The Magnetics Information Consortium (MagIC) Data Repository: Interoperability with GeoCodes, EPOS, and Other Information Systems

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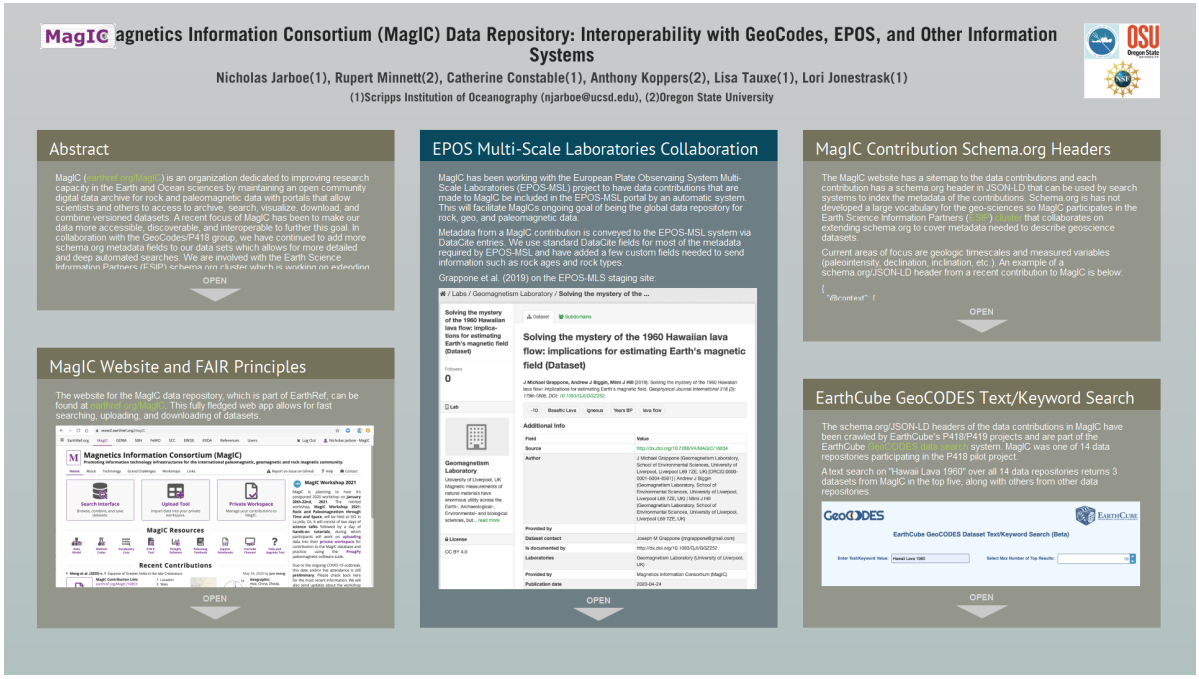
Abstract

MagIC (earthref.org/MagIC (https://www2.earthref.org/MagIC)) is an organization dedicated to improving research capacity in the Earth and Ocean sciences by maintaining an open community digital data archive for rock and paleomagnetic data with portals that allow scientists and others to access to archive, search, visualize, download, and combine versioned datasets. A recent focus of MagIC has been to make our data more accessible, discoverable, and interoperable to further this goal. In collaboration with the GeoCodes/P418 group, we have continued to add more schema.org metadata fields to our data sets which allows for more detailed and deep automated searches. We are involved with the Earth Science Information Partners (ESIP) schema.org cluster which is working on extending the schema.org schema to the sciences. MagIC has been focusing on geo- science issues such as standards for describing deep time. We are also collaborating with the European Plate Observing System (EPOS)'s Thematic Core Service Multi-scale laboratories (TCS MSL). MagIC is sending its contributions' metadata to TCS MSL via DataCite records for representation in the EPOS system. This collaboration should allow European scientists to use MagIC as an official repository for European rock and paleomagnetic data and help prevent the fragmenting of the global paleomagnetic and rock data into many separate data repositories. By having our data well described by an EarthCube supported standard (schema.org/JSON-LD), we will be able to more easily share data with other EarthCube projects in the future.

The Magnetics Information Consortium (MagIC) Data Repository: Interoperability with GeoCodes, EPOS, and Other Information Systems



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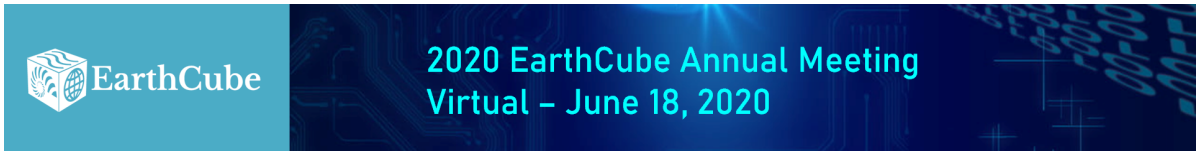
PRESENTED AT:

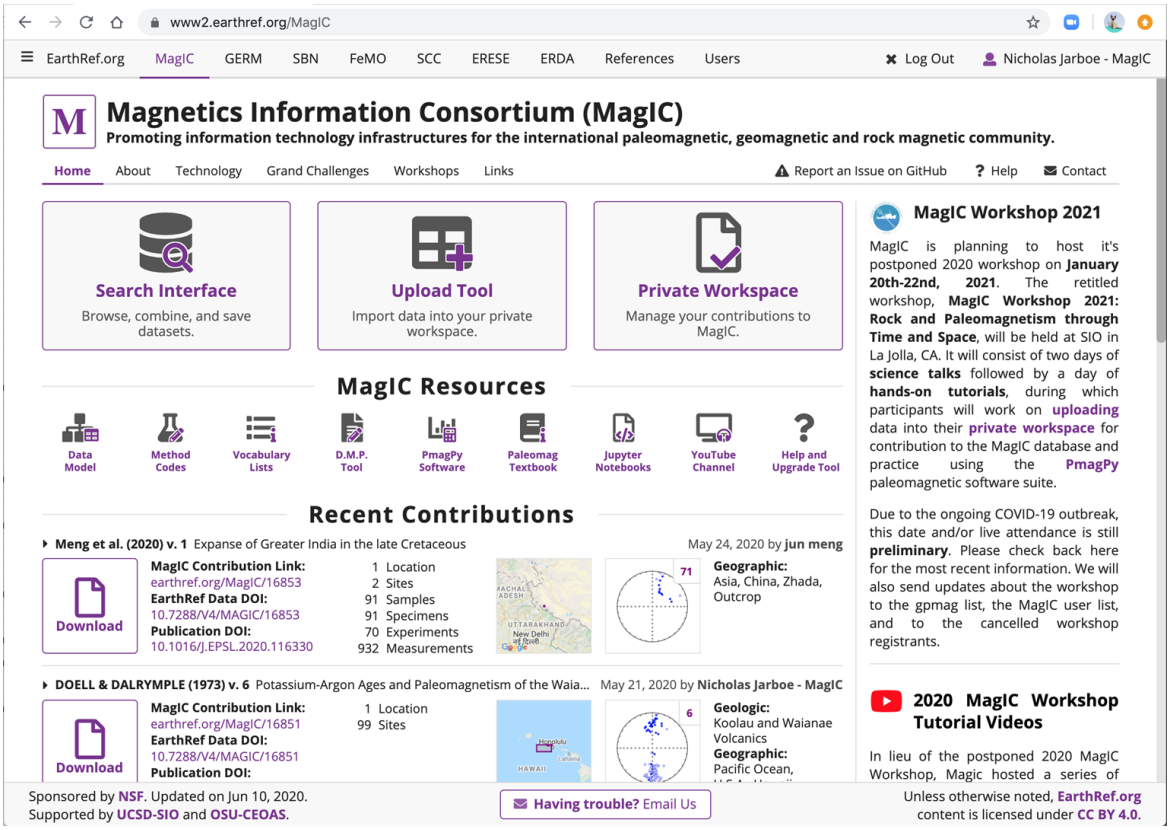


ABSTRACT

MagIC (earthref.org/MagIC (https://www2.earthref.org/MagIC)) is an organization dedicated to improving research capacity in the Earth and Ocean sciences by maintaining an open community digital data archive for rock and paleomagnetic data with portals that allow scientists and others to access to archive, search, visualize, download, and combine versioned datasets. A recent focus of MagIC has been to make our data more accessible, discoverable, and interoperable to further this goal. In collaboration with the GeoCodes/P418 group, we have continued to add more schema.org metadata fields to our data sets which allows for more detailed and deep automated searches. We are involved with the Earth Science Information Partners (ESIP) schema.org cluster which is working on extending the schema.org schema to the sciences. MagIC has been focusing on geo-science issues such as standards for describing deep time. We are also collaborating with the European Plate Observing System (EPOS)'s Thematic Core Service Multi-scale laboratories (TCS MSL). MagIC is sending its contributions' metadata to TCS MSL via DataCite records for representation in the EPOS system. This collaboration should allow European scientists to use MagIC as an official repository for European rock and paleomagnetic data and help prevent the fragmenting of the global paleomagnetic and rock data into many separate data repositories. By having our data well described by an EarthCube supported standard (schema.org/JSON-LD), we will be able to more easily share data with other EarthCube projects in the future.

MAGIC WEBSITE AND FAIR PRINCIPLES

The website for the MagIC data repository, which is part of EarthRef, can be found at earthref.org/MagIC (https://earthref.org/MagIC). This fully fledged web app allows for fast searching, uploading, and downloading of datasets.



MagIC adheres to Findable, Accessible, Interoperable, and Reusable (FAIR) principles.

Findable: Data DOIs minted for each version of a dataset, Google and EarthCube GeoCODES searchable schema.org/JSON-LD header on dataset landing pages, presence at relevant conferences such as AGU, EGU, ESIP, and EarthCube.

Accessible: Data available via website or API download. Deep data searches possible where only individual data elements from multiple data contributions can be downloaded in one file. For example, all sites in the database with an age between 1 and 5 Ma.

Interoperable: MagIC uses ORCID iDs for authentication and identification. The MagIC file format is compatible with the PmagPy paleomagnetic analysis software. Datasets interpreted with PmagPy can be easily uploaded to MagIC and many datafiles can be downloaded from MagIC and visualized and/or reinterpreted in PmagPy.

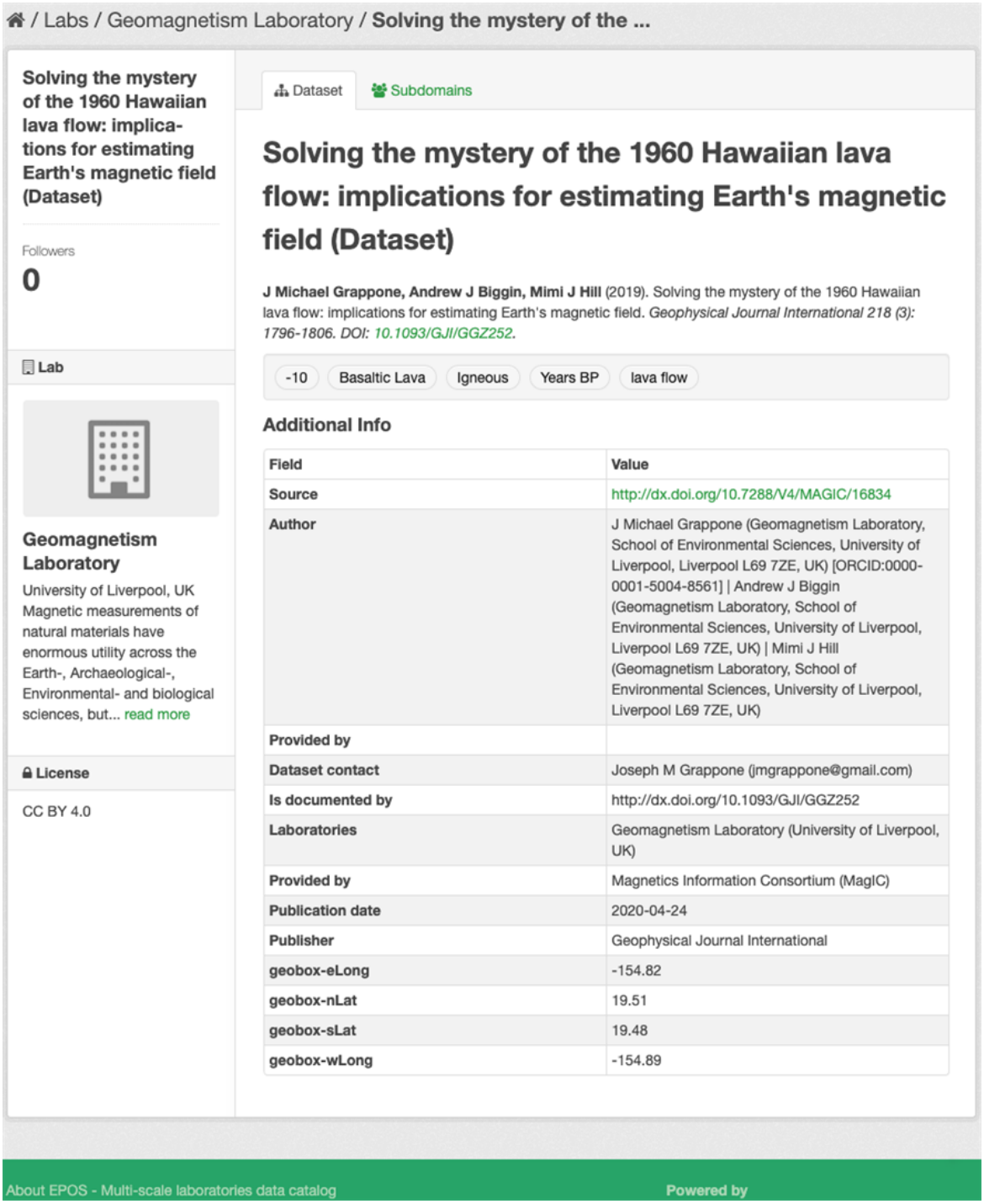
Reusable: MagIC data conforms to a strict data model for accurate and easy reuse.

EPOS MULTI-SCALE LABORATORIES COLLABORATION

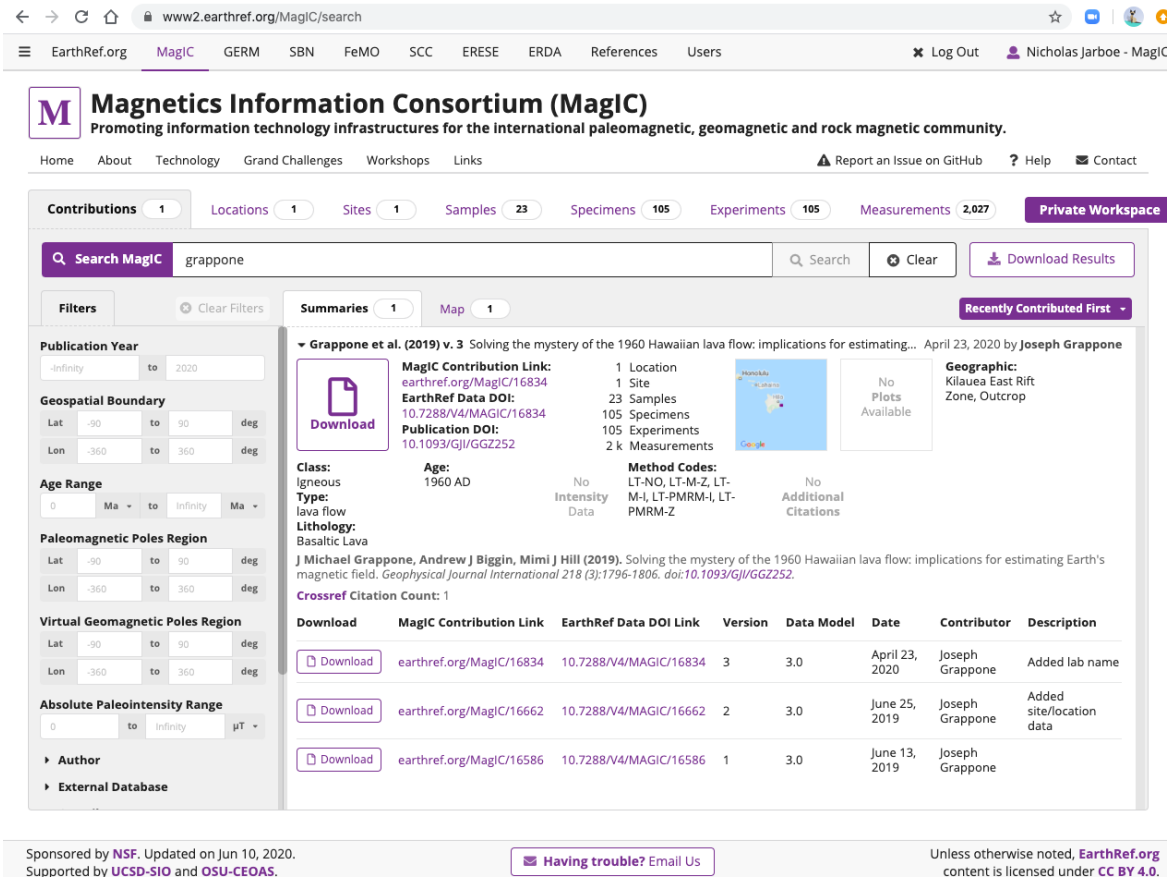
MagIC has been working with the European Plate Observaing System Multi-Scale Laboratories (EPOS-MSL) project to have data contributions that are made to MagIC be included in the EPOS-MSL portal by an automatic system. This will facilitate MagICs ongoing goal of being the global data repository for rock, geo, and paleomagnetic data.

Metadata from a MagIC contribution is conveyed to the EPOS-MSL system via DataCite entries. We use standard DataCite fields for most of the metadata required by EPOS-MSL and have added a few custom fields needed to send information such as rock ages and rock types.

Grappone et al. (2019) on the EPOS-MLS staging site:



Grappone et al. (2019) (https://www2.earthref.org/MagIC/dio/10.1093/GJI/GGZ252) on MagIC:


www2.earthref.org/MagIC/search
EarthRef.org MagIC GERM SBN FeMO SCC ERESE ERDA References Users Log Out Nicholas Jarboe - MagIC
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
Contributions 1 Locations 1 Sites 1 Samples 23 Specimens 105 Experiments 105 Measurements 2,027 Private Workspace
Search MagIC grappone Search Clear Download Results
Filters Clear Filters Summaries 1 Map 1 Recently Contributed First
Publication Year
Geospatial Boundary
Age Range
Paleomagnetic Poles Region
Virtual Geomagnetic Poles Region
Absolute Paleointensity Range
Author
External Database
Grappone et al. (2019) v. 3 Solving the mystery of the 1960 Hawaiian lava flow: implications for estimating... April 23, 2020 by Joseph Grappone
Download
MagIC Contribution Link: earthref.org/MagIC/16834
EarthRef Data DOI: 10.7288/V4/MAGIC/16834
Publication DOI: 10.1093/GJI/GGZ252
1 Location
1 Site
23 Samples
105 Specimens
105 Experiments
2 k Measurements
No Plots Available
Geographic: Kilauea East Rift Zone, Outcrop
Class: Igneous
Type: lava flow
Lithology: Basaltic Lava
Age: 1960 AD
No Intensity Data
Method Codes: LT-NO, LT-M-Z, LT-M-I, LT-PMRM-I, LT-PMRM-Z
No Additional Citations
J Michael Grappone, Andrew J Biggin, Mimi J Hill (2019). Solving the mystery of the 1960 Hawaiian lava flow: implications for estimating Earth's magnetic field. Geophysical Journal International 218 (3):1796-1806. doi:10.1093/GJI/GGZ252.
Crossref Citation Count: 1
Download | MagIC Contribution Link | EarthRef Data DOI Link | Version | Data Model | Date | Contributor | Description
Download | earthref.org/MagIC/16834 | 10.7288/V4/MAGIC/16834 | 3 | 3.0 | April 23, 2020 | Joseph Grappone | Added lab name
Download | earthref.org/MagIC/16662 | 10.7288/V4/MAGIC/16662 | 2 | 3.0 | June 25, 2019 | Joseph Grappone | Added site/location data
Download | earthref.org/MagIC/16586 | 10.7288/V4/MAGIC/16586 | 1 | 3.0 | June 13, 2019 | Joseph Grappone
Sponsored by NSF. Updated on Jun 10, 2020.
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MAGIC CONTRIBUTION SCHEMA.ORG HEADERS

The MagIC website has a sitemap to the data contributions and each contribution has a schema.org header in JSON-LD that can be used by search systems to index the metadata of the contributions. Schema.org is has not developed a large vocabulary for the geo-sciences so MagIC participates in the Earth Science Information Partners (ESIP (https://www.esipfed.org/)) cluster (https://github.com/ESIPFed/science-on-schema.org/) that collaborates on extending schema.org to cover metadata needed to describe geoscience datasets.

Current areas of focus are geologic timescales and measured variables (paleointensity, declination, inclination, etc.). An example of a schema.org/JSON-LD header from a recent contribution to MagIC is below:


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{
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  "@vocab": "http://schema.org",
  "geosci-time": "http://schema.geoschemas.org/contexts/temporal#"
 },
 "@type": "Dataset",
 "url": "https://earthref.org/MagIC/16853",
 "identifier": "http://dx.doi.org/10.7288/V4/MAGIC/16853",
 "license": "https://creativecommons.org/licenses/by/4.0/",
 "sdPublisher": "EarthRef.org",
 "sdLicense": "https://creativecommons.org/licenses/by/4.0/",
 "sdDatePublished": "2020-06-10T21:19:12.571Z",
 "version": 1,
 "contributor": "jun meng",
 "dateModified": "2020-05-24T12:51:55.810Z",
 "citation": "https://dx.doi.org/10.1016/J.EPSL.2020.116330",
 "sameAs": [
  "https://earthref.org/MagIC/10.1016/J.EPSL.2020.116330"
 ],
 "name": "<b>Jun Meng, Stuart A. Gilder, Yalin Li, Chengshan Wang, Tao Liu (2020).</b> Expanse of Greater India in the late Cretaceous. <i>Earth and Planetary Science Letters 542:116330. doi:<a href='//dx.doi.org/10.1016/J.EPSL.2020.116330'>10.1016/J.EPSL.2020.116330</a>.</i> (Dataset)",
 "description": "Paleomagnetic, rock magnetic, or geomagnetic data found in the MagIC data repository from a paper titled: <b>Jun Meng, Stuart A. Gilder, Yalin Li, Chengshan Wang, Tao Liu (2020).</b> Expanse of Greater India in the late Cretaceous. <i>Earth and Planetary Science Letters 542:116330. doi:<a href='//dx.doi.org/10.1016/J.EPSL.2020.116330'>10.1016/J.EPSL.2020.116330</a>.</i>",
 "keywords": [
  "Earth and Planetary Sciences (miscellaneous)",
  "Space and Planetary Science",
  "Geochemistry and Petrology",
  "Geophysics"
 ],
 "datePublished": 2020,
 "spatialCoverage": {
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    "latitude": 31.2,
    "longitude": 79.6
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   {
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    "longitude": 79.6
   }
  ]
 },
 "temporalCoverage": {
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  "startDate": -68998051,
  "endDate": -112998051
 },
 "geosci-time": {
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 "time:inTimePosition": {
  "@type": "time:ProperInterval",
  "time:hasBeginning": {
   "time:hasTRS": {
    "@id": "geosci-time:BeforePresent"
   },
   "time:numericPosition": {
    "@value": 69000000,
    "@type": "xsd:decimal"
   }
  },
  "time:hasEnd": {
   "time:hasTRS": {
    "@id": "geosci-time:BeforePresent"
   },
   "time:numericPosition": {
    "@value": 113000000,
    "@type": "xsd:decimal"
   }
  }
 }
},
"variableMeasured": [
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  "description": "Virtual geomagnetic pole, Latitude",
  "minValue": -33.4,
  "maxValue": 27.1,
  "unitText": "Degrees"
 },
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  "description": "Specimen direction in coordinates specified by tilt correction, Fisher's dispersion parameter Kappa",
  "minValue": 32.5,
  "maxValue": 33.6,
  "unitText": "Dimensionless"
 },
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  "name": "Latitude",
  "description": "Sample geographic location, Latitude",
  "minValue": 31.2,
  "maxValue": 31.2,
  "unitText": "Degrees"
 },
 {
  "@type": "PropertyValue",
  "name": "Inclination",
  "description": "Directions in specimen coordinates, Inclination",
  "minValue": -88.8,
  "maxValue": 86.4,
  "unitText": "Degrees"
 },
 {
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  "name": "Direction Alpha 95%",
  "description": "Specimen direction in coordinates specified by tilt correction, Fisher circle",
  "minValue": 3,
  "maxValue": 6.2,
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 },
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  "minValue": 0,
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  "description": "Order of the measurements",
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  "maxValue": 19
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  "description": "Measured magnetic moment, Z",
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  "unitText": "Am^2"
 },
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  "name": "Magnetic Moment Y",
  "description": "Measured magnetic moment, Y",
  "minValue": -1.6638021888050516e-9,
  "maxValue": 8.068822161467943e-10,
  "unitText": "Am^2"
 },
 {
  "@type": "PropertyValue",
  "name": "Magnetic Moment X",
  "description": "Measured magnetic moment, X",
  "minValue": -2.926390637943911e-9,
  "maxValue": 1.4485872353600732e-9,
  "unitText": "Am^2"
 },
 {
  "@type": "PropertyValue",
  "name": "Direction N Samples",
  "description": "Number of samples included in directional calculations.",
  "minValue": 18,
  "maxValue": 73
 },
 {
  "@type": "PropertyValue",
  "name": "Magnetization Volume",
  "description": "Measured intensity of magnetization, Volume normalized",
  "minValue": 2.45e-7,
  "maxValue": 0.000306,
  "unitText": "A/m"
 },
 {
  "@type": "PropertyValue",
  "name": "Longitude",
  "description": "Sample geographic location, Longitude",
  "minValue": 79.6,
  "maxValue": 79.6,
  "unitText": "Degrees"
 },
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  "@type": "PropertyValue",
  "name": "Measurement Temperature",
  "description": "Temperature",
```

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    "minValue": 273,
    "maxValue": 273,
    "unitText": "K"
   },
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    "description": "Virtual geomagnetic pole, Longitude",
    "minValue": 5.7,
    "maxValue": 231.2,
    "unitText": "Degrees"
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    "name": "Declination",
    "description": "Directions in specimen coordinates, Declination",
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    "maxValue": 359.2,
    "unitText": "Degrees"
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    "maxValue": 73
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    "maxValue": 893,
    "unitText": "K"
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    "description": "Measured magnetic moment",
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    "maxValue": 3.364e-9,
    "unitText": "Am^2"
   },
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    "minValue": 100,
    "maxValue": 100,
    "unitText": "%"
   },
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    "description": "Age",
    "minValue": 70,
    "maxValue": 107,
    "unitText": "Custom"
   }
  ]
 }
```

EARTHCUBE GEOCODES TEXT/KEYWORD SEARCH

The schema.org/JSON-LD headers of the data contributions in MagIC have been crawled by EarthCube's P418/P419 projects and are part of the EarthCube GeoCODES data search (https://earthcube.org/webapps/geocodes/discovery/ui/textSearch.html) system. MagIC was one of 14 data repositories participating in the P418 pilot project.

A text search on "Hawaii Lava 1960" over all 14 data repositories returns 3 datasets from MagIC in the top five, along with others from other data repositories.