Take the pre-workshop set-up steps if you haven't already

check your email for them or visit:

https://github.com/Institute-for-Rock-Magnetism/2025_rockmagpy_workshop

2025 `rockmagpy` workshop

This repository contains material associated with the rock magnetic data processing workshop at the 2025 IRM Conference on Rock Magnetism.

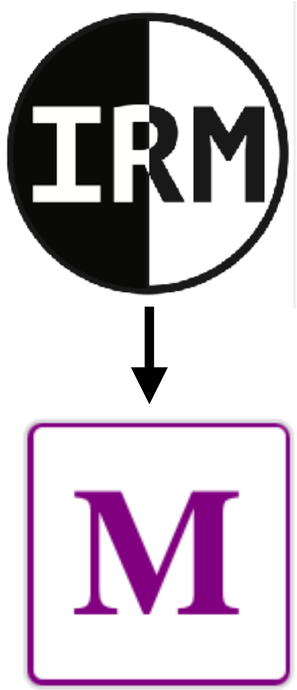
📅 **Thursday, June 12th, 9:00 to 15:30**
📍 **Room 401-20, Tate Hall, 116 Church St SE**

See steps that should be taken prior to the workshop here: pre-workshop set-up steps

🕘 Workshop schedule

- **9:00 to 9:45 am: `rockmagpy` and MagIC introduction**
  🔍 *Intro to `rockmagpy` and using it with data in MagIC, including Rock Magnetic Bestiary datasets. Tour and interact with content in the rockmagpy JupyterBook.*
- **9:45 to 10:30 am: Hands-on MagIC upload and data processing**
  💻 *Upload hysteresis and backfield data into private MagIC workspace and process using Jupyter notebooks following the steps described in this document*
- **10:30 to 11:00 am: ☕ Coffee break**
- **11:00 to 12:00 pm: Interactive + reproducible data analysis in Jupyter notebooks**
  🧪 *Estimate Verwey temperature with `rockmagpy`, explore data, make fits, and document those fits in the cloud.* Rockmagpy exploration part 1.
- **12:00 to 1:00 pm: 🍽️ Lunch**
- **1:00 to 2:00 pm: Discussion of future directions for `rockmagpy`**
  💬 Including:
  - 🐞 Contributing via GitHub issues, JupyterBook docs, and PmagPy code
  - 💡 Suggestions for feature development
  - 🔌 Designing export workflows from specialized instruments to MagIC We can document this discussion in discussion.md.
- **2:00 to 3:30 pm: Continued `rockmagpy` exploration and development**
  🚀 Explore more features (e.g., coercivity spectra; Rockmagpy exploration part 2.) and participate in a "hack-a-thon" on functionality and documentation.

We have been working on...



IRM database to MagIC export

rockmagpy

rockmagpy notebooks

Wild goats depicted in the Aberdeen Bestiary, ca 1200.

the next-generation of the Rock Magnetic Bestiary

...all a work in progress

IRM Quarterly 2001

The Rock-Magnetic Bestiary

Peat Sølheid
Mike Jackson
IRM

Our proto-database of mineral magnetic data is now online at www.geo.umn.edu/orgs/irm/bestiary

"Eventually, of course, there will be a rock-magnetic database."

"A rock-magnetic database will ultimately serve a variety of purposes. We anticipate that the most common use will be as a standard for comparison in interpreting data for natural materials, in terms of their magnetic mineralogy and size distribution."

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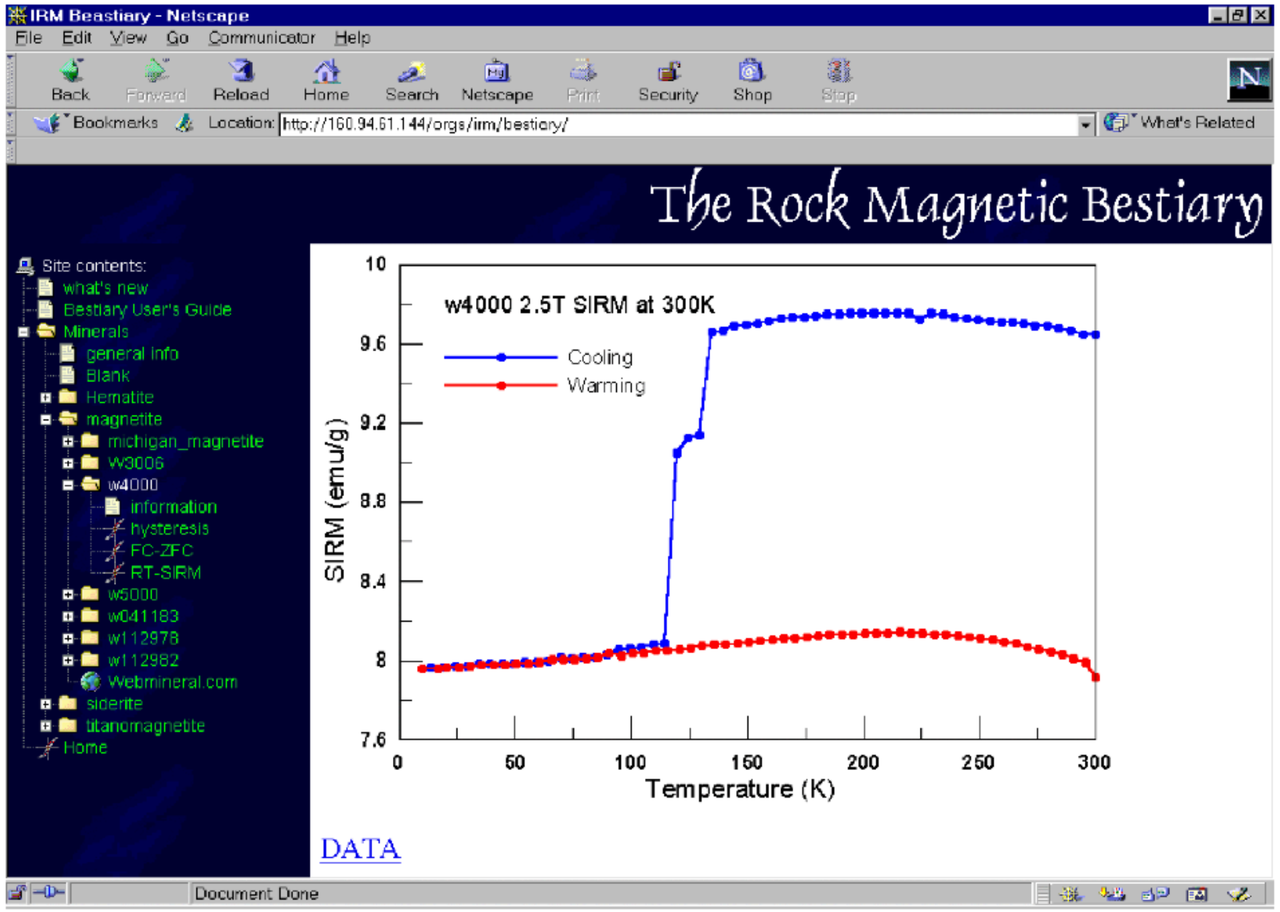

"Eventually, of course, there will be a rock-magnetic database."

"A rock-magnetic database will ultimately serve a variety of purposes. We anticipate that the most common use will be as a standard for comparison in interpreting data for natural materials, in terms of their magnetic mineralogy and size distribution."

We have a rock magnetic database!

Magnetics Information Consortium (MagIC)

Promoting information technology infrastructures for the international paleomagnetic, geomagnetic and rock magnetic community.

Home | About | Technology | Grand Challenges | Workshops | Links | Report an Issue on GitHub | Help | Contact

Search Interface
Browse, combine, and save datasets.

Upload Tool
Import data into your private workspace.

Private Workspace
Manage your contributions to MagIC.

MagIC Resources

Data Model | Method Codes | Vocabulary Lists | PmagPy Software | Paleomag Textbook | Jupyter Notebooks | YouTube Channel | MagIC/FIESTA API | MagIC FAQ and Help

Recent Contributions

Ahanin & Gilder (2025) v. 1 High-Resolution Tracking of Baltica's Northward Drift in the Ordovician June 6, 2025 by **Nastaran Ahanin**

Download

MagIC Contribution Link: earthref.org/MagIC/20312
EarthRef Data DOI: 10.7288/V4/MAGIC/20312
Publication DOI: 10.1029/2024GL114204

1 Location
7 Sites
114 Samples
130 Specimens
1 k Experiments
2 k Measurements

Geographic: Siljan impact structure, Outcrop

Yiming Zhang (2025) v. 1 Institute-for-Rock-Magnetism/RMB-oxyhydroxides: RMB-oxyhydroxides data June 3, 2025 by **Yiming Zhang**

Download

MagIC Contribution Link: earthref.org/MagIC/20427
EarthRef Data DOI: 10.7288/V4/MAGIC/20427
Publication DOI: 10.5281/ZENODO.15588182

1 Location
6 Sites
83 Samples
84 Specimens
40 Experiments
4 k Measurements

No **Plots** Available

Geographic: RMB oxyhydroxides, Laboratory

We have a rock magnetic database!

the MagIC data model

719

Version: **3.0** 2.5 2.4 2.3 2.2

Click on a table/group/column name: Updated on July 7th, 2022. Download as .json | View/Comment via Google Sheet

1. **Contribution**, contribution (13) Contribution metadata
2. **Locations**, locations (102) Groups of sites
3. **Sites**, sites (130) Units with a common age and magnetization
4. **Samples**, samples (100) Samples from a unique site
5. **Specimens**, specimens (234) Sub-samples being measured
6. **Measurements**, measurements (87) Measurements
7. **Criteria**, criteria (7) List of passing criteria
8. **Ages**, ages (32) Measured ages
9. **Images**, images (15) Images and plots

We have a rock magnetic database!

the MagIC data model

719

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Let’s take a look at an example together:

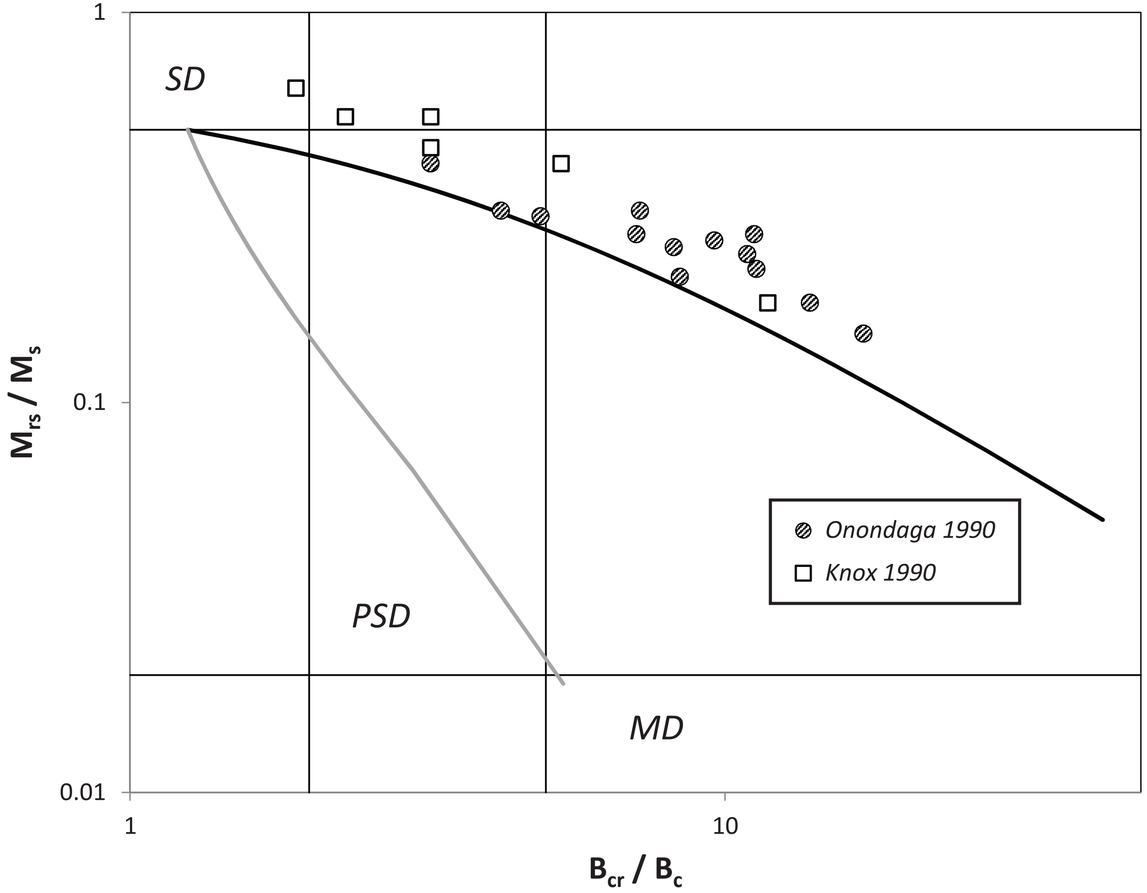
https://pmagpy.github.io/RockmagPy-notebooks

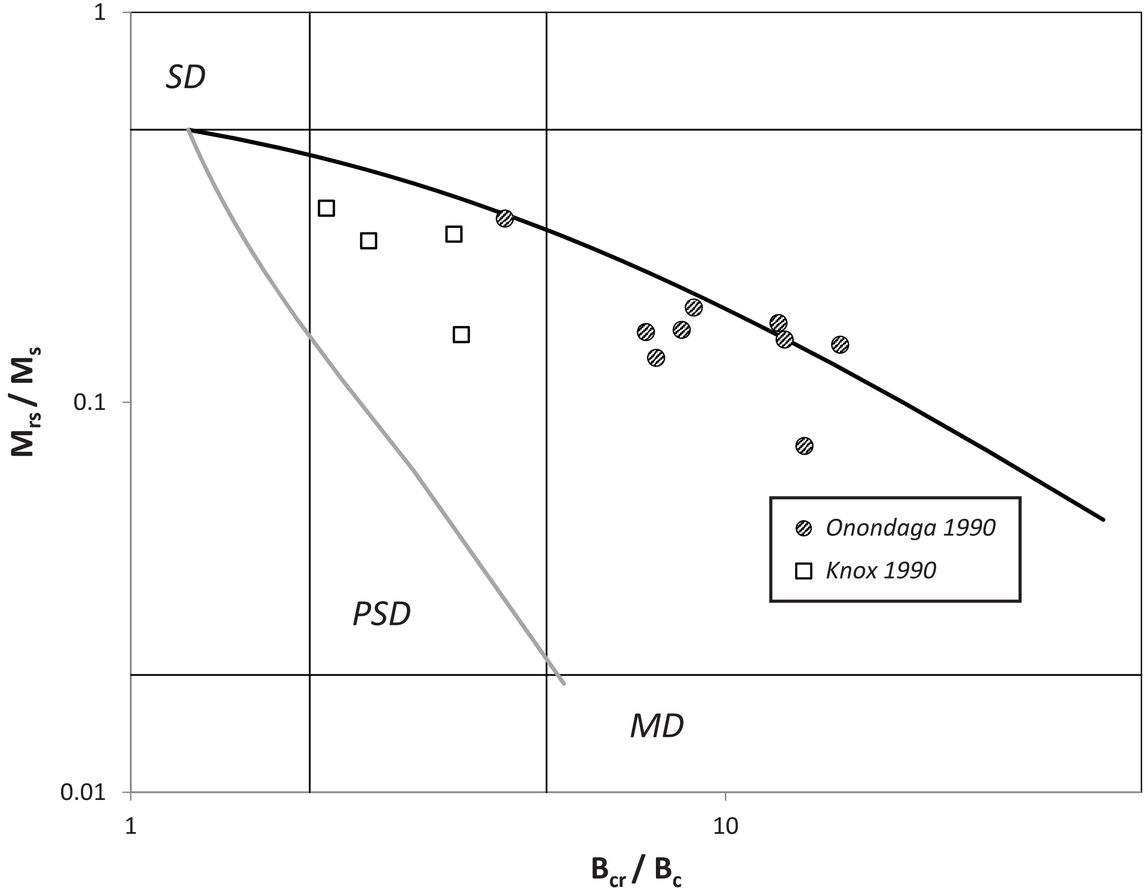
you can get there by googling “rockmagpy”

Goals for this workshop:

- Provide motivation for archiving of measurement level data from rock magnetic experiments
- Share our current progress on using rockmagpy for reproducible documentation of data analysis
- Provide hands-on opportunities for
  - contributing data to MagIC
  - analyzing data with rockmagpy
- Get feedback on project priorities and highlight how the community can contribute

A challenge in the presentation and synthesis of rock magnetic data is the sensitivity of many summary parameters to the specifics of the algorithms used for data processing.





same data, different algorithms

Jackson and Swanson-Hysell, 2012

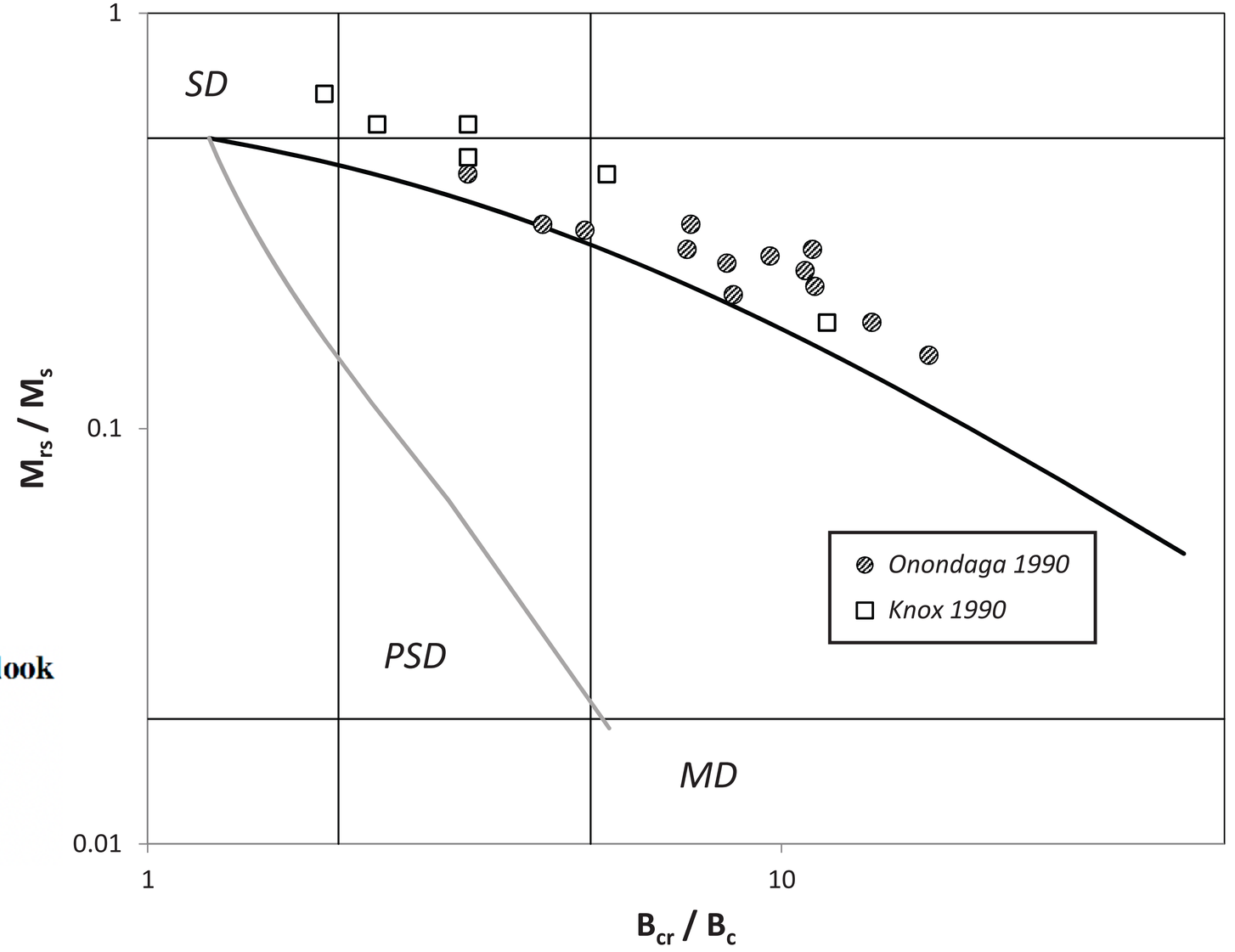
A challenge in the presentation and synthesis of rock magnetic data is the sensitivity of many summary parameters to the specifics of the algorithms used for data processing.

Rock magnetism of remagnetized carbonate rocks: another look

MIKE JACKSON* & NICHOLAS L. SWANSON-HYSELL

Institute for Rock Magnetism, Winchell School of Earth Sciences, University of Minnesota, Minnesota, US

**Corresponding author (e-mail: jacks057@umn.edu)*



A challenge in the presentation and synthesis of rock magnetic data is the sensitivity of many summary parameters to the specifics of the algorithms used for data processing.

reprocessed using approach-to-saturation fitting as implemented in:

On the quantitative analysis and evaluation of magnetic hysteresis data

M. Jackson and P. Solheid
Institute for Rock Magnetism, Department of Geology and Geophysics, University of Minnesota, 291 Shepherd Laboratories, 100 Union Street SE, Minneapolis, Minnesota 44544, USA (irm@tc.umn.edu)

Rock magnetism of remagnetized carbonate rocks: another look

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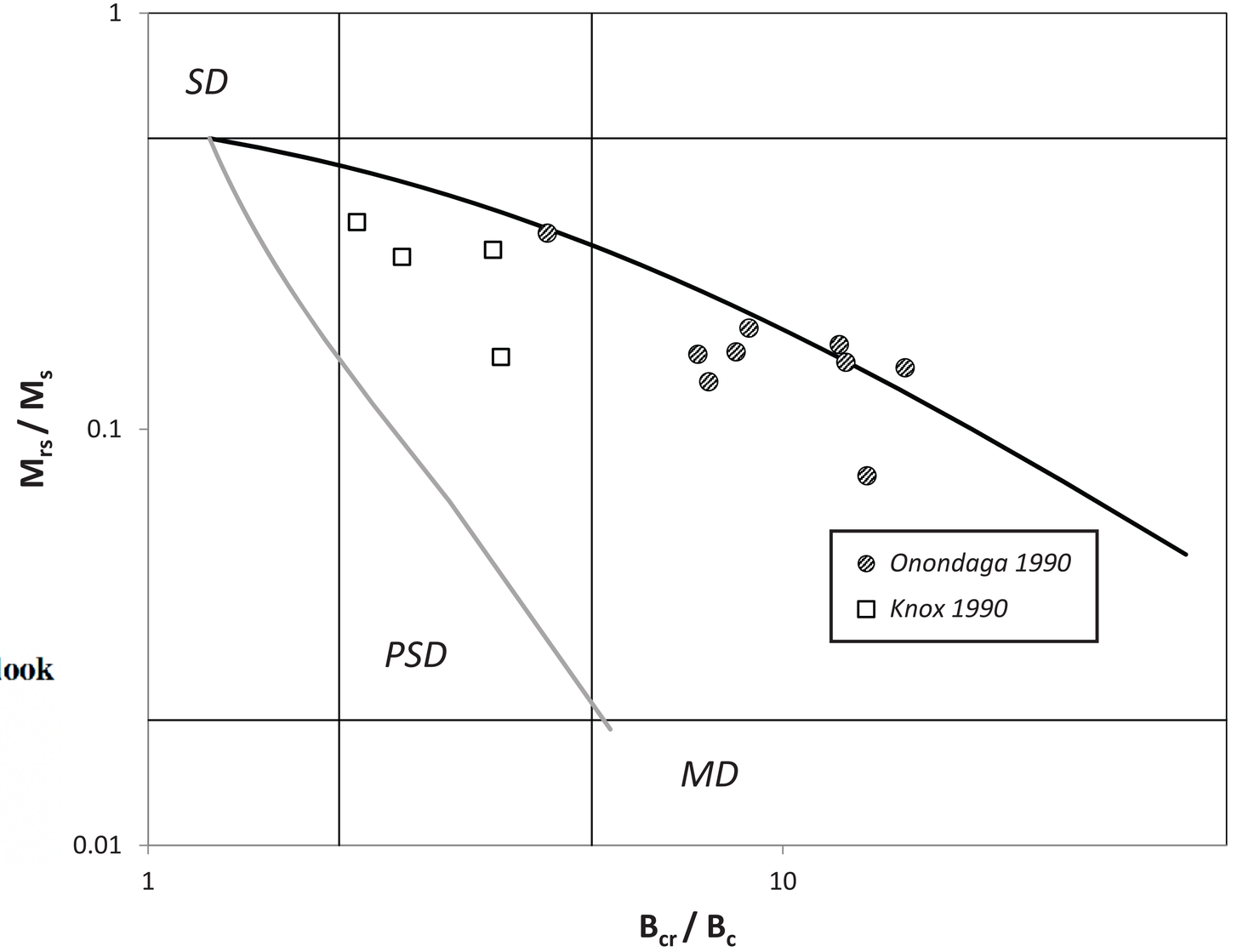
**Corresponding author (e-mail: jacks057@umn.edu)*



A challenge in the presentation and synthesis of rock magnetic data is the sensitivity of many summary parameters to the specifics of the algorithms used for data processing.

This challenge requires that we as a community:

- Archive measurement-level data from rock magnetic experiments complete with rich metadata that document sample information and experimental conditions.
- Document data analysis workflows using open source code such that reported results can be reproduced.

Archive measurement-level data from rock magnetic experiments complete with rich metadata that document sample information and experimental conditions.

▸ **Jackson & Swanson-Hysell (2012) v. 1** Rock magnetism of remagnetized carbonate rocks: another look April 30, 2018 by **Mike Jackson**

Download

MagIC Contribution Link:
earthref.org/MagIC/16460
EarthRef Data DOI:
10.7288/V4/MAGIC/16460
Publication DOI:
10.1144/SP371.3

4 Locations
8 Sites
51 Samples
97 Specimens
5 Experiments
5 k Measurements

Geographic:
Helderberg Group at Kingston NY, Knox Dol 1980s, McCabe_Trenton_1983, Trenton Falls,...

```
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Helderberg Group at Kingston NY This study      Appalachian Basin Pz carbonates 41.976  41.976  -73.9758        -73.9758
Helderberg Group at Kingston NY This study      Appalachian Basin Pz carbonates 41.9773 41.9773 -73.9722        -73.9722
Knox Dol 1980s  This study      Appalachian Basin Pz carbonates
McCabe_Trenton_1983, Trenton Falls      This study      Appalachian Basin Pz carbonates 43.275  43.275  -75.158 -75.158
Onondaga Ls 1980s       This study      Appalachian Basin Pz carbonates
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H1      Helderberg Group at Kingston NY This study      41.976  -73.9758        site 23 of Scotese, Beecraft Ls and Alsen Fm
H2      McCabe_Trenton_1983, Trenton Falls
H2      Helderberg Group at Kingston NY This study      41.9773 -73.9722
Knox Dolomite   Knox Dol 1980s  This study              0
MTA     McCabe_Trenton_1983, Trenton Falls      This study      43.275  -75.158
Onondaga Ls     Onondaga Ls 1980s       This study              0
Trenton Ls      McCabe_Trenton_1983, Trenton Falls      This study              0
>>>>>>>>>>
tab delimited   samples
sample  site    citations       orientation_quality     azimuth dip     lat     lon     description
```
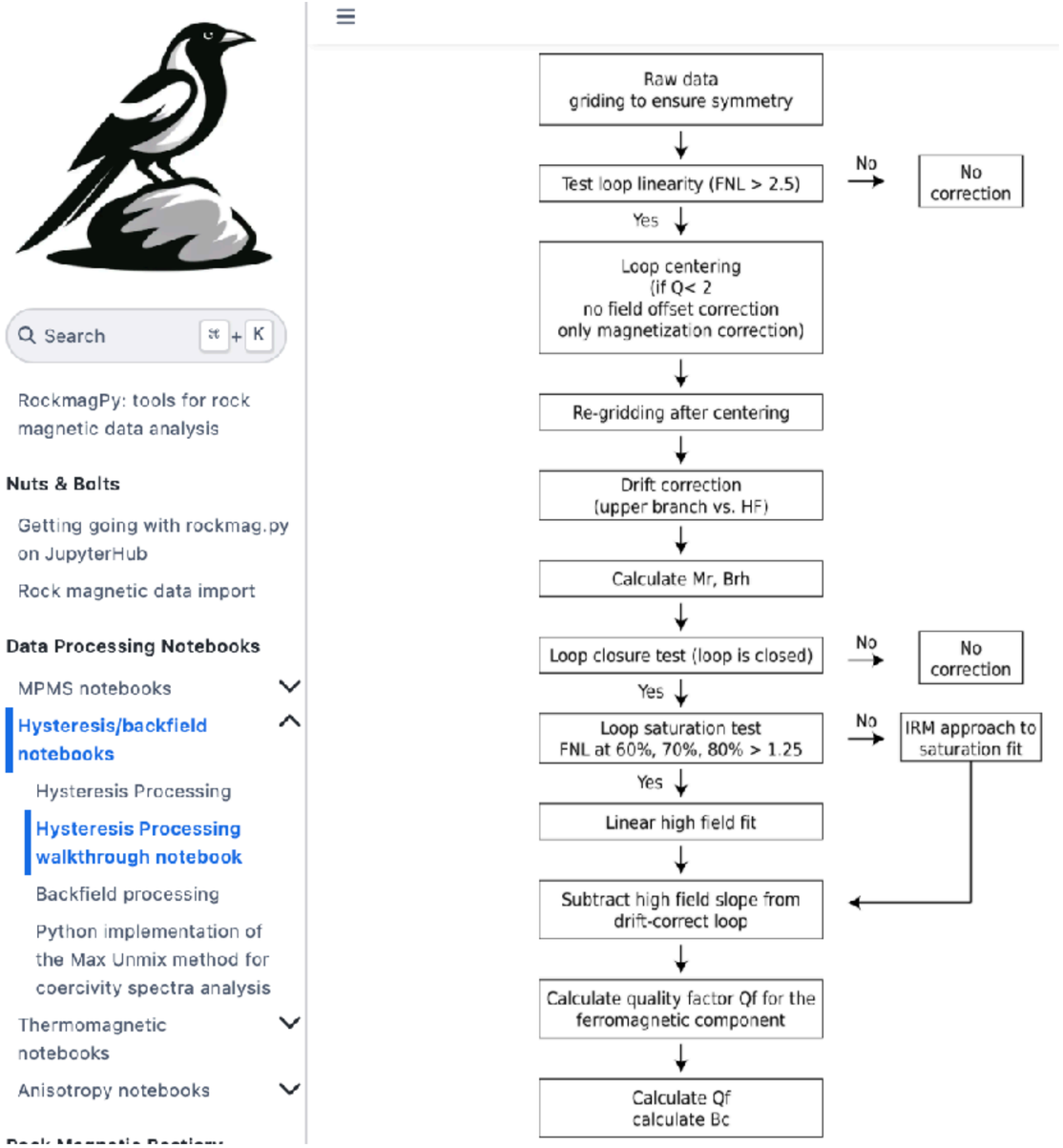
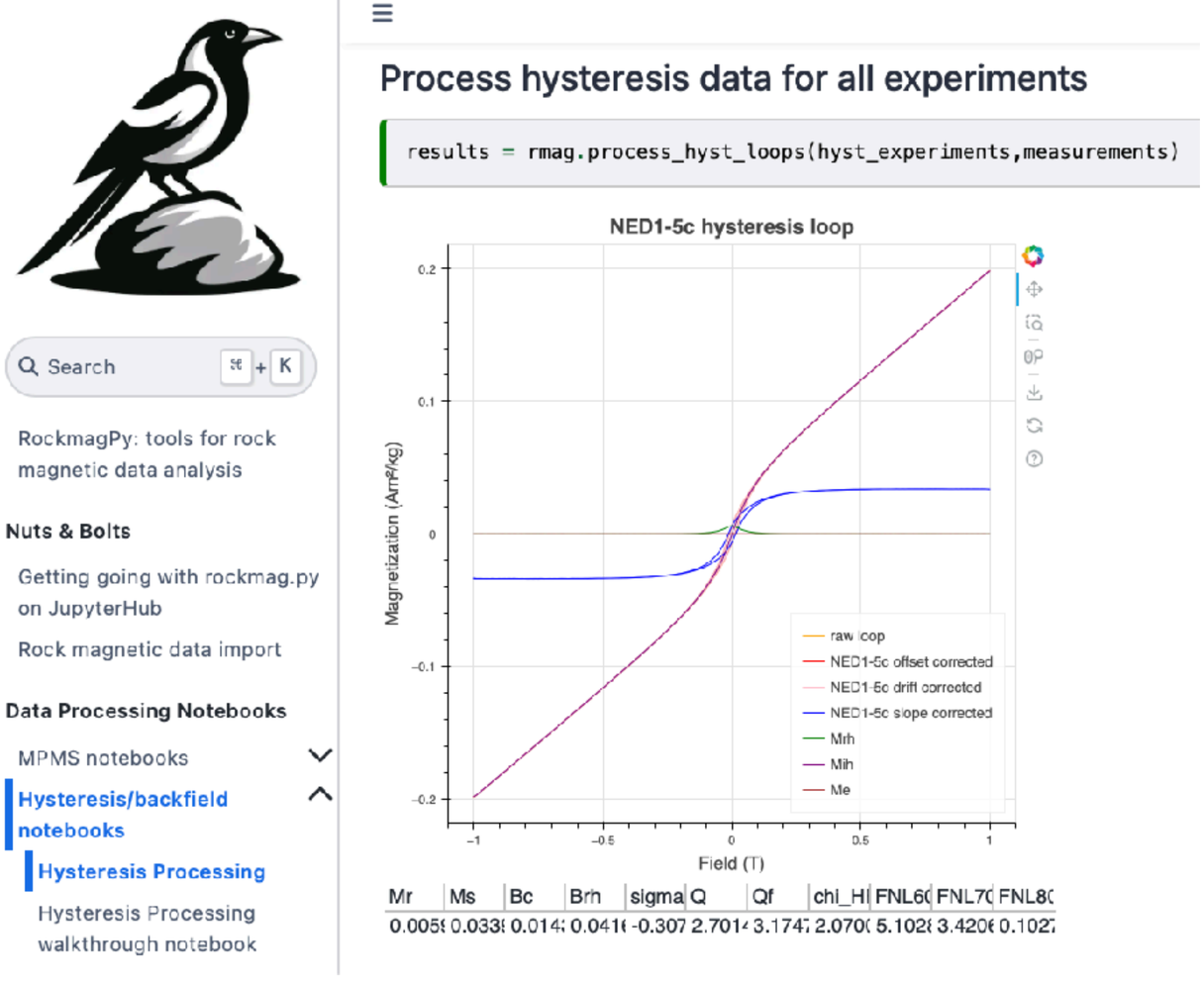

Document data analysis workflows using open source code such that reported results can be reproduced.





Let's look at these sites

rockmagpy

is part of

pmagpy

PmagPy / pmagpy / rockmag.py

rockmagpy

is part of

pmagpy

PmagPy / pmagpy / rockmag.py

and therefore builds on the visionary open source contributions of Lisa Tauxe

Search ⌘ + K

Plot and analyze anisotropy data (AMS)

The anisotropy of magnetic susceptibility (and remanence) can give significant insight to geological processes. Phenomena such as sedimentary deposition, magma flow, and deformation can all lead to preferred orientations of magnetic minerals. Such "magnetic fabrics'' give rise to anisotropy. Additionally, paleomagnetic vectors can potentially be influenced by magnetic fabrics in their direction and intensity which further motivates efforts to quantify anisotropy.

This notebook is focused on one of the most common types of anisotropy data which is anisotropy of magnetic susceptibility (AMS).

Import python libraries

Run the cell below to import the functions needed for the notebook.

```
import pandas as pd
import pmagpy.ipmag as ipmag
import pmagpy.contribution_builder as cb

import matplotlib.pyplot as plt

%matplotlib inline
%config InlineBackend.figure_format = 'retina'
```

Import data

We will download data from a MagIC contribution associated with the study:

> Schwehr and Tauxe (2003). Characterization of soft-sediment deformation: Detection of cryptoslumps using magnetic methods. Geology 31 (3):203. doi:10.1130/0091-7613(2003)031<0203:COSSDD>2.0.CO;2.

```
ipmag.plot_aniso(fignum=0, aniso_df=as1_specimen_data ,)
```

```
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```
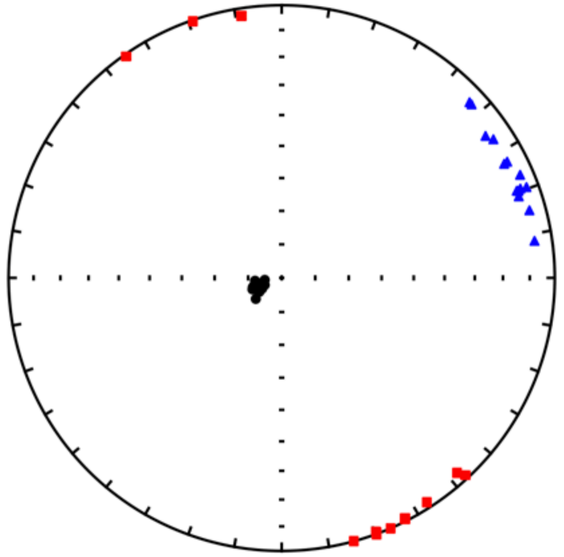
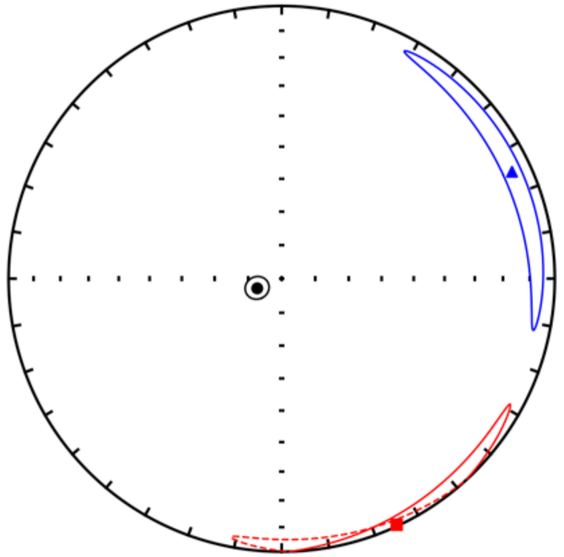

: V1=squares,V2=triangles,V3=circles



:Confidence Ellipses



https://pmagpy.github.io/RockmagPy-notebooks/anisotropy_notebooks/anisotropy_plot_AMS.html

Shout outs:

MagIC Core Group

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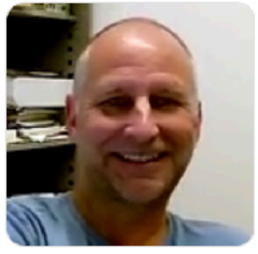
CEOAS, OSU

Rupert Minnett
Programmer via
CEOAS, OSU



Peat Solheid
Senior Scientist at
IRM, U. of Minnesota

Acknowledgements

Current development of RockmagPy is supported by the National Science Foundation through its support for the MagIC database.

Yiming Zhang

IRM postdoc

Peat Solheid

IRM senior scientist

Let's look at some data together!

jupyterhub.earthref.org