment of the procedures;
- to personally assume any compensation that may be due to their inventors.

8.3.4 Subject to compliance with the provisions of Article 13 below, neither of the Parties may assign to a third party, regardless of any circumstances, any patents jointly owned by them pursuant to the provisions of Article 8.3.1 above without having obtained the other Party's prior written authorization.

## **ARTICLE 9: EXPLOITATION OF THE FOREGROUND**

### **9.1 EXPLOITATION FOR RESEARCH PURPOSES**

Each of the Parties shall have a non-exclusive, non-transferable right, free of charge, to use the FOREGROUND for its internal research purposes as well as for implementation of the PROJECT.

### **9.2 EXPLOITATION FOR INDUSTRIAL AND COMMERCIAL PURPOSES**

9.2.1 CEA and UFSM will be free to use FOREGROUND in all domains for industrial or commercial purposes in any country, directly and/or indirectly through non-exclusive license grants to third parties. In all cases, a financial consideration shall be paid on exploitation revenues generated by one Party to the other one, the rate of such consideration being calculated by taking into account each Party's contribution, notably financial, to the relevant PROJECT.

9.2.2 Subject to any existing prior commitments upon the request by the other Party, each Party agrees to grant to the said other Party, on a non-exclusive basis, its rights over that part of its BACKGROUND that is necessary for exploitation of the FOREGROUND. The terms and conditions of this license shall be agreed upon pursuant to a separate agreement.

## **ARTICLE 10: LIABILITY – INSURANCE**

### **10.1 INSURANCE**

Each Party is required, during the term of this AGREEMENT, to take out and maintain the insurance policies it deems adequate to provide sufficient coverage, in view of the possibilities of the insurance market, of its risks and liability, pursuant to both the ordinary rule of law and to its contractual commitments.

### **10.2 INJURY TO STAFF**

Each Party shall be responsible for taking out coverage for its staff pursuant to the applicable laws in the field of social security, work-related accidents and occupational diseases and pursuant to the rules applicable to its status, and for accomplishing any and all legal formalities incumbent on it. Compensation for any injury sustained by their staff, arising out of or in connection with the performance of this AGREEMENT shall thus be made pursuant both to the legislation in the field of social security, work-related and occupational diseases as well as in the context of its own status.

Accordingly, each Party shall accomplish any and all formalities incumbent on it and bear, if applicable, any costs in connection with the insurance policies taken out to cover its own staff. In this respect, each Party agrees to notify the Party concerned of any accident or injury having occurred, during or in connection with the performance of this AGREEMENT, to the staff hosted by it so as to enable it to carry out any declarations required by law in a timely manner.

### **10.3 DAMAGE TO PROPERTY**

Each of the Parties shall be liable for, without recourse against the other Party, except in case of gross or intentional negligence, any damage sustained by its own property due to or in connection with the performance of this AGREEMENT.

### **10.4 DAMAGE TO THIRD PARTIES**

Each of the Parties shall be liable pursuant to the ordinary rules of law for damage of any kind caused to third parties in connection with this AGREEMENT.

### **10.5 LIABILITY BASED ON BACKGROUND, FOREGROUND AND CONFIDENTIAL INFORMATION**

Each Party shall have sole liability for any damage of any type arising out of or in connection with the use by it of BACKGROUND, or CONFIDENTIAL INFORMATION communicated by the other Party and of the FOREGROUND.

Accordingly, each Party agrees to hold the other harmless from and against any claim, lawsuit or proceedings brought against it on the basis of any damage, liability or costs in connection with any accident occurring during the use of such BACKGROUND, CONFIDENTIAL INFORMATION or FOREGROUND by said other Party.

## **ARTICLE 11: TERM**

11.1 This AGREEMENT shall enter into force on April 1<sup>st</sup> 2023 for a term of five (5) years.

11.2 In the event the PROJECT so requires at the end of this term, the Parties may extend this AGREEMENT, by an amendment negotiated in good faith specifying in particular the purpose of this extension as well as the funding arrangements.

11.3 The provisions of Articles 6 through 10 shall survive expiry or termination of this AGREEMENT.

## **ARTICLE 12: TERMINATION**

12.1 This AGREEMENT may be terminated by either of the Parties in the event of non-performance by the other of one or more obligations hereunder.

Termination shall only become effective two (2) months after the dispatching by the Party claiming non-performance of a registered letter with notice of receipt setting out the basis for its claim, unless the breaching Party has cured its non-performance within that period or shown proof of impediment due to force majeure.

12.2 The exercise of this termination option does not dispense the breaching or terminating Party from fulfilling its contractual obligations until the effective date of termination, subject to any damages that may be claimed by the Party claiming non-performance due to the early termination of the AGREEMENT.

12.3 A report on the work completed or in progress at the termination date of this AGREEMENT as well as the FOREGROUND obtained during the term of the AGREEMENT shall be provided by the breaching Party to the other Party.

12.4 In the event of termination, each Party agrees to return to the other all CONFIDENTIAL INFORMATION and/or Equipment supplied to it by the latter, as per the arrangements set forth in Article 6.6 of this AGREEMENT.

## **ARTICLE 13: ASSIGNMENT - TRANSFER**

This AGREEMENT may not be assigned or transferred to a third party by either of the Parties without the prior written authorization of the other Party.

## **ARTICLE 14: NOTICES**

All notices and other communications required or provided for under this AGREEMENT shall be given in writing and sent to the Party's address appearing below:

- **For UFSM:**

- For scientific matters: Jean Paolo Gomes MINELLA, coordinator of Interdisciplinary Research Group of Erosion and Surface Hydrology, jean.minella@ufsm.br, UFSM/CCR/DS, Roraima av., nº1000, Santa Maria, RS, Brazil
- For legal matters: Coordenadoria de Projetos e Convênios (COPROC/PROPLAN), Reitoria, Av. Roraima n. 1000, Santa Maria, RS, Brasil.

- **For LSCE:**

- For scientific matters: Olivier EVRARD, Principal Investigator of LSCE/CEA olivier.evrard@cea.fr; CEA Saclay – LSCE; Orme des Merisiers – Bâtiment 714 – 91 191 Gif-sur-Yvette Cedex – FRANCE
- For legal matters: CEA SACLAY – DRF/DAP/Cellule Juridique – Bâtiment 530 PC7 – 91191 Gif-Sur-Yvette cedex - FRANCE

#### **ARTICLE 15: GOVERNING LAW – DISPUTE RESOLUTION**

15.1 This AGREEMENT is drafted in Portuguese and in English, but only the English version is enforceable and binds the Parties.

15.2 This AGREEMENT shall be governed and construed in accordance with the laws of France.

15.3 Any dispute that may arise out of or in connection with the interpretation, performance, termination and/or validity of this AGREEMENT that the Parties are unable to resolve amicably within a period of two (2) months from its occurrence shall, at the request of the more diligent of the Parties, be submitted for final adjudication to the courts of the defeding Party.

#### **ARTICLE 16: SEVERABILITY**

If any of the provisions of this AGREEMENT is found to be invalid or unenforceable, the other provisions of this AGREEMENT shall remain valid in accordance with the applicable laws and regulations.

The severed provision shall be replaced to the fullest extent possible by a provision having an equivalent economic effect to the severed provision.

#### **ARTICLE 17: INDEPENDENT CONTRACTORS**

It is understood that this AGREEMENT does not have for its effect to render either of the Parties the principal, agent or legal representative of the other, or constitute a partnership.

Any *Affectio Societatis* between the Parties, as well as any several liabilities towards third parties or between the Parties is formally excluded.

In this respect, neither of the Parties has the right or the duty to assume or create any obligation or liability, express or implied, in the name or on behalf of the other Party.

Each Party should thus be considered as an independent contractor.

#### **ARTICLE 18: ATTACHMENTS**

The following documents are appended to the AGREEMENT as integral parts thereof:

- **Attachment I: Description of the PROGRAM;**
- **Attachment II: Parties' BACKGROUND;**
- **Attachment III: Template of SPECIFIC AGREEMENT**
- **Attachment IV: Equipment: Equipment (A) and template of transfer form (B).**

The Attachments of the AGREEMENT are an integral part of said AGREEMENT.

In case of contradiction or difference between the provisions of this AGREEMENT and the annexes, the provisions of this AGREEMENT shall prevail.

IN WITNESS WHEREOF, the Parties hereto agree that electronic signatures shall have the same legal force and effect as the exchange of original signatures and that in the event of any dispute or claim arising out of the AGREEMENT, each of the Parties hereby waives the right to invoke any defence and/or waiver based on the signature of the AGREEMENT by electronic signature.

Each electronically signed copy shall also be admissible in evidence and shall be fully binding on each Party that signed it.

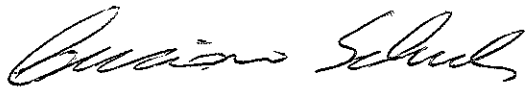
**For UFSM**

Luciano SCHUCH

Date

31 OCT. 2023

Signature



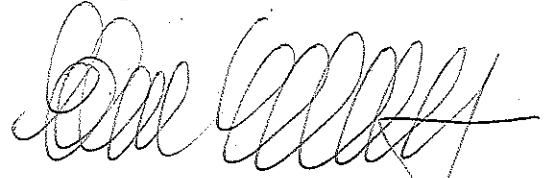
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**For CEA**

Elsa CORTIJO

Date 11 OCT 2023

Signature



## ANNEX 1- DESCRIPTION OF THE PROGRAMME

Identifying critical erosion hotspots is key for proposing sustainable landscape management to help prepare for the intense use of agricultural areas and the occurrence of intense rainfall events due to climate change. Runoff water connects the eroded sediments and other pollutants from the landscape to water bodies, and accelerated erosion in fragile areas can cause negative effects both on- and off-site. Using the tools of environmental monitoring, we are planning to describe how water flows connect the landscape to the streams, and how sediments and solutes are transported to the river channel in water basins in Southern Brazil. The main objectives of this cooperation project are to describe and quantify the hydrological processes acting on erosion to understand the processes of mobilization and transfer of sediments. The different methodologies used will explore a headwater catchment by monitoring runoff, suspended sediment, nutrient and pesticides concentrations, and estimating the main fine sediment sources to comprehend the impact of its agricultural land use on these transfers. The project will be carried out in a small experimental catchment (Guarda Mor river catchment – 18.5 km<sup>2</sup>), but also in a large water basin (Uruguay river with 200 000 km<sup>2</sup>) located in southern Brazil, northern Argentina and western Uruguay based on dating and tracing studies of sediments deposited in the Salto Dam reservoir. The main approaches of this study can be subdivided into the following goals:

Goal 1: Computational modelling applied to sediment source identification: uncertainty analysis and sample number optimization.

Goal 2: Improved simulation of runoff and erosion in no-till rural catchments to adapt agricultural production systems to the impacts of climate change.

Based on these research activities, we intend to generate insightful information and products to improve the land management and soil and water conservation, as well as to train researchers in the areas of environmental monitoring, mathematical simulation, sediment tracing, and the dating of erosion and deposition rates.

## ANNEX 2- PARTIES' BACKGROUND

The main contribution of the Brazilian team (UFMS) in the development of the project is related to environmental monitoring techniques and the modelling of hydrological and erosive processes in agricultural catchments to assess the impact of agricultural activities on water resources. The research group is responsible for conducting the monitoring work in the experimental basins under study.

The main contribution of the French team (LSCE) in the development of the project is related to the adaptation, development and implementation of the techniques of sediment tracing and dating, which will provide significant advance in the understanding of the processes of interest.

## ANNEX 3- TEMPLATE OF SPECIFIC AGREEMENT

**SPECIFIC AGREEMENT N° (to be added)**  
Implementing AGREEMENT (ref CEA : F44258)

Binding documents	This SPECIFIC AGREEMENT is governed by the AGREEMENT.
	The following Attachments are added to the SPECIFIC and are part of it : Attachment 1 : Technical description of PROJECT Attachment 2 : Financial data

Short name of PROJECT			
Title of PROJECT			
Parties	CEA/LSCE	UFSM/	specify specific laboratory
Starting date			
Duration of PROJECT / Ending date			
Parties may extend the duration of this SPECIFIC AGREEMENT by executing a covenant.			

<b>PROJECT Leader of USFM</b>	
Name	
Phone	
Email	

<b>PROJECT Leader of LSCE</b>	
Name	
Phone	
Email	

Purpose of PROJECT		
Goals of PROJECT		
TRL		
Interest of PROJECT		
Location of performance of PROJECT	LSCE (x%)	UFSM (x%)
Hosting of personnel		

<b>Technical presentation of PROJECT</b>	
<b>Tasks of PROJECT</b>	Task 1 :



	Task 2 :
	Task 3 :
Schedule of PROJECT	Task 1 :
	Task 2 :
	Task 3 :
Deliverables	
Platform (if any)	
Equipment of one Party made available to the other Party (if any)	

Intellectual Property	
LSCE BACKGROUND (if different from the one specified in AGREEMENT)	
UFSM BACKGROUND (if different from the one specified in AGREEMENT)	
Nature of FOREGROUND expected	

Budget of PROJECT : xxxxxxxx € H.T.		
Budget for each Party (€)	CEA :	UFSM :
Details of budget are provided in Attachment 2 of this SPECIFIC AGREEMENT.		
Financing	<p>Case 1 :</p> <p>Each party bears its own costs.</p> <p>Or</p> <p>Case 2:</p> <p>XXX pays to YYY xxxx euros according to the following schedule : Deliverables and payments shall be validated by the Principal Investigators.</p> <p>Invoices shall be sent to ...</p> <p>Payment shall be done by wire transfer to the bank account identified in the relevant invoice.</p>	

<p>SIGNATURE CEA</p> <p>Mme Elsa Cortijo Directrice de la Recherche Fondamentale</p>	<p>SIGNATURE UFSM</p> <p>Name Title</p>
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**Attachment 1 : Technical description of PROJECT**

**Attachment 2 : Budget of PROJECT**

For LSCE/CEA

Costs	Costs (H.T) k€
Manpower	
Consumables	
Other expenses ( <i>to be specified</i> ) –	
Total	
Financing by CEA/LSCE ( <i>is any</i> )	

For UFSM

Costs	Costs (H.T) k€
Manpower	
Consumables	
Other expenses ( <i>to be specified</i> )	
Total	
Financing by UFSM ( <i>is any</i> )	

**ANNEX 4 - EQUIPMENT**

**IV A : List of Equipment made available or transferred from one Party to the other one**

**IV B : Template of Equipment transfer form**

The undersigned Parties hereby acknowledge the provision and receipt of the following Equipment for the sole purposes of use for the PROJECT defined in the AGREEMENT (ref CEA F44258) and SPECIFIC AGREEMENT (ref CEA Sxxxx).

The Parties agree that the provisions of the AGREEMENT and SPECIFIC AGREEMENT shall apply in full to this transfer of Equipment.

<b>Owner of Equipment</b>	
<b>Description of Equipment</b>	
<b>Use of Equipment</b>	
<b>Supplier / Laboratory</b>	
<b>Beneficiary / Laboratory</b>	
<b>Transfer Date</b>	

For UFSM

Name:

Position:

Date:

Signature:

For CEA:

Name:

Position:

Date:

Signature:

<b>SPECIFIC AGREEMENT N° 1</b> Implementing AGREEMENT (ref CEA : F44258)
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Binding documents	This SPECIFIC AGREEMENT is governed by the AGREEMENT.
	The following Attachments are added to the SPECIFIC and are part of it : Attachment 1 : Technical description of PROJECT Attachment 2 : Financial data

Short name of PROJECT	
Title of PROJECT	Improved simulation of runoff and erosion in no-till rural catchments to adapt agricultural production systems to the impacts of climate change.
Parties	CEA/LSCE   UFSM/CCR/Soil Department
Starting date =	01/04/2023
Duration of PROJECT / Ending date	31/03/2024
Parties may extend the duration of this SPECIFIC AGREEMENT by executing a covenant.	

<b>PROJECT Leader of USFM</b>	
Name	Jean Paolo Gomes Minella
Phone	+55/55/997.070.238
Email	<a href="mailto:jean.minella@ufsm.br">jean.minella@ufsm.br</a>

<b>PROJECT Leader of LSCE</b>	
Name	Olivier Evrard
Phone	+33/1/69.08.27.96
Email	<a href="mailto:olivier.evrard@lsce.ipsl.fr">olivier.evrard@lsce.ipsl.fr</a>

<b>Purpose of PROJECT</b>	
Goals of PROJECT	Preparing Brazilian agriculture to face the impacts of climate
TRL	1
Interest of PROJECT	Hydrological monitoring and modelling Sediment transfer modelling Identification of suspended sediment sources
Location of performance of PROJECT	LSCE (50%)   UFSM (50%)
Hosting of personnel	<i>Jean Minella hosted at CEA/LSCE for one year (April 2023 – March 2024)</i>

<b>Technical presentation of PROJECT</b>	
Tasks of PROJECT	Task 1 : To apply the models and describe the processes
Schedule of PROJECT	Task 1 : April 2023 – March 2024
Deliverables	Scientific papers, training of researchers, tools to environmental monitoring and modelling

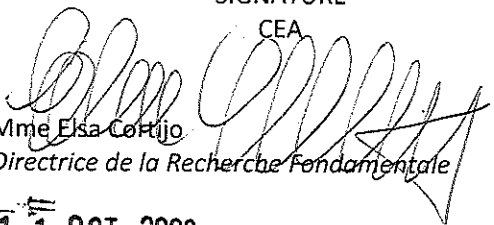
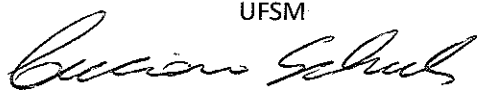
Platform (if any)	
Equipment of one Party made available to the other Party(if any)	

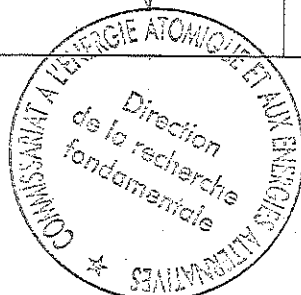
Intellectual Property	
LSCE BACKGROUND (if different from the one specified in AGREEMENT)	
UFSM BACKGROUND (if different from the one specified in AGREEMENT)	
Nature of FOREGROUND expected	

Budget of PROJECT : 130.500 € H.T.		
Budget for each Party (€)	CEA : 98.500	UFSM : 32.000
Details of budget are provided in Attachment 2 of this SPECIFIC AGREEMENT.		
Financing	Case 1 : Each party bears its own costs.	

IN WITNESS WHEREOF, the Parties hereto agree that electronic signatures shall have the same legal force and effect as the exchange of original signatures and that in the event of any dispute or claim arising out of the SPECIFIC AGREEMENT, each of the Parties hereby waives the right to invoke any defence and/or waiver based on the signature of the SPECIFIC AGREEMENT by electronic signature.

Each electronically signed copy shall also be admissible in evidence and shall be fully binding on each Party that signed it.

<p>SIGNATURE CEA</p>  <p>Mme Elsa Cortijo Directrice de la Recherche Fondamentale</p> <p>11 OCT 2023</p>	<p>SIGNATURE UFSM</p>  <p>Luciano Schuch Dean of UFSM</p> <p>31 OCT. 2023</p> <p>Luciano Schuch Reitor</p>
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**Attachment 1 : Technical description of PROJECT**

***Improved simulation of runoff and erosion in no-till rural catchments to adapt agricultural production systems to the impacts of climate change.***

**Abstract:** The repercussions of climate change have great potential to cause negative impacts on water resources and agriculture. The Intergovernmental Panel on Climate Change (IPCC) reported that high magnitude and intensity rainfall will increase in southern Brazil, increasing its potential to degrade natural resources (soil, water, and biodiversity). In addition, more severe droughts will lead to frequent crop failures and reduced water availability in water sources. Despite the wide adoption of no-till farming in Brazil, its efficiency in managing runoff has not been enough to control soil degradation and its impacts on water resources. The lack of runoff control practices and soil densification amplifies the negative effects resulting from climate change. This new climate scenario, associated with the simplification of the production system, must be understood by employing a strategy that combines hydrological monitoring and mathematical modeling of small rural catchments. Mathematical models are powerful tools to evaluate the impacts of different climate, land use, and management scenarios and shed more light on the dominant hydrological processes. Nonetheless, the models must be adapted to the local condition either by compiling the set of equations and/or by parameterization with verification from monitoring data. Hence, this study aims to adapt two models to no-till and tropical soil conditions that are specific to rural Brazilian catchments, which are significantly different from those where the models were developed. The type of soil degradation in no-till farming determines infiltration conditions and runoff hydraulics that are still poorly understood and not properly incorporated into hydrologic and erosion models. Thus, the objective of the study period abroad is to improve the runoff and erosion simulation strategy in order to adapt agricultural production systems. The WATERSED and LISEM models will be used to improve the efficiency of runoff and sediment production modeling for the Brazilian study conditions. The improvement of the simulations will be carried out together with experts in hydrological and sediment transfer modeling in agricultural catchments. In addition, modeling results will be combined with results from sediment source identification ("Fingerprinting" approach) and Cs137 inventories. The proposed study will be carried out in a network of catchments in southern Brazil, ranging from the slope scale to large catchments ( $10^{-2}$  -  $10^2$  km<sup>2</sup>). This monitoring data set will enable us to improve the mathematical modeling technique of hydrological and erosive processes for rural catchments under no-till farming. From the improvement of simulations, soil and water conservation techniques will be recommended to adapt the agricultural production system to intense rainfall with positive repercussions to soils and water resources. The advances involve: (a) the proposition of mathematical modeling tools capable of contributing to recommending soil conservation practices to reduce environmental problems associated with erosion, runoff, and the transfer of pollutants; (b) the learning of new tools for environmental monitoring and modeling that will be useful for training researchers in this area with a focus on the management and control of runoff and erosion; (c) strengthening of international cooperation with groups of excellence.

**Scientific and technological relevance**

The change in the heavy rainfall pattern and increased frequency and intensity of droughts have required the agricultural production system to adapt to runoff management to maintain expectations for agricultural production without soil degradation. Moreover, these adaptations

are also expected to benefit water resources, including reducing maximum flows, increasing minimum flows, and improving quality by reducing the contribution of sediments and chemical elements. In this scenario, conservation practices are an essential agent of ecosystem services, significantly improving the quality and quantity of water resources. Degradation mechanisms are specific to each region and depend on the characteristics of the climate, soil, relief, and production systems. The study of these mechanisms must be carried out at the catchment scale to enhance the productive capacity of the production areas while analyzing the repercussions on the water resources. This is because soils have crucial hydrological functions and, according to their use and management, alter the runoff pattern and consequently affect the quantity and quality of water resources. What is more, there are few studies on runoff monitoring and modeling and its associated processes, such as the transfer of sediments and pollutants in Brazilian catchments, especially for medium and small rural catchments. Developing tools to help control these processes to achieve a condition of sustainability necessarily depends on the knowledge of what kind of hydrological alteration this system promotes. By improving modeling tools, more efficient agricultural practices can be defined to avoid degradation by runoff and improve the quality and quantity of water bodies. Given this scenario, the support for the development of this project contributes to generating objective information to help establish public policies for water use in rural areas. As land use and land exploitation systems and their environmental consequences vary locally, each region must have specific soil and water management practices. Modeling techniques are fundamental to diagnosing the problems and precisely planning runoff and diffuse pollution measures. The currently available models are extremely robust and efficient, although they were not developed based on the observation of Brazil's processes. Our climate characteristics with high erosivity, deep and weathered soils, and management based on no-till farming impose highly specific conditions that must be incorporated into the models and tested in order for the models to be improved and recommended for use in Brazil. In summary, the primary outputs that indicate the relevance of the project include:

- 1 - Improving the mathematical modeling specific to Brazilian conditions, especially considering the influence of no-till farming on infiltration processes and runoff formation.
- 2 - Based on mathematical models adjusted to Brazilian conditions, propose soil and water conservation measures to control degradation processes involving surface runoff, contributing to reducing the impacts of agriculture on water resources and increasing agricultural productivity through better water management.

**Attachment 2 : Budget of PROJECT**

For LSCE/CEA

Costs	Costs (H.T) k€
Manpower (implication of two researchers and one engineer from CEA *4 person-months/in 2 years)	63.5
Consumables	5
Other expenses (to be specified) – use of analytical facilities at LSCE	30
Total	98.5
Financing by CEA/LSCE ( <i>is any</i> )	98.5

For UFSM

Costs	Costs (H.T) k€
Manpower (implication of two researcher from UFSM *12 person-months/in 1 year	32
Consumables	0
Other expenses (to be specified)	0
Total	32
Financing by UFSM ( <i>is any</i> )	32



**SPECIFIC AGREEMENT N° 2**  
Implementing AGREEMENT (ref CEA : F44258)

Binding documents	This SPECIFIC AGREEMENT is governed by the AGREEMENT.
	The following Attachments are added to the SPECIFIC and are part of it : Attachment 1 : Technical description of PROJECT Attachment 2 : Financial data

Short name of PROJECT		
Title of PROJECT	Computational modeling applied to sediment source identification: uncertainty analysis and sample number optimization	
Parties	CEA/LSCE	UFSM/CCNE/Math Department
Starting date =	01/04/2023	
Duration of PROJECT / Ending date	31/03/2024	
Parties may extend the duration of this SPECIFIC AGREEMENT by executing a covenant.		

<b>PROJECT Leader of USFM</b>	
Name	Lidiane Buligon
Phone	+55/55/984.046.425
Email	buligon.l@ufsm.br

<b>PROJECT Leader of LSCE</b>	
Name	Olivier Evrard
Phone	+33/1/69.08.27.96
Email	olivier.evrard@lsce.ipsl.fr

Purpose of PROJECT		
Goals of PROJECT	Preparing Brazilian natural resources to face the impacts of	
TRL	1	
Interest of PROJECT	Sediment transfer modelling Identification of suspended sediment sources	
Location of performance of PROJECT	LSCE (50%)	UFSM (50%)
Hosting of personnel	Lidiane BULIGON hosted at CEA/LSCE for one year (April 2023 – March 2024)	

<b>Technical presentation of PROJECT</b>	
Tasks of PROJECT	Task 1 : To apply the models and describe the processes
Schedule of PROJECT	Task 1 : April 2023 – March 2024

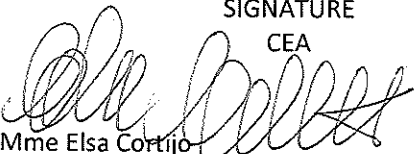
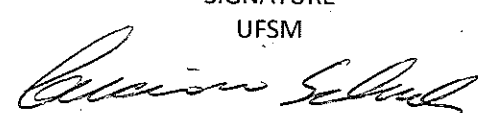
<b>Deliverables</b>	Scientific papers, training of researcher, tools to environmental modelling
<b>Platform (if any)</b>	
<b>Equipment of one Party made available to the other Party(if any)</b>	

<b>Intellectual Property</b>	
<b>LSCE BACKGROUND (if different from the one specified in AGREEMENT)</b>	
<b>UFSM BACKGROUND (if different from the one specified in AGREEMENT)</b>	
<b>Nature of FOREGROUND expected</b>	

<b>Budget of PROJECT : 130.500 € H.T.</b>		
<b>Budget for each Party (€)</b>	CEA : 98.500	UFSM : 32.000
Details of budget are provided in Attachment 2 of this SPECIFIC AGREEMENT.		
<b>Financing</b>	Case 1 : Each party bears its own costs.	

IN WITNESS WHEREOF, the Parties hereto agree that electronic signatures shall have the same legal force and effect as the exchange of original signatures and that in the event of any dispute or claim arising out of the SPECIFIC AGREEMENT, each of the Parties hereby waives the right to invoke any defence and/or waiver based on the signature of the SPECIFIC AGREEMENT by electronic signature.

Each electronically signed copy shall also be admissible in evidence and shall be fully binding on each Party that signed it.

<p>SIGNATURE CEA</p>  <p>Mme Elsa Cortijo Directrice de la Recherche Fondamentale</p> <p>11 OCT 2023</p>	<p>SIGNATURE UFSM</p>  <p>Luciano Schuch Dean of UFSM</p> <p>31 OCT. 2023</p> <p>Luciano Schuch Reitor</p>
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**Attachment 1 : Technical description of PROJECT**

***Computational modeling applied to sediment source identification: uncertainty analysis and sample number optimization.***

Abstract: Identifying sources of sediments is an important branch of catchment erosion modeling that uses soil and sediment tracers in a robust set of statistical analysis techniques commonly known as the “fingerprinting approach.” The techniques employed in the fingerprinting approach generally follow two distinct stages of statistical analysis: discrimination and classification. The first stage refers to determining which geochemical characteristics have the potential to be selected as a tracer among the sources; this stage is known as discrimination analysis. The second stage consists of classifying the eroded sediment samples in the n-dimensional space defined by the source tracer properties. In this step, the relative contribution of each source to the composition of the suspended sediment is calculated. According to researchers of the field, one of the challenges for improving the technique of sediment source identification is estimating the uncertainties of the results. In this sense, defining the number of samples used to characterize sources and eroded sediments is considered an important source of uncertainties. The assumption, in this case, is based on estimating the increased uncertainty as the number of samples decreases in the sources or eroded sediment samples. Hence, this project’s main objective is to improve the method of sediment source identification with a focus on uncertainty analysis and sample number optimization. The new algorithm will be implemented in Python language. To this end, we will validate the modeling using data collected in catchments in Brazil and elsewhere. The advantages of the proposed model include 1) it can calculate the relative proportions of each source, making it possible to evaluate the effects of reducing the sample number on the result of identifying sediment sources; 2) it considers the possible correlations that naturally exist between the different chemical variables that make up the set of tracers from the variance-covariance matrix applied to the generalized least squares (GLS) method; 3) it solves the overdetermined system coupled with the constraint condition; and 4) it complements the analysis of the correlations between variables and the effects of the variance present in each variable by calculating the uncertainty associated with the number of samples considered in the characterization of each sediment source and/or of the suspended sediments. With these results, the confidence region of the feasible solutions is defined using Mahalanobis distance. With this tool, the modeler can systematically improve the definition of the necessary sample number based on the uncertainty analysis of the set of available samples. In general, the development and shared use of open-source software provides speed and transparency in scientific development and increases methodological accessibility. Considering the cooperation already established with the Interdisciplinary Research Group on Erosion and Surface Hydrology (GIPEHS-UFSM) and with the research group led by Dr. Olivier Evrard in sediment source identification studies, the possibility of developing this research project together will be fundamental to improve the proposed technique as well as to validate and spread the proposed model.

Scientific and technological relevance

Simulating processes involving sediment transfer in catchments has contributed significantly to solving environmental problems, either for its importance in the silting of rivers and reservoirs.

as well as for controlling the pollution of water bodies. The description and understanding of the erosive process at the catchment scale demand a set of integrated and complementary monitoring techniques and mathematical modeling because, in addition to the complexity of the phenomena involved, they are highly variable in time and space. Modeling the spatial and temporal dynamics of eroded sediment production is fundamental for erosion control and the management of eroded sediments in rivers. The quantities and quality of the sediments in a river are the result of the integration of several sediment sources, making it highly difficult to identify the importance of each of them separately. Nevertheless, quantitatively understanding their importance is essential to propose soil conservation measures and reduce environmental and economic problems linked to soil erosion, and describing these processes is based not only on the principles that govern sediment transfer at the catchment scale but also on characterizing the sources and suspended sediments. This is because the concentration of tracers present in the samples must reliably represent the sediment sources and eroded sediments. Among the methods used to improve information gathering and modeling, the “fingerprinting approach” uses tracers present in the composition of soils and eroded sediments in multivariate statistical analyses and mathematical models to optimize overdetermined systems. The fingerprinting model is based on tracer variables naturally present in the environment to characterize the different sediment sources and suspended sediments. However, the models do not consider the collinearity between these tracer variables, nor do they allow the uncertainty associated with the number of samples used to characterize the sediment sources and suspended sediment mixture to be calculated. Among the numerous sources of uncertainty, the internal variability of each source and their dissimilarity is of fundamental importance to consider the valid results and define the necessary number of samples. Defining the smallest number of samples that maximizes the discriminant capacity of the sources is pivotal to reducing the costs involving sample collection and analysis and increasing the efficiency of the method. Considering that the methodological development occurs through the contribution of professionals from different areas or the same area with different objectives, it is understood that the exchange of ideas and efficient use of available computer resources promote the standardization and accuracy of the techniques applied to the modeling of erosive processes in catchments. Given this context, developing and providing a computational code to solve overdetermined systems with restrictive conditions applied to sediment tracing (or similar areas) in order to evaluate and quantify the influence of the number of samples when calculating uncertainty is fundamental for the advancement of research in the area of environmental monitoring and modeling, as well as for the management of water resources and soil management in agricultural catchments. Furthermore, promoting the exchange of ideas and information among researchers from different areas at a national (Interdisciplinary Research Group on Erosion and Surface Hydrology; GIPEHS-UFSM) and international (Laboratoire des Sciences du Climat et de l’Environnement; LSCE) level will strengthen cooperation, since the implemented code can be generalized and made available to other areas of knowledge.

**Attachment 2 : Budget of PROJECT**

For LSCE/CEA

Costs	Costs (H.T) k€
Manpower (implication of two researchers and one engineer from CEA *4 person-months/in 4 years)	63.5
Consumables	5
Other expenses (to be specified) – use of analytical facilities at LSCE	30
Total	98.5
Financing by CEA/LSCE ( <i>is any</i> )	98.5

For UFSM

Costs	Costs (H.T) k€
Manpower (implication of one researcher from UFSM *12 person-months/in 1 year	32
Consumables	0
Other expenses (to be specified)	0
Total	32
Financing by UFSM ( <i>is any</i> )	32