**Use cases WP16 Multi-scale laboratories**

Several conceptual use cases for interdisciplinary usage of the TCS datasets are imaginable: data on volcanic ash could be utilized by the aviation industry, meteorological institutes, and governments in decision making on the response to volcanic ash eruptions. The experimental rock physics and analogue model data could be used by scientists modelling sedimentary basin formation, and in the exploration for unconventional resources and geothermal energy. Paleomagnetic data could be used in charting geo-hazard frequency.

Some more specific and detailed technical use cases are given below. These descriptions apply to datasets that are already accessible via their applicable DOIs (for use cases 1 and 2).

## *USE CASE 1: Material parameters*

**Use case name/topic**:

*Retrieve material parameters for setting up analog experiments*

**Use case domain**

This use case is focused on the domain of *Geodynamics*

**Use case description**.

*Problem:*

*As an <analog modeler> Graham wants to < decide>< which material (brittle, ductile) is suitable for his experimental setup>.*

*Elucidation:*

*Friction and viscosity are crucial experimental parameters that can be influenced by a right choice of used materials.*

*Persona:*

*Graham is a geologist. He usually uses a centrifuge for analogue modelling, which requires rather stiff materials (clay, plasticine). As his centrifuge broke down he now needs weaker materials to setup an experiment under normal gravity conditions.*

*Supposed context:*

*Graham knows that EPOS might provide useful information for his setup. He is however not certain about the form of the available information (i.e. of the data product), so he does not know whether*

* *he will learn about the availability of data sets that can be used by him for further analysis to decide which materials are suitable, or*
* *that he can consult a database or other piece of software to directly retrieve raw material values.*

*So, he is unaware of the representation of the data that will be valuable to him.*

*Result:*

*Graham has assessed and downloaded the data sets (and associated papers). He has decided on a suitable material, and moreover he has gained knowledge about the materials which he didn’t have before.*

**Actors involved in the use case** A list of the actors who communicate with this use case.

* *Researcher (system user)*

*Analog modeler*

**Priority**: *Medium*

**Pre-conditions**:

*<analog modeler> is logged in as a named user.*

**Flow of events – user view**

Basic sequences and needed steps (user view) – *Full text search without pre-filtering*

1. *<analog modeler> is going to search for material properties. He searches directly for “viscosity material properties” with the aid of a generic text search box.*
2. *<analog modeler> applies a filter to the rather large result set by choosing from a keywords facet the combination of string values “viscoelasticity” and “analog models”.*
3. *<analog modeler> clicks in the updated result set on the entrance “GeoMod2008 materials benchmark: The ring shear test dataset (*[*http://doi.org/doi:10.5880/GFZ.4.1.2016.002*](http://doi.org/doi:10.5880/GFZ.4.1.2016.002)*)”, which brings him to the landing page of this data product.*
4. *<analog modeler> assesses this data set by a) reading the abstract, b) viewing the inline iso19115 metadata, and c) reading the explanation of the dataset which is provided as a downloadable pdf (“*[*Explanations for the RST dataset.pdf*](http://escidoc.gfz-potsdam.de/ir/item/escidoc:1423018/components/component/escidoc:1453898/content)*”).*
5. *Based on his analysis and the open availability of the dataset <analog modeler> downloads the compressed data package (“*[*RST-data.zip*](http://escidoc.gfz-potsdam.de/ir/item/escidoc:1423018/components/component/escidoc:1453897/content)*”).*

Alternatives for steps 1 and 2 (user view) – *Full text search with filter on type of requested data*

1. *<analog modeler> is going to search for material properties. Therefore, he applies a search filter “material properties” (chosen from a topic list) as a constraint on a search query that he is going to execute.*
2. *<analog modeler> now searches free text with the search string “friction viscosity”.*

Alternative for steps 1 and 2 (user view) – *Searching through filtering without full text search*

1. *<analog modeler> is going to search for material properties. Therefore, he applies a search filter “material properties” (chosen from a topic list) that directly leads him to a result set.*
2. *<analog modeler> refines the result set by applying the filters “viscosity” and “friction” (within the facet “property type”), and “analog models” (from a list of keywords), again directly leading to new results sets.*

**System workflow - system view**

*Full text search without pre-filtering*

1. *The GUI receives the input: new full text search*
   1. *The system connects to the full text index and executes the query “viscosity material properties” over all indexed fields*
      1. *The system makes use of fuzzy search techniques and/or vocabularies to relate “viscosity” to “viscoelasticity”.*
   2. *The system returns a results page*
      1. *That is shown in the GUI*
      2. *That contains filters (facets) that apply to the underlying result set (i.e. all results have a keyword field, and “keyword” is contained as a restricted list of values upon which further refinements can be made; values that do not apply to some individual result are not in the refinement list).*
2. *The GUI receives the input: applied filter*
   1. *The system connects to the full text index and executes the query <keywords: “viscoelasticity” AND keywords: “analog models”> onto the last result set.*
   2. *The system returns a result set that is a refinement of the former one.*
3. *The GUI receives the input: hyperlink clicked*
   1. *The URL is followed (possibly in a new target tab of the browser)*
   2. *User session remains active*
4. *Steps 4 and 5 are not controlled by the system. However, the user may return to update his choice of filter values, in which case action 2 is executed again. (A request for a new search may or may not reset applied filtering.)*

*Full text search with filter on type of requested data*

1. *The GUI receives the input: filter applied*
   1. *Search filter “material properties” receives value “material properties”.*
2. *The GUI receives the input: new full text search with filter applied*
   1. *The system connects to the full text index and executes the query < (“friction” OR “viscosity”) AND (topic: “material properties”)>*
      1. *The system makes use of fuzzy search techniques and/or controlled vocabularies to relate “viscosity” to “viscoelasticity”.*
      2. *Search is over all indexed fields, except “material properties”, which is only sought within the field “topic”.*
   2. *The system returns a results page*
      1. *That is shown in the GUI*
3. *The GUI receives the input: hyperlink clicked*
   1. *The URL is followed (possibly in a new target tab of the browser)*
   2. *User session remains active*

*Steps 4 and 5 are not controlled by the system. However, the user may return to update his choice of filter values, in which case action 1 is executed again.*

*Searching through filtering without full text search*

1. *The GUI receives the input: new search with filter applied*
   1. *The system connects to the full text index and executes the query <topic: “material properties”>*
      1. *Search is over the field “topic”.*
   2. *The system returns a results page*
      1. *That is shown in the GUI*
      2. *That contains filters (facets) that apply to the underlying result set (i.e. all results have a keyword field, and “keyword” is contained as a restricted list of values upon which further refinements can be made; values that do not apply to some individual result are not in the refinement list).*
2. *The GUI receives the input: filter applied*
   1. *The system connects to the full text index and executes the query <keywords: “viscoelasticity” OR keywords: “analog models”> onto the last result set.*
   2. *The system returns a result set that is a refinement of the former one.*
3. *The GUI receives the input: hyperlink clicked*
   1. *The URL is followed (possibly in a new target tab of the browser)*
   2. *User session remains active*

*Steps 4 and 5 are not controlled by the system. However, the user may return to update his choice of filter values, in which case action 1 or 2 is executed again.*

**Post-conditions**

* *<analog modeler> is logged in as a named user.*
* *<analog modeler> owns a search results object*
* *<analog modeler> owns a ‘last query executed’*
* *<analog modeler> is connected to an active search parameterization profile (with or without constraints).*

**Extension Points**

*None*

**« Used » Use Cases** Determine the systems functionality that might be reused and model this using the <<uses>> relationship. If the use case uses other Use Cases, list them here

## *USE CASE 2: Sand vs rock comparison*

**Use case name/topic**:

*Comparison of sand with rock*

**Use case domain**

This use case is focused on the domain of *Geo-engineering*

**Use case description**.

*Problem:*

*As an <engineer> Guido wants to < assess><the stability of his underground storage reservoir>. Therefore he wants to <investigate> the hypothesis that < sand is mechanically comparable to rock>, < depending on the scale of observation>.*

*Persona:*

*Guido is a geo-engineer. He worries about the stability of his underground storage reservoir and would like to setup small-scale experiments to test some key issues.*

*Supposed context:*

*Guido knows EPOS might provide the information he needs. He is unaware of the representation of data that will be valuable to him.*

*Result:*

*Guido has verified that, depending on the scale of observation, sand indeed mechanically behaves comparable to rock.*

**Actors involved in the use case** A list of the actors who communicate with this use case.

* *Researcher (system user)*

*Geo-engineer*

**Priority**: *Medium*

**Pre-conditions**:

*< Geo-engineer > is logged in as a named user.*

**Flow of events – user view**

Basic sequences and needed steps (user view) – *Full text search without pre-filtering (The ‘Google Search’)*

1. *<Geo-engineer> is going to search for context models of material properties. He searches directly for “sand rock mechanics” with the aid of a generic text search box.*
2. *< Geo-engineer > applies a filter to the rather large result set by choosing from a topic facet the string value “analog models”.*
3. *<Geo-engineer > clicks in the updated results set on the entrance “GeoMod2008 materials benchmark: The axial test dataset (*[*http://doi.org/doi:10.5880/GFZ.4.1.2016.006*](http://doi.org/doi:10.5880/GFZ.4.1.2016.006)*).”, which brings him to the landing page of this data product.*
4. *<Geo-engineer > assesses this data set by a) reading the abstract, b) viewing the inline DataCite metadata, and c) reading the explanation of the dataset which is provided as a downloadable pdf (“*[*Explanations for the AT datasets.pdf*](http://escidoc.gfz-potsdam.de/ir/item/escidoc:1423017/components/component/escidoc:1453892/content)*”).*
5. *Based on his analysis and the open availability of the dataset <Geo-engineer> downloads the compressed data package (“*[*AT-data.zip*](http://escidoc.gfz-potsdam.de/ir/item/escidoc:1423017/components/component/escidoc:1453894/content)*”).*

**System workflow - system view**

*Full text search without pre-filtering*

1. *The GUI receives the input: new full text search*
   1. *The system connects to the full text index and executes the query “sand rock mechanics” over all indexed fields*
   2. *The system returns a results page*
      1. *That is shown in the GUI*
      2. *That contains filters (facets) that apply to the underlying result set (i.e. all results have a topic field, and “topic” is contained as a restricted list of values upon which further refinements can be made; values that do not apply to some individual result are not in the refinement list).*
2. *The GUI receives the input: applied filter*
   1. *The system connects to the full text index and executes the query <topic: “analog models”> onto the last result set.*
   2. *The system returns a result set that is a refinement of the former one.*
3. *The GUI receives the input: hyperlink clicked*
   1. *The URL is followed (possibly in a new target tab of the browser)*
   2. *User session remains active*
4. *Steps 4 and 5 are not controlled by the system. However, the user may return to update his choice of filter values, in which case action 2 is executed again. (A request for a new search may or may not reset applied filtering.)*

**Post-conditions**

* *< Geo-engineer > is logged in as a named user.*
* *< Geo-engineer > owns a search results object*
* *< Geo-engineer > owns a ‘last query executed’*

*< Geo-engineer > is connected to an active search parameterization profile (with or without constraints).*

**Extension Points**

*None*

**« Used » Use Cases** Determine the systems functionality that might be reused and model this using the <<uses>> relationship. If the use case uses other Use Cases, list them here.

…

**USE CASE 3: Use case name/topic:** User looking for an analogue material property and geological experiments.

**Use case domain:** mono-disciplinary, focusing on one discipline available within MLs.

**Use case description:** As a scientist studying compressive margins with analogue models I need to build up a multi-layered terrain with specific rheological properties. Therefore, I’m looking in EPOS for finding:

a) the best suitable material => I want to see data about the material properties (e.g. strain rates, density, viscosity, etc.);

b) same typology of experiment already done by the scientific community => Looking for images, movies, apparatus types etc.

**Metadata fields:**

a) **Experiment type** => **Material testing properties** => **Analogue material** (selection of one or more analogue materials).

b) **Experiment type** => **Geologic feature** => **Event Environment Process** (Collisional setting) + **Event Process** (Orogenic process or Continental Collision) + **Apparatus** (Sandbox) => **Elaborated data** (photos, movies, etc.).

**USE CASE 4: Use case name/topic:** User applying bounding box to obtain the available resources.

**Use case domain:** multi-disciplinary, mainly focused on paleomagnetic data.

**Use case description**: as a paleomagnetist working in a strike-slip faulted domain, I’m studying crustal block rotation due to the fault activity. To this aim, I look in EPOS for data on paleomagnetic directions. Moreover, I look for analogue experiments of strike slip faults in order to compare them with the paleomagnetic dataset.

**Metadata fields:**

a) **Material** => **Provenance** (Geographic coordinates / bounding box / bounding polygon).

**Type of data** => (**Remanence** => **Natural remanent magnetization NRM**)+(**Elaborated data** => **Paleomagnetic direction**).

b) **Analogue modelling** => **Experiment Type** => **Geologic Feature** => **Event Process** (Deformation => Faulting) + **Fault type** (Strike slip fault) => **Elaborated data** (photos, movies, etc.).

**USE CASE 5: Use case name/topic:** User looking for an analogue lab.

**Use case domain:** Trans National Access (TNA)

**Use case description**: I want to do an experiment and I am looking for a lab where I can do so. I have very specific needs (i.e. want to simulate mountain building, with brittle-ductile rheology, including monitoring of strain and stress).

**Metadata fields:**

**Apparatus** (chose of the apparatus type) **+ Monitoring device** (chose of one or more devices) **+ Software** (see available codes) **=> Where** (lab location) **+ Who** (lab contact person).

**USE CASE 6: Use case name/topic:** Fault mechanical properties

**Use case domain:** mono-disciplinary, focusing on one discipline available within MLs.

**Use case description:** I’m a structural geologist interested in the mechanical properties of carbonaceous fault gouge. Specifically, I want to know if the microstructures that I have observed are corresponding to a certain slip-rate.

**Metadata fields:**

**Desired result:** <http://doi.org/doi:10.5880/fidgeo.2017.012>

**USE CASE 7: Use case name/topic:** Geochemistry of granites from the Pyrenees.

**Use case domain:** multi-disciplinary, multi-domain, combines Analytical data from WP16 and geological maps from WP15

**Use case description:** I’m a geochemist interested in creating a compilation of REE-patterns of all granites sampled in the Pyrenees. Specifically I want to investigate if there is a difference in REE-patterns for the Permian and Ordovician granites and if this has implications for the source of these intrusive rocks. For this I want to combine high-resolution geological maps (with the differently-aged granitic suites mapped) and overlay that with sample locations from the area, which allows me to easily select datasets containing suitable samples.

**Metadata fields:**

**Desired result:** no suitable datasets yet (WP16)

**USE CASE 8: Use case name/topic:** SEM images of specific mineral

**Use case domain:**

**Use case description:**

**Metadata fields:**

**Desired result:** no suitable datasets yet (WP16)??

**USE CASE 9: Use case name/topic:**

**Use case domain:**

**Use case description:**

**Metadata fields:**

NB: **Metadata** are in **bold**, **underlined** **metadata** are from **INSPIRE**.

**Other Potential use cases:**

Matias:

1. TNA: an applicant searching for a lab which has specific equipment (e.g. microprobe), does specific experiments (e.g. sandbox), has specific expertise (e.g. fault lubrication)
2. Data: a researcher looking for specific data, e.g. SEM images of minerals in general or (more specific but probably too specific for ICS) SEM images of a certain mineral
3. Serina is looking for all available data on a certain topic in a given area. She draws a box on a map in ICS-C (or click on it and draw a circle, or draw a polygon). Based on the selected area, the individual icons of the TCSs pop-up (in a cluster), from which one or more (depending on which domains Serina is interested in) can be selected. This is an alternative, and possibly more intuitive, way of displaying and filtering the results. Depending on the selection, Serina is forwarded to a list of data sets on the topic of interest in the specific area.
4. Alternatively we may think about (as also discussed) having a more granular metadata description (e.g. for geochem) allowing to visualize (meta)data (i.e. having a limited number of actual data in the metadata), e.g. a histogram of e.g. the >silica content or >age of >volcanic rocks or >basalts in that specific area, a streckeisen (QAPF) diagram or whatever analytical people are used to plot with rather high-order chemical components (main elements etc.)!?

Use case idea (brainstorm Annique EPOS IP meeting Barcelona November 2018):

1. Shapefiles geologische kaart
2. Data erop geprojecteerd
3. Per geologische unit/tijdschaal
4. + back-in-time
5. Export functie (selecteren van bepaalde datasets/subset)
6. Mogelijkheid om zelfde soort data ‘aan’ te zetten voor de hele wereld (bijvoorbeeld global datasets paleomag Krijt 🡪 kijken waar nog niks gedaan is).