Plan Overview

A Data Management Plan created using DMP Tool

Title: Data management plan for: Structural, Geochemical, and Permeability Measurements of the Basement Interface Contact and Associated Fault Zones Using Outcrop and Core Analog Studies: Implications for Injection Induced Seismicity in the Midcontinent Region

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Funder: United States Geological Survey (usgs.gov)

Funding opportunity number: G17AS00030

Template: U.S. Geological Survey DMP Guidance

Project abstract:

The location and timing of induced earthquakes km to 10+km's away from deep waste water injection wells near or at the base of the sedimentary reservoirs in the midcontinent region of the U. S. shows that fluid pressures are likely to be communicated via permeable pathways in the subsurface. We hypothesize that one of the likely pathways for fluid pressure migration occurs along the nonconformity contact or *interface* between the sedimentary bedrock and crystalline basement. Fault and fracture systems that intersect this *interface* and/or extend downwards into the crystalline basement may be reactivated as a result of the propagation of fluids and potential alteration of rock properties due to these fluid-rock interactions. Heterogeneities in physical and chemical rock properties along this interface will influence the distribution and rate of fluid migration and fluid propagation pressures, potentially leading to induced seismicity and associated hazards within the mid-continent region. It is critical to examine the spatial distribution of physical, chemical, and hydraulic properties and characterize the heterogeneity of this interface from the pore- to meter-scale, as these are the scales at which faults slip and earthquakes nucleate.

We propose to examine rock and hydraulic properties of the *interface contact* and fault zones that may intersect or cross-cut this contact by using integrative approach of field observations, whole-rock core analyses, stable isotope geochemistry, and laboratory permeability measurements. Much of the interface is buried within the midcontinent region, thus, we propose to focus on developing the structural and permeability architecture of key analog sites. We will use a compilation of our previous work coupled with new field and laboratory analyses to develop a more comprehensive inventory of rock and hydraulic properties of the interface contact within the mid-continent region and to evaluate the implications for fault reactivation and induced seismicity.

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Data management plan for: Structural, Geochemical, and Permeability Measurements of the Basement Interface Contact and Associated Fault Zones Using Outcrop and Core Analog Studies: Implications for Injection Induced Seismicity in the Midcontinent Region

1. Project and Contact Information

What is the name of the project?
Include any identifiers related to the project (e.g. Project ID, Funding ID etc).

Funding Opportunity Title:2019 Earthquake Hazards External Grants Program

CFDA Number(s):15.807 -- Earthquake Hazards Program Assistance

What is the name of the USGS Center/Program that oversees the project?
Include contact information (email, phone, address).

U. S. Geological Survey National Earthquake Hazards Reduction Program

Margaret Eastman Contract Specialist Phone 703-648-7366

mrussell@usgs.gov

Summary description of the project.
Include reason why the data is being collected.

Fundamental research to examine the contact between sedimentary rocks and crystalline rocks of the subsurface of the midcontinent of the U. S. This work explores the hydroglogic and mechanical nature of the contact for study of induced seismicity. This seismicity is thought to be caused by injection of large volumes of waste fluids from oil and gas production.

What is the project start date?
Start date.

2019-01-01

What is the project's expected end date?
Estimated end date. This field can be updated as needed.

2019-12-31

Are there additional information available?
Include any web links with more information related to the project, if applicable.

no

Who is the main point of contact for the project and its data?
Also list any alternate points of contact, if any.

none

Are there collaborating/funding agencies and organizations?
Who are they and who are the main points of contact?

2. Plan and Acquire

How will the data be acquired?
Are they newly collected or using existing datasets?

Newly collected data sets. Data will consist of field data, rock core, and permeability data. Field data will be acquired using standard field methods, with sampling of rocks. Outcrop descriptions of contacts at scales of 1:100-1:1000, and sampling, will be recorded with GPS and samples will be recorded in the IEDA database.

If acquiring existing datasets, include more information.
Include the name, format, a persistent identifier, and source citation, if any. Are there any restrictions or agreements such as Memorandum of Understandings (MOUs) for use and storage?

Existing 'data' is in the form of rock core, and any documents from previous projects. This includes well descriptions, logs, and any publically available files related to the core.

If collecting new data, include more information.
Are there special processes or procedures for collecting the data (e.g. licenses, permissions, equipment, software)?

Samples of core will be collected from established core labs, and all samples will be acquired with permissions and documentations that each lab requires. Field sites will be accessed via public land sites.

What is the estimated volume of the data collected, transformed, and/or generated?
For example in megabyte (MB), GB, TB, or PB.

Estimate 25 core samples, each 3 to 6 cm diamente, and 10-20 cm long for rock properties analyses. Approximately 25 hand samples from the field will be approximately 1000 cm3 in size (1-2 kg each).

Permeability data will consist of 25 lab tests, no more than 1 GB of data.

Will the data be static or frequently updated?
If frequent updates, describe how frequent (e.g. Continuously, weekly, annually, irregular etc)

static

**Are the appropriate equipment and staff resources accounted for in the budget?
Include estimated time and cost for such data management activities.**

Data management will be modest - curation of field samples, core samples, and rock data. Field data also, approximately 30-40 person hours.

3. Describe/Metadata and Manage Quality

**How many new datasets will be created?
List the anticipated title of each dataset.**

Permeability of rock core samples

Outcrop description of contacts at 2-4 sites

Grain size analysis - xcel spreadsheets

Whole-rock mineralogy and chemistry of rock samples

Images from thin-sections and SEM

XRD analysis plots

EDS images from SEM

**What are the data types and formats, in which the data will be maintained?
Open data formats such as csv, tiff, mp3, are required.**

xcel and .csv data sets, and maps in .png format

.xrdml, .hrf, .jpg, xcel, and word doc for XRD data

.png and word docs for SEM data

**Briefly describe the data processing steps or provide the scientific workflow.
Also identify any software or technology needs where applicable.**

Field site description and sample collection. Core samples will be collected from labs. Rock characterization will include grain size analysis, X-ray diffraction analyses, whole rock chemistry, stable isotope data, and optical microscopy and petrography studies. Selected samples will be tested at Schlumberger.

**How will the metadata for each dataset be created?
Who will be responsible for the metadata creation and update? Include their contact information.**

Metadata will be collected and curated by Dr. Bradbury. These will be standard spreasheet data sets.

Which metadata standard will be used to describe each dataset?
For USGS, FGDC-CSDGM or ISO 19115 series are required.

FGDC-CSDGM

What procedures will be used for ensuring data quality (QA/QC)?
If using a known standard or protocol, include the citation source.

Whole rock chemistry will be performed by a commercial lab that follows mining company exploration protocols Quality Management System that meets, as a minimum requirement, ISO 9001 and ISO/IEC 17025.

4. Backup/Secure and Preserve

Where will the data be stored in the short-term?
Is it properly secured, backed up, and environmentally controlled?

Utah State University Department of Geology computers with daily and weeking external harddrive backups.

Short term data will be stored on 2 separate hard drives in 2 different office locations.

What will be the approach for routine backup of the data?
Include the frequency, duration, software, and media information. Will the data be stored in multiple places and on different media types (recommended minimum of 3 copies with 1 stored in an offsite location)?

We use Time Machine backups that do hourly, daily, and weekly backups to two external drives.

Describe any potential access restrictions.
For example if the data contain Personally Identifiable Information (PII). Please include any practices to ensure access will be restricted.

Access is password restricted on all laboratory computers, and all Utah State computers are registered on the USU system, behind a firewall. All logins require a valid USU ID and Duo passcode.

What will be the final format of the data product?
Will there be any software needs? Will the data format be appropriate for long-term preservation? Open data formats such as csv, tiff, mp3, are required.

Excel and csv files, GPS registered figures, and outcrop sample locations all on standard formats and programs.

Where will the data and metadata be preserved in the long-term?
And which funding Program if in collaboration, will be responsible for the preservation of the data? Who will be the point of contact?

Our data sets are stored in the USU digital commons system. These are backups are in two permanent data repositories that will be linked via standard urls.

https://works.bepress.com/james_evans/

If costs are associated with long-term storage, how will they be provided for?
Are there agreements made for the preservation of the data and metadata?

No costs incurred for storage.

5. Publish and Share

How will the data be shared and made available to the public?
For example a web page, system or application, data portal, repository, USGS Data Series, etc. Are there data release policies that need to be followed?

We present results a national geologic and geophysical meetings, and publish inpeer reviewed publications. Data sets are made publically available via digital commons.

Will there be access or use restrictions on the data?
For example for sensitive data, restricted data, privacy, software with license restrictions, etc. Provide justification for the restriction citing any policies or legal reasons.

No access restrictions.

How can someone overcome any access restrictions?
For example are the following required? Fees, non-disclosure statements, special authorization, data embargo or hold, MOUs/MOAs.

no.

Identify any anticipated publications or electronic outlets resulting from the data.
For example, peer-reviewed articles, information/fact sheets, web pages. If a USGS publication, indicate type (e.g. Open File Report, Provisional Release etc).

Reviewed journal articles in journals such as Geophysical Research Letters, Geofluids, Geological Society of America publications.

Where will metadata be stored to enable data discovery by the public?
USGS requires that your metadata must be available for harvest by the USGS Science Data Catalog. Contact sciencedatacatalog@usgs.gov for more information.

https://works.bepress.com/james_evans/

How and where will you obtain a digital object identifier (DOI) for the data? USGS provides a Digital Object Identifier Creation Tool available at https://www1.usgs.gov/csas/doi/

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