
DMP of project "Shallow Water modelling and satellite Imagery combination for improving Flood predicTionS"

Plan de gestion de données créé à l'aide de DMP OPIDoR, basé sur le modèle "Science Europe: structured template" fourni par Science Europe.

Plan Details

Plan title DMP of project "Shallow Water modelling and satellite Imagery combination for improving Flood predicTionS"

Deliverable

Version First version

Plan purpose/scope DMP for all WPs in SWIFT project.

Fields of science and technology (from OECD classification) 1.5 Earth and related environmental sciences, 1.1 Mathematics, 2.7 Environmental engineering, 1.2 Computer and information sciences

Language eng

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Identifier type Identifiant local

License

Name	Etalab Open License 2.0
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Associated documents

(publications, reports, patents, experimental plan...), website

- Web site for project : <https://www.swift.cnrs.fr/>

Project Details

Project title Shallow Water modelling and satellite Imagery combination for improving Flood predicTionS

Acronym SWIFTS

Abstract The SWIFTS project aims to develop innovative methods for combining big data, derived from satellite Earth observation, and hydrodynamic simulations to improve flood inundation modelling at local to regional scales. The project focuses on urban and peri-urban areas and relies on the advanced exploitation of SAR, optical and topography data to characterise complex inundation flows. The main motivation is to simultaneously improve observed and simulated products via advanced machine learning and data assimilation methods in order to reduce related uncertainties. SWIFTS will therefore contribute to tackle three main scientific challenges: (i) to improve topography and model friction parameterization in hydrodynamic models via the advanced use of photogrammetry, interferometry and land-use classification on images mainly provided by the Pleiades and Sentinel satellite missions, (ii) to further develop SAR image classification algorithms, including machine learning and interferometry techniques, for flood extent mapping in urban and peri-urban areas as well as exclusion area mapping where the SAR data doesn't enable floodwater detection, (iii) to further develop methods for assimilating flood extent maps into hydrodynamic model as front information, probabilistic and binary flood maps along with the exclusion layers. SWIFTS will rely on big data and high performance computing for machine learning, high resolution hydrodynamic modelling and ensemble-based data assimilation. To embrace both local and regional scales a traditional high-resolution hydrodynamic modelling approach will be complemented with a larger scale modelling approach including porosity concepts. To demonstrate and evaluate the developed approaches, the project will use as test cases a well-gauged French basin and a more poorly-gauged Cambodian basin where most part of the information will come from satellite Earth observation.

Funding

- French National Research Agency : ANR-23-CE56-0009

Start date 2024-01-01

End date 2027-12-31

Partners

- ARTELIA SAS
- Observation spatiale, modèle et science impliquée (ex-ESPACE pour le DEVeloppement)
- Centre de Recherche Inria - Lemon HSM-IMAG
- Centre National d'Etudes Spatiales
- Luxembourg Institute of Science and Technology
- Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique
- Institute of Technology of Cambodia

Research outputs :

1. DSM from tristereo data
2. Exclusion maps (Dataset)
3. Automated satellite Flood image mapping (Software)

Contributors

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Data description and collection or re-use of existing data

DSM from tristereo data

Research output description

Name	DSM from tristereo data
Description	New perspectives are open in urban area flood analysis thanks to 3D modelling. LiDAR airborne acquisitions provide accurate and VHR 3Dpoint cloud data on urban areas, but such datasets are not globally available. By virtue of continuous advances in RS, VHR optical satellites offer stereoscopic acquisition modes, enabling large-scale 3D modelling. Current satellite missions as Pléiades and Pléiades-Néo acquire 30-50 cm resolution images, allowing the generation of 1-m resolution DSM and DEM, which can be adapted for urban flood analyses. Furthermore, future satellite constellations like CO3D will foster the access and application of such measurements. The expertise for high-resolution building maps making the most of tri-stereo data at CNES will be complemented by the expertise on building detection techniques at LIST. Also, with an effort from Inria, fine topography elements will be added working on the fusion of heterogeneous data. Hydraulic infrastructures such as weirs, bridges, reservoirs or drains will be identified and an a priori description will be given to complement the DSM, especially in regions where LiDAR data are not available.
Workpackage	WP1 DL1-3
Keywords (free-text)	Digital Surface Model
Language	english
Issued Date	0004-03-12
Persistent identifier	
Identifier type	Identifiant local
May contain personal data?	No
May contain sensible data?	No
May take ethical issues into account?	No

Will existing data be reused?

Justification	Currently, Form@ter platform allows DSM generation from Pléiades acquisitions through an automatic pipeline. Furthermore, DINAMIS platform allows data sharing of scientific Pléiades-HR acquisitions for the research community, or to command new acquisitions for new zones (free up to 600 km ²). In this context, AI4GEO program by CNES develops Artificial Intelligence solutions applied on urban areas, mostly using 3D information from stereo images. The DSM These elements will be integrated in numerical models inputs
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How new data will be collected or produced?

Name of the method	DSM generation method
Description	<ul style="list-style-type: none"> • Building segmentation, which includes a general mapping algorithm and a post-processing to obtain correct building footprint geometries (Fig. 3). • Building extrusion, generating realistic and pertinent 3D-geometrical blocks with the measured building height. • Vegetation feature detection, including high vegetation extrusion (recreation of a cleaner forest canopy on the DSM). High resolution images and derived height information allow a robust characterisation of vegetation height and types [54] [55]. • Edit of DSM to obtain DTM after building and forest detection. • Change detection techniques.
Data Nature	Observation
Equipments, technical platforms used	<ul style="list-style-type: none"> • CARS software from CNES :
Related references	<ul style="list-style-type: none"> • https://doi.org/10.5194/isprs-annals-V-2-2020-171-2020 :

Exclusion maps	
Research output description	
Name	Exclusion maps
Description	Binary SAR-based flood mapping algorithms struggle to identify inundation in water look-alike regions or where the water surface is broken or obscured. Recently studies have targeted the generation of exclusion masks to remove such insensitive areas before processing SAR-based flood extents. Sentinel-1 with its systematic global data acquisition strategy enabled the derivation of exclusion maps directly from SAR data for the first time. WP2 improve the exclusion maps for Sentinel. Planned improvements include a more accurate classification of its sub-classes using descriptive time series statistics, and the combined use of SAR amplitude and multitemporal InSAR coherence.
Type	Dataset
Workpackage	WP2
Keywords (free-text)	exclusion maps
Language	english
Issued Date	2027-06-01
Persistent identifier	
May contain personal data?	No
May contain sensible data?	No
May take ethical issues into account?	No
Will existing data be reused?	
How new data will be collected or produced?	

Automated satellite Flood image mapping

Research output description

Name	Automated satellite Flood image mapping
Description	Both LIST's and CNES's algorithms for flood extent generation will be improved, cross compared and combined with FloodML into a common flood mapping strategy in order to provide a reliable flood extent map. LIST will assure the merging of both algorithms.
Type	Software
Workpackage	WP3
Keywords (free-text)	flood mapping algo
Language	english
Issued Date	2027-03-12
May contain personal data?	No

Will existing data be reused?

Justification	Improvement on FloodML algorithm from CNES that is openSource (Apache 2.0)
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How new data will be collected or produced?

Question sans réponse.

Documentation and data quality

DSM from tristereo data

What metadata and documentation (for example way of organising data) will accompany the data?

Description	A technical report will be provided and 2 publications are planned.
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What methods will be used to ensure their scientific quality?

Exclusion maps

What metadata and documentation (for example way of organising data) will accompany the data?

Description Technica report and scientific publication

What methods will be used to ensure their scientific quality?

Automated satellite Flood image mapping

What metadata and documentation (for example way of organising data) will accompany the data?

Question sans réponse.

What methods will be used to ensure their scientific quality?

Question sans réponse.

Legal and ethical requirements, codes of conduct

DSM from tristereo data

How will other legal issues, such as intellectual property rights and ownership, be managed? What legislation is applicable?

Description French legislation is applicable to this project. Legal issues are fairly limited in this project, as the results are not intended for commercial exploitation, and the project partners have accepted free use of the data and results.

Related references

- Consortium Agreement :

What ethical issues and codes of conduct are there, and how will they be taken into account?

Exclusion maps

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Question sans réponse.

Automated satellite Flood image mapping

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Question sans réponse.

Data processing and analysis

DSM from tristereo data

How and with what resources will the data be processed / analyzed?

Description

Computational resources avec CNES, CERFACS and LIST

Exclusion maps

How and with what resources will the data be processed / analyzed?

Question sans réponse.

Automated satellite Flood image mapping

How and with what resources will the data be processed / analyzed?

Question sans réponse.

Storage and backup during the research process

DSM from tristereo data

How will data be stored and backed up during the research?

Exclusion maps

How will data be stored and backed up during the research?

Question sans réponse.

Automated satellite Flood image mapping

How will data be stored and backed up during the research?

Question sans réponse.

Data sharing and long-term preservation

DSM from tristereo data

How will data be shared?

Modalities of sharing

The Digital Elevation Model produced over selected areas of interest will be published as Open Data on <https://recherche.data.gouv.fr/fr>
The data set will also be referenced on Zenodo.

Reusability

How will data be long-term preserved? Which data?

Exclusion maps

How will data be shared?

Modalities of sharing

The exclusion maps selected areas of interest for different remote sensing products will be published as Open Data on <https://recherche.data.gouv.fr/fr>
They will also be referenced on Zenodo.

Reusability

How will data be long-term preserved? Which data?

Question sans réponse.

Automated satellite Flood image mapping

How will data be shared?

Modalities of sharing

The software for automatic satellite flood mapping will be published on CNES and LIST git platforms, open on demand.

Reusability

How will data be long-term preserved? Which data?

Question sans réponse.