D11.4 Report on Use Cases, Requirements, Metadata and Interoperability of WP 11

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SUMMARY

This report is the first revision of the D11.4 report delivered in March 2016. The main changes in this version of the report are the following:

- The DDSS Priority list has been revised and modified
- A report on an IT survey that was carried out is given
- The status of harmonization and development of new standards is given
- An updated roadmap for work to be done before M24 is presented
- The conceptual work of a Volcanology Gateway is presented
- Comments on use cases, testing and validation are given

1. Introduction to the TCS

Volcano observations is the theme for this TCS and Work Package 11. The WP11 TCS is organized in a layered structure, where at the lower level there are the national/local DDSS providers as seen in figure 1.

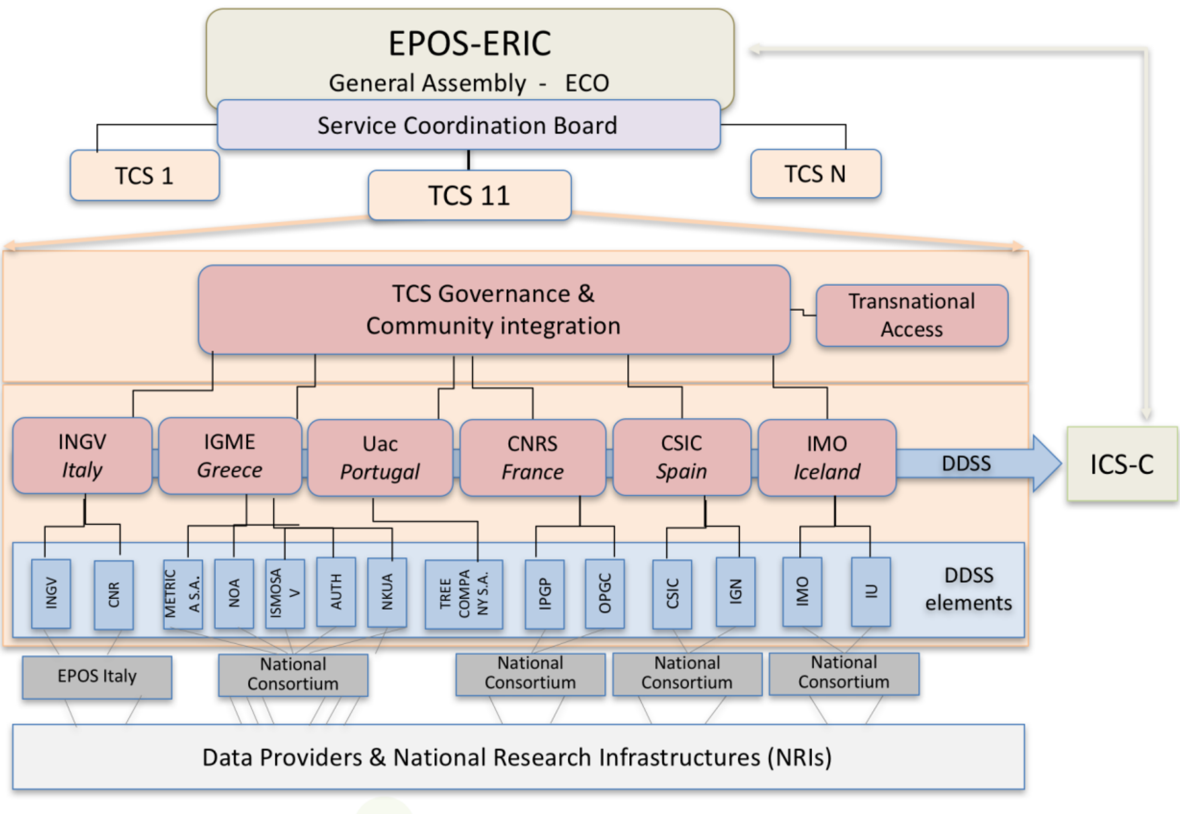

Figure 1: Volcano observations - TCS organization

At the date of this writing, the candidate service providers (i.e. those that declared to be able to provide DDSSs) are INGV, IMO, CSIC, CNRS, IGME and UAc.

- **INGV**, based in Italy, manages two volcano observatories (Osservatorio Vesuviano and Osservatorio Etneo), and include several laboratories and modelling centres.
- **IMO**, based in Iceland, manages the monitoring of Icelandic volcanoes and include also the contributions of the local university.
- **CSIC**, based in Spain, is a research institution that includes also the data provided by the monitoring system of the Canary Island, managed by IGN.
- **CNRS** is based in France and consists of two third parties: IPGP and OPGC. Through the IPGP it manages three volcano observatories (Observatoire Volcanologique et Sismologique de la Martinique, Observatoire Volcanologique et Sismologique de la Guadeloupe, Observatoire Volcanologique du Piton de la Fournaise) and OPGC contributes to the national volcano monitoring systems. Both include several laboratories and modelling centres.
- **IGME**, based in Greece, provides the observation relevant to Santorini volcano.
- **UAc**, based in the Azores, Portugal, provides the observation relevant to the monitoring system of the volcanoes of the Azores Islands, managed together with CIVISA.

Beside this list, there are three further participants to WP11, one of which has declared some DDSS at a medium/low priority:

- **GFZ** (EPOS-IP full partner)
- **DIAS** (Dublin Institute for Advanced Studies; IR)
- **UB** (University of Bristol; UK) as EPOS-IP Contributing Institutions.

All services providers, except for INGV, are national Research Infrastructures (RIs) that manage DDSSs implemented either in their own activities or provided by other national RIs, to which they are linked by specific agreements.

In the DoA the data (Level 0,1) and belong to the following disciplines:

- seismology
- geodetic
- geochemistry (e.g. gas emission)
- volcanology (e.g. rock/ash)
- environmental (e.g. meteorological in co-located geochemical/geophysical stations)

Then there are also multidisciplinary volcanic and hazard products (Level 2, 3):

- geo-volcanological maps
- chemical/physical data on rocks
- ashes

- fluids
- eruptive parameters
- thermal characteristics of lavas
- eruption rates

Currently, there are five candidate service providers contributing to this TCS, providing a variety of DDSSs, e.g. time series, data plots, terrestrial /spatial images, and volcanic maps. This can be seen in Table 1 here below which also provides information on institutes and contact persons.

Table 1: Institutes, Location, Contact and Major offerings information

Institute	Location	Contact person(s)	Major function / offerings
INGV - **Osservatorio Etneo** - **Osservatorio Vesuviano** - **INGV Pisa**	Italy	Giuseppe Puglisi *giuseppe.puglisi@ingv.it* Danilo Reitano *danilo.reitano@ingv.it*	1. seismology 2. geodetic 3. environmental 4. geochemistry 5. potential fields 6. remote sensing 7. volcanology
UAc	Azores	Teresa JL. Ferreira *Teresa.JL.Ferreira@azores.gov.pt* Carlos Primo *Carlos.MS.Primo@azores.gov.pt*	1. seismology 2. geodetic 3. environmental 4. fluid geochemistry 5. remote sensing 6. petrology
CNRS - **IPGP** - **OPGC**	France	Aranaud Lemarchand (IPGP) *arnaudl@ipgp.fr* Philippe Labazuy (OPGC) *p.labazuy@opgc.fr*	1. seismology 2. geodetic 3. environmental 4. fluid geochemistry 5. potential fields 6. remote sensing 7. petrology
CSIC / IGN	Spain	Adelina Geyer Traver (CSIC) *ageyertraver@gmail.com* Carmen Lopez (IGN) *clmoreno@fomento.es*	1. seismology 2. geodetic 3. environmental 4. fluid geochemistry 5. potential fields 6. remote sensing 7. petrology
IMO	Iceland	Kristín Vogfjörð *vogfjord@vedur.is* Fjalar Sigurðarson *fjalar@vedur.is*	1. seismology 2. geodetic 3. environmental 4. geochemistry 5. remote sensing 6. petrology 7. volcanology

2. IT Survey and the Maturity Scorecard

To gain better overview over the current state of the Priority list DDSSs and IT infrastructure of each DDSS provider participating in WP11, a survey was carried out by using a questionnaire properly implemented. The questionnaire was sent out in the beginning of November 2016 and results were collected from the 25th of November and until the end of the year. Summarisation of results and analysis were conducted and compiled during January/February 2017.

Most of the questions in the survey were open and more of qualitative nature than quantitative which meant that extra work was needed to compile comparative results for each DDSS. In the light of that a method was designed to measure the maturity of each DDSS from the results. The method consists of six questions, listed here below.

1. Is the DDSS collected on regular basis and stored on a hard drive?
2. Does the DDSS have standardized metadata?
3. Is station information available for all stations providing the DDSS?
4. Is index information (metadata) managed in a database for the DDSS?
5. Is there available web service for the DDSS?
6. Is AAAI implemented for the DDSS?

When all results had been received, each DDSS was overlaid with this set of questions. The answer YES gave 1 point and NO gave 0 point, giving each DDSS max 6 points. Then the points were summarised and a score calculated as ratio of YES-es over total possible YES-es so 6 of 6 gave 100%. In figure 2 here below an example of the scoring can be seen (MQ1 stands for Maturity Question 1).

Institution (Institute/University)	Icelandic Meteorological Office, IMO		
Storage of the Data / Data-product			
Data/Data-product Type (e.g. time series, parametric data, images, etc.)	Time series		
Data/Data-product current volume (Gb)	< 250 Gb	MQ1	1
Data/Data-product growth (Gb/month)	1 Gb		
The structure of the data/data-product has been standardized (y/n) (if not,	**Yes**		
Name of the standard			
Version (if applicable)	?		
Reference community (if applicable)	?		
The file format of the data/data-product has been standardized (y/n) (if no	**Yes**		
Format name	SAC (Seismic Analysis Code)	MQ2	1
binary ? ASCII ?	Binary		
Is it a proprietary (instrument) format ?	No		
Is it a proprietary (scientist/institution) format ?	Yes		
Description of the format			

Figure 2: Maturity questions overlaid over survey results

In WP11's context, DDSS are often provided by more than one institute which means different score depending on institutes for the same DDSS item. To compensate for that fact, an average score was also calculated for each DDSS. This can be seen in figure 3 here below.

Institutes	UAc	CSIC	IMO	INGV	IPGP	OPCG	Average score	Comment
Seismic data								
Seismic waveforms			83%	100%	83%		89%	INGV and IPGP Resif use miniseed while IMO uses in-house format named BC but will also use miniseed. AAAI maturity needs to be confirmed
Acceleration / Accelometer waveforms			83%	100%	0%		61%	IMO uses SAC format but INGV Suds or MiniSeed. Info missing from IPGP for this.
Geodetic data								
GNSS Raw data (Rinex data)			92%	100%	100%		97%	Authority of GNSS is by WP10. IMO does not have a functioning web service at the moment but is expected. The AAAI part is unclear but will be managed with GLASS (WP10)
Borehole strainmeter			67%				67%	By IMO the Strain data is stored in file structure but is lacking data index and metadata databases. Then webservices need to be defined/developed. Some work is needed to make the data deliverable via webservice.
Tilt meter				92%			92%	Webservice available.The uncertainty here is the AAAI part.
Tide gauge				92%			92%	Webservice available.The uncertainty here is the AAAI part.
Continuous gravity				92%			92%	Webservice available.The uncertainty here is the AAAI part.
Environmental data								
River stage data			67%				67%	Hydrological data. KISTERS XML time series format. Web service/access missing.

Figure 3: Initial Maturity Scorecard calculations

It was known from the beginning of this process that the questions were not perfect and they would need some revision and tuning. Question number 6 was particularly difficult to evaluate because there were no questions in the survey regarding access control of web services (AAAI) and therefore difficult to evaluate quantitatively. But it was deemed important by the group to keep the question as part of the maturity evaluation to reflect this property.

From the initial Maturity Scorecard evaluation, the results were categorised into three intervals, which gave the following results.

Table 2: Statistics from Maturity Scorecard

Scoring Interval	Number of DDSS
81-100%	12
51-80%	12
0-50%	44

The factors contributing to these results are few. For example, in few cases, there were no information provided on DDSS items resulting in lower score than expected. And as mentioned before, in the case of the Software and Services DDSS, two of the six questions did not apply to the survey results, also resulting in lower score than expected for DDSS in these categories.

Although the score was not perfect and could be improved it became clear that the DDSS Priority list had way too many items, especially considering there are only six months until M24.

When the Maturity Scorecard was reviewed during a WP11 meeting in Prague in March 2017 it became clear that some of the questions did not reflect the properties of all the DDSS types. As mentioned before, Software and Services DDSSs scores were considerably lower than expected because points for station information and configuration history did not apply at all. This finding led to a revision of the Maturity Scorecard that has been conducted and scores recalculated with the following results, as seen in figure 4,5,6 and 7. One important point to mention here is that the DDSS Priority list was also revised prior the revision of the Maturity Scorecard which resulted in reduction of the Priority list from 71 DDSS to 40 DDSS. In that context, the revised Maturity Scorecard was applied to the revised Priority list.

With respect to the initial Maturity Scorecard evaluation, the scores were classified into three intervals, which have now also been assigned colours for faster browsing. As before, and now with colour codes, the intervals are:

- Green scores: 81-100%
- Yellow scores: 51-80%
- Red score: 0-50%

Table 3: Data Maturity Scorecard

DDSS	Average score
Seismic data	
Seismic waveforms	89%
Acceleration / Accelometer waveforms	61%
Geodetic data	
GNSS Raw data (Rinex data)	97%
Tilt meter	92%
Tide gauge	92%
Continuous gravity	92%
Environmental data	
Groundwater parameter	0%
Atmospheric parameter	0%
Geochemistry data	
Furamole temperature	50%
Soil CO2 concentration / flux	50%
Remote sensing data	
Raw SAR data and SAR SLC	100%
Ground-based UV scanner, DOAS	67%

Table 4: Products Maturity Scorecard

DDSS	Average score
Seismic data products	
Earthquake parameters (hypocentral or magnitude)	61%
Tremor parameters (amplitude information)	100%
Geodetic data products	
GNSS time series	59%
Volcanological data products	
Reports on volcanic activity	83%
Aviation colour codes for volcanoes	90%
Maps of recent and past lava flows	100%
Geochemical / Petrological data products	
Chemical analysis and physical properties of gas, water and rocks	67%
Remote sensing (groud based and satellite) data products	
Specral radiance and/or Brightness temperature and/or Surface temperature	84%
SO_2 flux in eruption plumes	67%
Volcanic Plume (Ash+SO2)	100%
Thermal anomaly (lava flow)	100%
Wrapped Differential Interferograms (Phase and Amplitude)	92%
InSAR Lava Flow Maps	67%
Multi-look SAR images	67%
Spatial coherence	67%
LOS Displacement Time Series	67%
Mean LOS velocity	83%
Ground-based Doppler radar near-source eruptive parameters	100%
Volcanic hazards products	
Volc. hazard Event Tree	25%
Spatial probability analysis/maps (EH;GVF; Deception)	0%
Vent opening propability map	50%
Hazard maps	50%

Table 5: Service Maturity Scorecard

DDSS	Average score
Volcanic hazard service	
Effects on health and recommendations for response to SO2 from volcanic eruptions (to contact UST for agreement)	88%
Daily dispersal forecasting maps	88%
Software catalogue for petrological to geophysical modelling	88%

Table 6: Software Maturity Scorecard

DDSS	Average score
Software catalogue	
Spatial probability Tool (QVAST)	50%
Event Tree HASSET tool	50%
Bayesian Event Tree (BET) tools	75%

And from the Scorecards we get the following statistics:

Table 7: Statistics from revised Maturity Scorecard

Scoring Interval	Number of DDSS
81-100%	19
51-80%	11
0-50%	10

These results give us some ground for further reduction of the DDSS Priority list to be able to fulfil the agenda for the delivery of priority DDSSs by M24. The revised DDSS list is presented in next chapter.

Other information was also collected from the IT survey and during two Skype meetings. The Skype meetings focused on the status of the IT infrastructure by each DDSS contributor. The following overview was gained:

- **INGV** and **CNRS (IPGP / OPGC)** already have some level of IT infrastructure in place and are servicing data and products via websites and portals to the world.
- **IMO** current data/product distribution is not as mature as INGV's and CNRS's but the groundwork for web services infrastructure is well underway.
- **CSIC** will soon have some services available via http websites.
- **IGN** has a service available via http websites. (www.ign.es).
- **UAc** does currently not have infrastructure to share data.

3. Revised DDSS Priority list

The DDSS Priority list has gone through heavy revision since last year, both regarding number of DDSSs presented and in the work of the harmonization groups. The maturity of each DDSS has been evaluated to measure the probability of success for implementation of all the DDSS. This was done with the help of an IT survey and a tool (quantitative) called **Maturity Scorecard** that was designed to help with the analysis of the survey results. The IT survey was described in the previous chapter.

In short, the results of all the revisions are that the estimated likelihood of success has been lowered for many of the items from high to medium, and even to low. In other case items have been simplified and multiple items have been merged into one item with new description due to similar properties and nature, specifically regarding metadata.

Last year there were **71 DDSS** defined for WP11 which was the highest number among the WPs in the project but after revisions and input from the Maturity Scorecard there are now only **19 DDSS** items in the list. This means 73% reduction of the list since a year ago. The group is quite optimistic about its capability to deliver those 19 DDSS by the end of M24.

Some of those DDSS are under the authority of other work packages which means WP11 depends in some cases on deliverables and solutions of other WPs. An example of this is the GLASS framework which WP10 is developing for GNSS data and products. It is possible that some institutes will use their existing IT infrastructure to make data available, which means less dependency on solutions from other WPs but in some case delays in delivery in other WPs may affect WP11. The possible extent of this is not presently clear.

The current **revised** DDSS Priority list for WP11 contains the providers (institutes) and the items each one will provide access to before M24. Summary tables for each item type can be found here below.

Table 8: Data Priority list

Data	Institute							Maturity Level
Seismic data	UAc	IGN	CSIC	IMO	INGV	IPGP	OPGC	
Velocity seismic waveforms				X	X	X		89%
Geodetic data								
GNSS Raw data (Rinex data)				X	X	X		97%
Tiltmeter					X			92%
Tide gauge					X			92%
Continuous Gravity					X			92%
Remote sensing data	UAc	IGN	CSIC	IMO	INGV	IPGP	OPGC	
Raw SAR data and SAR SLC					X			100%

Table 9: Product Priority list

Products	Institute							Maturity
Seismic data products	UAc	IGN	CSIC	IMO	INGV	IPGP	OPGC	Level
Tremor parameters (amplitude information)					X			100%
Volcanological data products								
Reports on volcanic activity				X	X	X		83%
Aviation colour codes for volcanoes				X	X			92%
Maps of recent and past lava flows					X			100%
Remote sensing (ground based and satellite) data products								
Specral radiance and/or Brightness temperature and/or Surface temperature					X		X	84%
Volcanic Plume (Ash+SO2)							X	100%
Thermal anomaly (lava flow)							X	100%
Wrapped Differential Interferograms (Phase and Amplitude)					X		X	92%
Mean LOS velocity					X			83%
Ground-based Doppler radar near-source eruptive parameters							X	100%

Table 10: Service Priority list

Services	Institute							Maturity
Volcanic hazard services	UAc	IGN	CSIC	IMO	INGV	IPGP	OPGC	Level
Effects on health and recommendations for response to SO2 from volcanic eruptions (to contact UST for agreement)				X				88%
Daily ash/gas forecasting maps				X				88%
Software catalogue for petrological to geophysical modelling			X		X			88%

4. Harmonization and new metadata standards

Great emphasis has been put on the work of the harmonization groups. Significant input on assessing the metadata came from the HGs that WP11 has lead: HG-09 on Geochemical Data and HG-11 on Analog and Numerical modelling. Other input was provided by the WP11 team on the hazard product.

The hazard products metadata standard has gone through intensive development and according to the group, version 2 of the standard is ready to be published. This will be the first published version where version 1 only existed on the developmental stage. A metadata standard for Modelling and computational volcanology is scheduled to be published late April and standard for Volcanological products is scheduled to be ready early May. The metadata structure for Hazard products – in JSON format - can be seen here below:


```
{
   "name":"",
   "functionality":"",
   "category":"",
   "item_type":"",
   "authors":[
      {
         "name":"",
         "title":"",
         "organization":"",
         "email":"",
         "phone":"",
         "gsm":"",
         "comment":""
      }
   ],
   "product_reference":"",
   "tags_keywords”:["",""],
   "dependencies":"",
   "hazard_type":{
      "data_source":"",
      "model_name":"",
      "scenario_definition":"",
      "product_type":"",
      "parameter":"",
      "percentile":"",
      "threshold":"",
      "units":""
   },
   "geograhpical_location":{
      "country":"",
      "volcano_name":"",
      "primary_volcano_type":"",
      "volcano_id":"",
      "volcano_lat":"",
      "volcano_lon":"",
      "ll_grid_point_ref":"",
      "ur_grid_point_ref":"",
      "ll_grid_point":"",
      "ur_grid_point":"",
      "grid_unit":""
   },
   "language":"",
   "date_of_creation":"",
   "date_of_event":"",
   "date_range_for_validity":"",
   "temporal_extensions":{
      "":"",
      "initial_date_volc_dataset":"",
      "final_date_volc_dataset":"",
      "initial_date_meteo_dataset":"",
      "final_date_meteo_dataset":"",
   },
   "reference_system":"",
   "additional_data":""
}
```


Few examples have been realised for some of the products listed in the DDSS Priority list to test the standard. One example can be seen here below:

Table 11: Metadata for "Probabilistic hazard map for tephra fallout at Öræfajökull volcano"

Name	**Tephra fallout hazard map at Öræfajökull volcano**
Functionality	It shows the likelihood to exceed a specific threshold of tephra fallout as function of space
Category	Map
Item type	png
Authors	Icelandic Meteorological Office
Product reference	Paper, url, doi, etc..
Tag-keywords	Tephra fallout, hazard map, Öræfajökull, Iceland
Dependencies	None
Hazard type:	Tephra fallout
Data source	Model output
Model name	VOL-CALPUFF
Scenario definition	Deterministic
Product type	Probabilistic
Parameter	Ground loading
Percentile	NA
Threshold	10
Units	kg/m^2
Geographical location:	
Country	Iceland
Volcano name	Öræfajökull
• ***Volcano ID***	374010
• ***Volcano Lat***	64.05°N
• ***Volcano Long***	16.633°W
Ll grid point (product reference system)	196265.0, 253391.0
Ur grid point (product reference system)	892265.0, 749391.0
Ll grid point (ll)	66N, 55W
Ur grid point (ll)	77N, 66W
Grid unit (product reference system)	m
Language	Icelandic
Dates:	
Date of creation (for static products)	2016-11-15
Range of validity (for forecast products)	NA
Date of event	NA
Temporal extension:	
Initial date of temporal coverage of the volcanological dataset	1362
Final date of temporal coverage of the volcanological dataset	1362
Initial date of temporal coverage of the meteorological dataset	1980
Final date of temporal coverage of the meteorological dataset	1990
Reference system	ISN93
Additional data:	DEM, meteo data, resolution

At present, there are no known guidelines within the scope of EPOS-IP for the publication process of newly standardised metadata. WP11 IT group (Task 3) proposed to WP6 and WP7 that new standards will be published on a sub-page on the https://www.epos-ip.org/ webpage, according to standard format or template properly defined. The proposal is still under evaluation. A possible alternative might be the publication of the new standards by one of theWP11 partners. This issue will be defined in the forthcoming months.

5. Use cases, testing and validation

From the perspective of WP11 there are two categories of use cases; basic use cases and advanced use cases. The basic use cases are also the most important ones for the success of the project. These are:

1) Search for DDSS item in item catalogue
2) Download DDSS item from item catalogue

Each item in the DDSS Priority list has those two use cases and for each use case we have testing and validation to do. This means, for the 19 DDSS we have at least 38 use cases.

The second category of use cases is the advanced one, which includes multidisciplinary comparison of data and other services that work with the data in innovative ways. This category of use cases will be further worked on and developed as part of the Volcanology Gateway conceptualization.

Use cases, testing and validation will be further realised in in the coming months and the testing candidates required by WP6/7 will start that work. See more on the candidates in next chapter.

6. Testing candidates for WP6/7

One of the requests put forward by WP6/7 at the meeting in Prague was that each work package would make a list with three mature DDSS that would be suitable testing candidates. These testing candidates would be used in WP6/7 integration work with each work package. The following DDSS items have been selected based both on the Maturity Scorecard and by subjective evaluation conducted in a meeting by the task group The resulting four candidates have been proposed by the IT group of WP11 and from them three will be submitted it WP6/7.

- Thermal anomaly (lava flow) (CNRS-OPGC)
- Chemical analysis and physical properties of gas, water and rocks (CNRS-OPGC & INGV)
- Wrapped Differential Interferograms (INGV)
- Velocity Seismic Waveforms (CNRS-IPGP)

The service interface information will be collected and shared with WP6/7.

7. Work until M24: The simple roadmap

The time until M24 is very short so tasks and actions must be clear and doable. Thus, the roadmap recognized in two phases, with two deadlines; by July and by September:

Phase 1: By July

- Provide test candidates to WP6/7 (according to the template of Annex1).
- Plan testing: List use cases, define testing scenarios and validation criteria (according to the template of Annex2).

- Get results from harmonization groups for the DDSS still lacking basic metadata description.
- Plan approaches to implementing web services based on infrastructures at each institute.
- Start implementing services – prioritise: the easiest first according to the Maturity Scorecard.

Phase 2: By August

- Continue implementation in cooperation with WP6/7
- Schedule and execute testing of services when available and notify WP6/7
- Announce available services when tested and ready.

8. Data Management Plan (DMP)

The Data Management Plan (DMP) of the TCS "Volcano Observation" will provide an analysis of the main elements of the data management policy with regard to all data sets (i.e. DDSS proposed by the TCS "Volcano Observation") that will be delivered in the framework of EPOS. The DMP will not be a fixed document, but will evolve during the lifespan of the project. The DMP will address the points below on a data set by data set basis and will reflect the current status of reflection within the consortium about the data that will be distributed *(source: European Commission DGRI. 2016. Guidelines on Data Management in Horizon 2020)*.

✓ **Data set reference and name** - Identifier for the data set to be delivered.

✓ **Data set description** - Description of the data that will be delivered, its origin, nature and scale and to whom it could be useful, and whether it underpins a scientific publication. Information on the existence (or not) of similar data and the possibilities for integration and reuse.

✓ **Standards and metadata** - Reference to existing suitable standards of the discipline. If these do not exist, an outline on how and what metadata will be created.

✓ **Data sharing** - Description of how data will be shared, including access procedures, embargo periods (if any), outlines of technical mechanisms for dissemination and necessary software and other tools for enabling re-use, and definition of whether access will be widely open or restricted to specific groups. Identification of the repository where data will be stored, if already existing and identified, indicating in particular the type of repository (institutional, standard repository for the discipline, etc.). In case the dataset cannot be shared, the reasons for this should be mentioned (e.g. ethical, rules of personal data, intellectual property, commercial, privacy-related, security-related).

✓ **Archiving and preservation (including storage and backup)** - Description of the procedures that will be put in place for long-term preservation of the data. Indication of how long the data should be preserved, what is its approximated end volume, what the associated costs are and how these are planned to be covered.

9. “VULKAN” – The Volcanology Gateway

Due to their highly heterogeneous nature and broad variety of phenomena, active volcanoes are quite different from other geological environments and the relevant data needs to be characterized and organized according to specific approaches and exploiting the experience of a large community. The European volcano observations community, represented by Volcano Observatories (VO) and Volcano Research Institutions (VRI) participating to the EPOS-IP project, will implement services to enable open access to data, data products, software and services (DDSS) provided from the community. Technical implementation of these services starts from the Volcano Observations Thematic Core Service (VO-TCS), which will coordinate activities among the contributing VOs and VRIs to ensure their interoperability with the EPOS Integrated Core services (ICS) and will be realized in the first European volcanic portal.

Figure 4: FutureVolc Supersite Portal

Figure 5: HotVolc Observing System

By its nature, the TCS depends on DDSSs from many of the other TCS, if not all of them such as that of the seismological or GNSS TCSs. At present, there are two pilot projects within the EU – Volcano observation gateways – that are in the early stages of deployment or have been deployed:

FutureVolc (http://futurevolc.vedur.is) and *MED-SUV* (http://med-suv.eu/). These projects with the *TSD System* (http://tsd.ct.ingv.it/) and *HotVolc Observing System* (http://hotvolc.opgc.fr/www/) are firm indicators of how a future TCS level portal will function and what it may look like.

The conceptual portal currently has the working title "VULKAN" and will be a smart connection between data providers (e.g. ICS) and common users such as researchers, students, industry, and enthusiasts. The role of "VULKAN" is to harmonize different kind of data, products and service and create multidisciplinary environment, supporting specifically standards widely used by the community of European researchers.

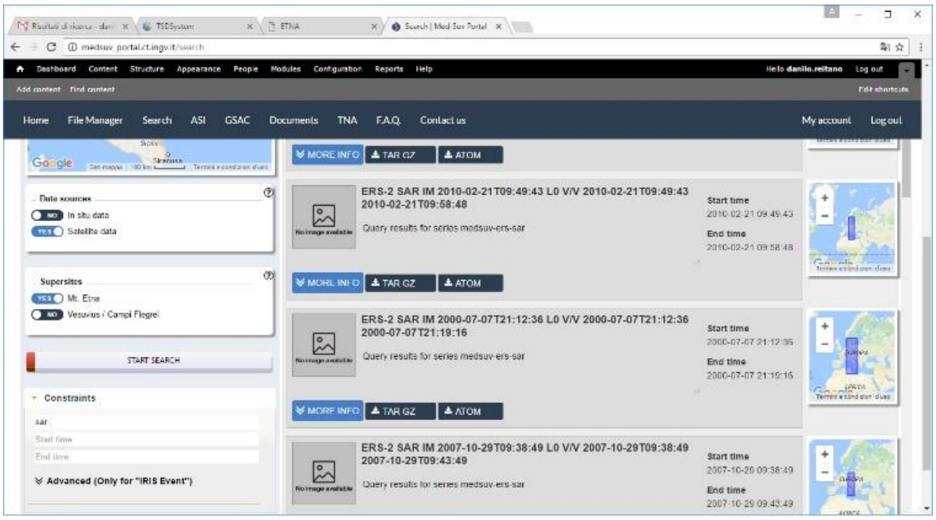

Figure 6: Med-Suv Supersite portal

Figure 7: TDS System portal

Annex 1 – DDSS: Detailed Description

DDSS type Please specify the type of resource (Data, Data Software, Software or Service) and its name. If you are describing a group of resources, then provide the name of each one. *EXAMPLE: seismological waveforms*
Format(s) of the data / data products (if applicable) Please specify the format(s) of the disseminated data/data products. *EXAMPLE: SEED, miniSEED*
Metadata standard used Please provide information about the metadata used to describe the DDSS. If you still have to decide which standard, please specify the status of the process. You may point to existing documentation, or any other kind of resource which provide a *detailed* and *complete* description of the metadata you use
APIs used to provide discovery and access to the DDSS Please provide information about the APIs (web services) used to provide access to the DDSS. In case it is an on-going process, please specify the status. You may point to existing documentation, or any other kind of resource which provides a *detailed* and *complete* description of the APIs. If for the same DDSS you have two different APIs (one for discovery, the other for accessing – downloading) please provide details of both.
Authentication, Authorization, Accounting Infrastructure (AAAI) Do you intend to provide secure access to your DDSS or will it be openly available? Do you have an AAAI in place or do you envisage having one? Which technology are you using (e.g. eduGAIN, certficates, proprietary technology)? Please provide as much detail as possible. You may point to available documentation (please provide links to useful documents, with technical specifications on how to integrate your AAAI in the ICS framework)
Data policy Please briefly describe the data policy for this DDSS. (Is the data available in near-real time? Does it have an embargo period? Is it accessible on demand?)
Other technical details In the case where the following topics are applicable to this DDSS only (and are not TCS-wide) may you provide technical details and roadmap for implementation? 1. Data curation system (specify which system. Is it interoperable?) 2. Data provenance (do you track provenance? Which standards are you using? Which software?) 3. Identification (do you have a system to assign identifiers to this DDSS? Which is your roadmap to this respect? Please provide technical details) 4. Do you provide processing features for this DDSS? Which ones? Which standard are you using to provide programmatic access to your processing services by ICS?
Roadmap for implementation Please provide a roadmap for the implementation of this DDSS. Alternatively you may provide a separate diagram covering all DDSS (e.g. gantt). EXAMPLE:

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M6 – choice of metadata standard M12 – homogenization of the data (data format and metadata) at each node M18 – APIs ready at 1 node (test) M24 - APIs ready at all nodes

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Annex 2 – Use cases: Detailed description

Use case name/topic: *Viewing and comparing spatial and temporal aspects of rainfall, riverflows and groundwater heads*

Use case domain This use case is: *Discipline-oriented, namely focusing on the discipline of geology.*

Use case description *As a <ground water researcher at a geological survey> I want to <view and compare the spatial and temporal changes in rainfall with the temporal and spatial response in riverflows and groundwater heads> so that I can <gain an understanding of the variability of extreme events such as the 2010-12 droughts and show how spatial variability of weather interacts with the spatial heterogeneity of the hydrogeology>.*

Actors involved in the use case

- *System user – researcher*
    - *Ground water researcher*

Priority: *Medium*

Pre-conditions: *User must have logged in*

Flow of events – user view

Determine the start and the end of the typical Use Case scenario. If a use case scenario grows too complex, it can be split up into subsequent scenarios.

Basic sequences and needed steps (user view)

The following steps are need to answer the question:

1. *<ground water researcher> chooses locations and times to undertake analysis based on criteria: aquifers and longevity of record*
2. *<ground water researcher> performs analysis to create Standardised Groundwater Index, Standardised Precipitation Index and Standardised Flow Index for each set of locations*
3. *<ground water researcher> produce "heat maps" for each set of data and allow the manipulation of them to examine hypothesis*

Alternative sequences and needed steps (user view)

1. *<ground water researcher> enables other analysis as required: e.g. principal Component Analysis (PCA)*

System workflow - system view

1. *The user interfaces receives the input: location*
2. *It connects to the database and search, in that location, records that match to the required criteria (SQL query with parameters "aquifiers" and "longevity")*
3. …

Post-conditions *The request is stored in a « Draft » state (not submitted)*

Extension Points If the use case has extension points, list them here.
No extension points.

« Used » Use Cases If the Use Case uses other Use Cases, list them here.
No other use cases.

Other Requirements This can include non-functional requirements related to the Use Case.
Privacy legislation, response time of the system

(to be filled in by WP7) Class diagram and sequence diagram