EUROVOLC

European Network of
Observatories and Research Infrastructure for Volcanology

Deliverable Report

D24.1: Report on the WP24 VA service during the project

Work Package:	*Virtual access to remote sensing and numerical models and simulations*	
Work Package number:	*24*	
Work Package leader:	*Philippe Labazuy*	
Task (Activity) name:		
Task number:		
Responsible Activity leader:	*Philippe Labazuy*	
Lead beneficiary:	*UCA*	
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Programme: H2020
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Contents

Summary

The goals of WP24, lead by the UCA-CNRS OPGC Research Infrastructure (Clermont-Ferrand, France), are to provide Virtual Access to two tools, (1) HOTVOLC (Visualisation of and access to real-time thermal data and products) and (2) DefVolc (Tools for inverse modelling ground surface displacements related to magma chamber processes or magma migration (dike or sill propagation). Deliverable 24.1 summarizes the activity in the WP24 (Virtual access to remote sensing and numerical models and simulations). It describes the development of the DefVolc modelling service,and the use of the two Virtual Access services HOTVOLC and DefVolc during the project.

Introduction

Within the EUROVOLC Project, the UCA-OPGC Research Infrastructure (Clermont-Ferrand, France) provides Virtual Access to two tools, (1) HOTVOLC (Visualisation of and access to real-time thermal data and products) and (2) DefVolc (Tools for modelling of ground surface displacements related to magma chamber processes or magma migration (dike or sill propagation).

HOTVOLC is a real-time WebGIS monitoring system (http://hotvolc.opgc.fr) of active volcanoes using satellite-based data from geostationary (GEO) platforms (MSG-SEVIRI in particular). It allows 24/7 early-warnings of volcanic activity from both thermal anomalies and ash/gas plumes detection using TIR spectral window. It also allows the continuous monitoring of the ongoing activity (fundamental to catch eruptive style evolutions/changes) at a rate of one image every 15 minutes.

DefVolc will allow to perform inverse modelling on a cluster. The inversions will be submitted using batch submission to launch the calculations in the order they are received (typically, an inversion on a cluster of 50 processors takes up to 2 days 1/2). The use of local and free computing resources will involve the authentication of users through a registration procedure (registration characteristics: Name, email, address, affiliation).The granted service is the download of inversion results (e.g. models of ground surface displacements related to magma chamber processes or magma migration (dike or sill propagation).

1. HOTVOLC

Scientific (and contact) person: Mathieu Gouhier (M.Gouhier@opgc.fr)
Technical person: Yannick Guéhenneux (Y.Guehenneux@opgc.fr)

1.1 Reminder: Status of the operation at the beginning of EUROVOLC

- Real-time access & download of IR time series (under registration)
  - Spectral radiance @3.9µm
  - Spectral radiance @3.9µm
  - LAVA TSR (Total Spetrcal Radiance)
  - LAVA VFR (Volume Flow Rate)
  - ASH BTD (Brightness Temperature Difference)
  - ASH plume area
  - SO2 RD (Radiance difference @8.7µm)
  - SO2 plume area

- Real-time download to Geotiff (under registration)
  - Cloud RGB
  - Cloud Temperature
  - Thermal monitoring

- LAVA monitoring
- ASH monitoring 1
- ASH monitoring 2
- SO2 monitoring

1.2 Update: Status of the operation at month 16

- Product-based URL/URI search engine

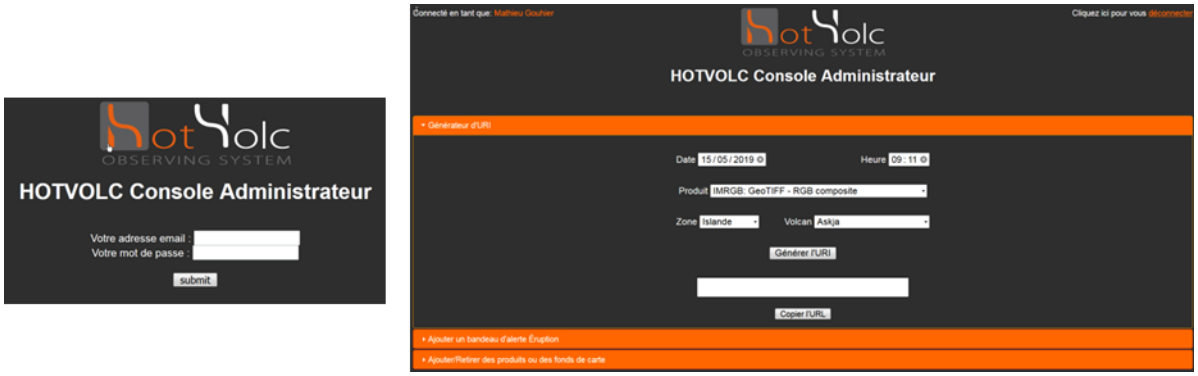


Figure 1. Generation of URL/URI addresses from administrative interface allows a direct access to the data from EPOS.

- Development of 3 new IR time series (under registration)
  - ASH plume altitude
  - ASH plume concentration
  - ASH plume mass

- Development of 4 new Geotiff (under registration)
  - ASH 5-bands
  - ASH plume altitude
  - ASH plume mass
  - ASH plume contour

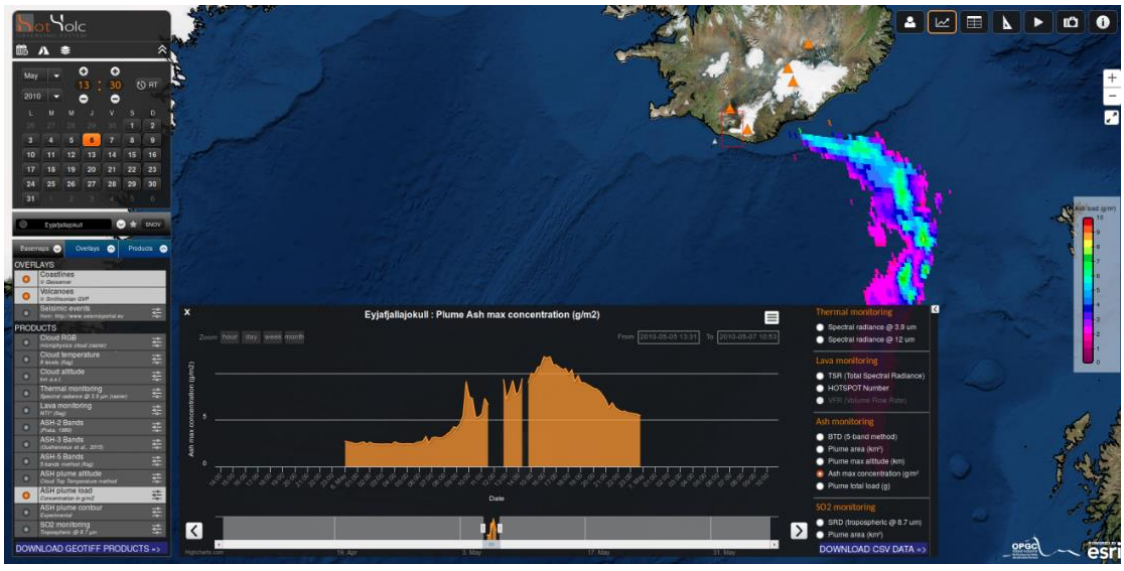
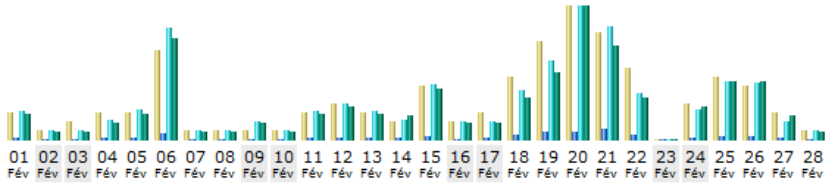


Figure 2. HOTVOLC WebGIS interface with implementation of the new products

- Technical assessment (current status of access stats)



Résumé

Période d'analyse	Mois Fév 2019				
Première visite	NA				
Dernière visite	28 Fév 2019 - 17:17				
	Visiteurs différents	Visites	Pages	Hits	Bande passante
Trafic 'vu' *	72	123 (1.7 visites/visiteur)	146 (1.18 Pages/Visite)	1 951 (15.86 Hits/Visite)	320.21 Mo (2665.81 Ko/Visite)
Trafic 'non vu' *			278	599	36.36 Mo

* Le trafic 'non vu' est le trafic généré par les robots, vers ou réponses HTTP avec code retour spécial.

Figure 3. Statistics for HOTVOLC data access on February 2019.

- Registered users (phpPg_Admin database): # = 84

Colonne	Type	NOT NULL	Défaut	Contraintes	Actions	Commentaire
id	integer	NOT NULL	nextval('users_data_id_seq'::regclass)		Parcourir Modifier Droits Supprimer	
firstname	character varying(255)	NOT NULL			Parcourir Modifier Droits Supprimer	
lastname	character varying(255)	NOT NULL			Parcourir Modifier Droits Supprimer	
email	character varying(255)	NOT NULL			Parcourir Modifier Droits Supprimer	
city	character varying(255)	NOT NULL			Parcourir Modifier Droits Supprimer	
country	character varying(255)	NOT NULL			Parcourir Modifier Droits Supprimer	
address	character varying(255)				Parcourir Modifier Droits Supprimer	
phone	character varying(255)				Parcourir Modifier Droits Supprimer	
password	character varying(255)	NOT NULL			Parcourir Modifier Droits Supprimer	
volcanoes	character varying(1023)				Parcourir Modifier Droits Supprimer	
status	character varying(255)	NOT NULL			Parcourir Modifier Droits Supprimer	
favorite_1	character varying(255)		'Etna'::character varying		Parcourir Modifier Droits Supprimer	
favorite_2	character varying(255)		'Piton de la Fournaise'::character varying		Parcourir Modifier Droits Supprimer	
favorite_3	character varying(255)		'Nyamuragira'::character varying		Parcourir Modifier Droits Supprimer	
favorite_4	character varying(255)		'Eyjafjallajokull'::character varying		Parcourir Modifier Droits Supprimer	
favorite_5	character varying(255)		'Chaine des Puys'::character varying		Parcourir Modifier Droits Supprimer	
admin	boolean		false		Parcourir Modifier Droits Supprimer	

Figure 4. "Registered user" table for HOTVOLC data download access (PostGre-SQL)

1.3 Next steps: Status of the operations

- Technical note and description (09/2019)
- Improvement of the UI (mobile + static) (01/2020)

2. DefVolc

Scientific (and contact) person: Valérie Cayol (V.Cayol@opgc.fr)
Technical persons: Farshid Dabaghi (6 months Engineer: 01/12/2018-31/05/2019) and
Clément Dupland (IUT Trainee, 01/05/2019-15/07/2019)

2.1 Milestone MS41: DEFVOLC modelling service revamped

Developments and improvements of the tools were carried out or are in progress, either thanks to internal human resources or via the recruitment of CDD staff (9 pm in total for DefVolc; 6+3 months), for the on-line release of the DefVolc modelling code (code itself and web interface).

Steps already performed:

- The interface has 5 main tabs corresponding to subtasks: (1) data subsampling, (2) Model characteristics, (3) Ground surface mesh creation, (4) inversion setup, (5) inversion, (6)

visualization.n3 main subtasks needed improvements : "data subsampling", "Model characteristics", "Ground surface mesh creation". Only the "Ground surface mesh creation" remains to be improved, the 5 other subtasks are functional.

- A web page was created at UCA-OPGC (http://www.opgc.fr/defvolc) for the users identifications, the exchange of files and launching the inversions. It now waits for our inputs.
- We agreed with the Computer Centre of Université Clermont Auvergne (UCA) about the best strategy to launch inversions from this web page.
- A users guide has been written in French, we have to translate it to English.

2.2 Update: status of the operation at month 16

Defvolc implementation is split into several tasks, all of them should be ready end of May 2019.

◦ Pre and post processor for setting up inversions: This interface (in matlab) already exists but it is not robust and has to be rewritten and improved. An executable for Linux, and Windows will be downloaded. It will have to run using runtime (matlab standalone program). Mr. Farshid Dabaghi started working on this part on December 1, 2018. He has a background in scientific computing.

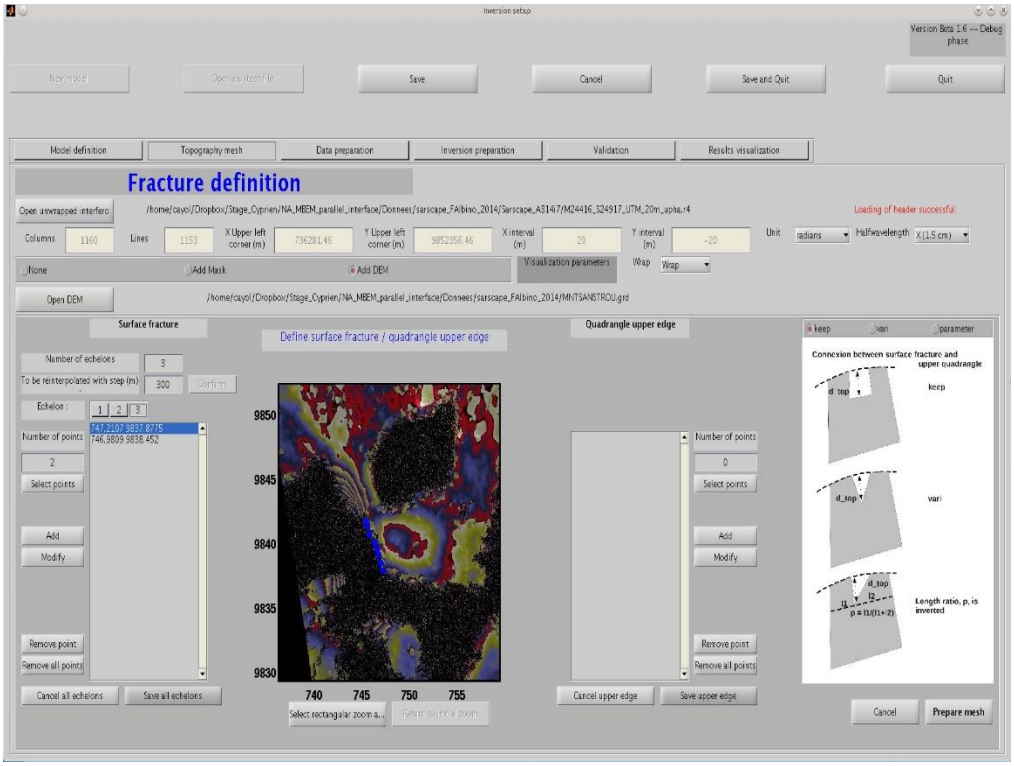


Figure 5. Pre and post processor for DefVolc

◦ Inversion and direct simulations programs: inversions are in Matlab. A Linux executable will be built. Direct simulations are in C.

Valerie Cayol is making the inversions more robust and writing a user's manual.

Web server: it will be used by users to download the DefVolc interface and launch inversions on the UCA cluster.

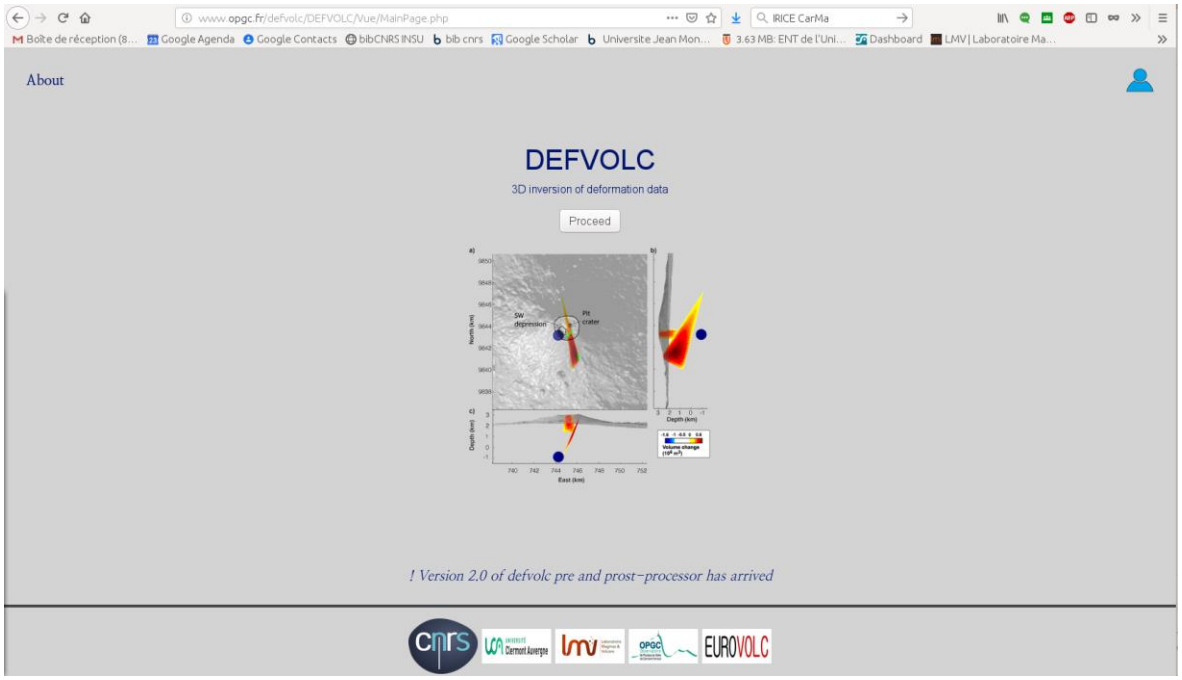


Figure 6. Web page to launch displacement inversions with DefVolc

The use of local and free computing resources will involve the authentication of users through a registration procedure (registration characteristics: Name, email, address, affiliation)
Granted service: download of inversion results (e.g. models of ground surface displacements related to magma chamber processes or magma migration (dike or sill propagation).

2.3 Next steps: Status of the operations

- MS41: DefVolc ready to use on 31 May
- Technical note and description (09/2019)
- Access statistics (Metrics definition)

3. Activity meetings

We presented the technical issues and assessed the key objectives of the two VAs provided by UCA-OPGC in the frame of EUROVOLC during dedicated VA sessions:

1) VA session at the EUROVOLC kick-off meeting, in Keflavik, 5-7 February 2018
2) Cities on Volcanoes 10th conference, in Naples, September 2018
3) VAACs meeting in London, 6-8 February 2019
4) VA session at the EUROVOLC 1st year meeting in Azores, 19-20 February 2019

Access activities – WP24-VA statistics

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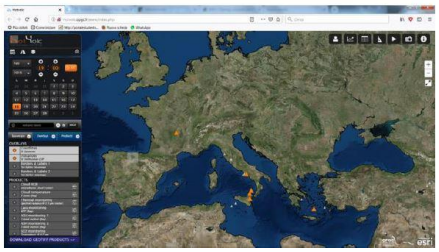
Access activities – VA Statistics

WP24 **OPGC** **Facility:** HOTVOLC

The Service access WebGIS system for volcanoes monitoring using MSG-SEVIRI satellite IR data.

Anonymous users: visualization

Registered users: download



Period of the analysis	from 01/Jan/2019 to 01/Nov/2021
Total number of users (whichever is the type of access)	from 501 to 1000
User's countries	> 25 countries
Total number of access (whichever is the type of actions)	more than 1000
Number of access per user (whichever is the type of actions)	N/A
Total number of downloads (e.g., codes, documents, data)	N/A
Number of downloads per user (e.g., codes, documents, data)	N/A
Total number of runs	not suitable
Total number of runs per user	not suitable

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Access activities – VA Statistics

WP24 **OPGC** **Facility:** DefVolc

The Service access computational resources for the inversion of displacement data models.

Registered users: run

Users are grouped in 5 categories ("Projects")
- EUROVOLC
- MDIS
- UCA
- Collaborators
- Openaccess
  - 4 Institutions:
    - Univ. of Miami
    - WJEC
    - Univ. of Thessaloniki
    - Univ. of Bristol

France, Canada, Japan, Italy, United States, Greece, United Kingdom

Period of the analysis	from 01/Jun/2019 to 09/Nov/2021
Total number of users (whichever is the type of access)	from 1 to 50 (16)
User's countries	7
Total number of access (whichever is the type of actions)	from 501 to 1000 (743)
Number of access per user (whichever is the type of actions)	from 50 to 100
Total number of downloads (e.g., codes, documents, data)	from 1 to 50
Number of downloads per user (e.g., codes, documents, data)	from 1 to 50
Total number of runs	more than 50 (373)
Total number of runs per user	from 20 to 50