

House Committee on Appropriations
Subcommittee on Interior, Environment, and Related Agencies
Public Witness Written Testimony (non-tribal programs)
February 16, 2020

Supplemental Testimony of David Jonas Bardin on USGS Geomagnetism Program

Chair McCollum and Ranking Member Joyce,

This Written Testimony supplements my thematic oral testimony presented on February 6. It supports the Administration's subsequent USGS Geomagnetism Program Request for FY 2021 — with Congressional enhancements, directions, and clarification inquiries.

- That Request is for \$4.1M for FY 2021 (compared with \$4.0M as enacted for FY 2020). See Department of the Interior (DoI) FY 2021 Budget Justification for USGS (“Greenbook”) at <https://www.doi.gov/sites/doi.gov/files/uploads/fy2021-usgs-budget-justification.pdf> (especially pp. 60-62).¹ Also see my historic table at page 4, below, showing flat appropriations, sequester impact, and flat appropriations again, until December’s Minibus.
- Secure the Grid (STG) Coalition² members lobbied Senate Appropriators for the USGS Geomagnetism funding in Pub. Law No. 116-94, approved Dec. 20, 2019.³

STG Coalition; InfraGard National Disaster Resilience Council; and Electric Infrastructure Security Council. The STG Coalition, the InfraGard National Disaster Resilience Council (formerly EMP SIG), and the Electric Infrastructure Security Council (EISC) have helped shape my concern about “Black Sky” hazards – catastrophic events that severely disrupt the normal functioning of our critical infrastructures for multiple regions for long duration.⁴ So, too, President’s National Infrastructure Advisory Council.⁵ A robust USGS Geomagnetism Program is a necessary component for protecting the electric power grid against such an event. For example, USGS geomagnetism research and data are required to improve forecast models that NOAA’s Space Weather Prediction Center uses to inform electrical system operators of impending solar storms so that they may minimize impacts of a storm when it does hit the Earth.

The USGS Greenbook’s Program Overview (at p. 61) broadly explains this vital Program:

“Magnetic storms are caused by the dynamic interaction of the Earth’s magnetic field with the Sun. [They can] wreak havoc on the infrastructure and activities of our modern,

¹ Request proposes no cuts to Geomagnetism Program, yet Greenbook p. 62, line 2, mistakenly parrots boilerplate which applies only to cuts in *other* Programs [“The budget does not request funding for these activities in order to address other priorities”]. For USGS as a whole, Administration proposes a cut of \$300M. See <https://www.doi.gov/sites/doi.gov/files/uploads/fy2021-bib-bh053.pdf>.

² See <https://securethegrid.com>.

³ H.R. 1865 - Further Consolidated Appropriations Act, 2020 (116th Cong.) — 2019 Minibus.

⁴ See <https://www.empcenter.org> and <https://www.eiscouncil.org/BlackSky.aspx>.

⁵ See NIAC, [Surviving a Catastrophic Power Outage](#) (2018).

technologically based society. Large storms can induce voltage surges in electric-power grids, causing blackouts and the loss of radio communication, reduce GPS accuracy, damage satellite electronics, and affect satellite operations, enhance radiation levels for astronauts and high-altitude pilots, and interfere with directional drilling for oil and gas.

“In order to understand and mitigate geomagnetic hazards, the USGS Geomagnetism Program monitors and analyzes the Earth’s dynamic magnetic field. The Program is part of the U.S. National Space Weather Program (NSWP), an interagency collaboration that includes programs in the National Aeronautics and Space Administration (NASA), DOD, NOAA, and NSF. The Geomagnetism Program provides data to the NSWP agencies, oil drilling services companies, geophysical surveying companies, and several international agencies. Data, products, and services from the USGS are also used by the electric-power industry to evaluate geomagnetic storm risk.

“Domestically, the USGS works cooperatively with NOAA, the Air Force 557th Weather Wing, and other Federal agencies. For example, USGS observatory data are used by NOAA’s Space Weather Prediction Center, and by the U.S. Air Force, for issuing geomagnetic warnings and forecasts. The USGS magnetic observatory network is part of the global INTERMAGNET network. The USGS research is conducted in collaboration with the Colorado School of Mines, the USGS Crustal Geophysics and Geochemistry Science Center, the NOAA Space Weather Prediction Center and the NASA Community Coordinated Modeling Center.

“The USGS also works with private entities that are affected by space weather and geomagnetic activity, including electric-power grid companies”

Summary of position; conclusions and recommendations. Congress should approve FY 2021 Request with following *directions, clarifications and enhancements* — reaching out to USGS:

MT Survey(s) Implementation Plan(s)

Like other NSWP agencies, USGS’s Geomagnetism Program supported completion of the reconnaissance magnetotelluric survey (MT Survey) of the contiguous United States (CONUS); but it didn’t have budget responsibilities prior to FY 2020. ⁶ USGS has not yet issued any MT Survey implementation plans for FY 2020, or 2021, or later years.

—Congress should ask USGS, within 90 days, to (a) review plans and assumptions, (b) provide realistic data as to field campaign seasons, number of field stations, and likely campaign costs, and (c) suggest specified expenditure levels in FY 2021 and subsequent years for the MT Survey.

⁶ Almost all of the MT Survey to date was funded through the National Science Foundation (NSF) and implemented by Oregon State University (OSU). NASA provided funds for OSU work in FY 2019 and 2020 at a reduced pace. (A USGS component MT-surveyed peninsular Florida and a few smaller areas.)

The USGS Greenbook vaguely states (at p. 62): “In 2021, USGS will continue the magnetotelluric (MT) survey of the U.S. to improve U.S. electrical grid resilience, improve forecast models for geomagnetic storms, and aid in mineral resource assessments. Collection of MT data on a national scale is a basis for modeling the Earth’s electric field, which can be used to assess the impact of electrical storms. This survey is responsive to priorities established in the *National Space Weather Strategy*, as well as related international initiatives for pursuing induction hazard research. This broad collaboration includes scientists from NASA, NOAA, the Institute for Defense Analyses, the Federal Energy Regulatory Commission, the Federal Emergency Management Agency, and NSF.”

- For FY 2020, the Administration requested and the December 2019 enactment specified \$1.726M for MT Survey. But the FY 2021 Request does not specify any MT Survey amount. How much does USGS expect to spend during FY 2021 to “continue” that MT Survey?
- Of the \$1.726M specified for FY 2020, none has yet been obligated. How much do DoI and USGS expect actually to spend during FY 2020 for that MT Survey?
- How much of the FY 2020 enacted amount and FY 2021 Request would USGS spend for data acquisition in the field and data processing (as contrasted with overheads and administration)?
— When does USGS expect to complete its “continued” reconnaissance MT Survey of CONUS?
- How long would a *quality* reconnaissance MT Survey take? What funding would USGS need?
- In FYs 2020 and 2021, at how many field station sites will MT Survey acquire data for the first time? At how many sites will MT Survey be repeating data acquisition for sake of acceptable quality? How many weeks will each site take? What will be duration of field work season? ⁷
— Congress should direct that a specific amount for the reconnaissance MT Survey actually be spent exclusively on MT Survey in FY 2021 — having your staff discuss with USGS whether \$1.726M (same as enacted for FY 2020) would be a reasonable specific amount.
— Congress should also direct USGS to analyze and report to Appropriators within 60 days likely future needs for denser, follow-up MT surveying in high geo-hazard areas near especially critical infrastructure (additional to reconnaissance MT Survey), for national security reasons.

Observatories and variometer stations

- Congress should determine whether Administration’s two proposed increases above FY 2020 enacted \$4.0M — \$25,000 for Fixed Costs ⁸ and \$114,000 for Observatory Operations — would be adequate both to operate 14 permanent, ground-based geomagnetic observatories and address their deferred maintenance backlogs. ⁹
- Congress should direct USGS to report to Appropriators within 60 days: (a) identifying gaps in its network of observatories, and (b) indicating options, timetables, estimated costs and priorities for closing such gaps by means of new observatories and/or variometer stations.
- Congress should compliment USGS for its cost-effective leveraging of equipment at seismic and geomagnetic station sites in order to help achieve missions of both programs.
- Congress should (a) direct USGS to install at least two new observatories or permanent variometer stations during FY 2021 and FY2022 (a two-year effort) and (b) enhance the Request commensurately (based on cost estimates your staff acquires from USGS).

⁷ President’s EMP Executive Order of March 26, 2019 (EO 13865) gave the Secretary of the Interior four years to complete that MT Survey. Request interprets EO as calling for a “three-year effort” (Greenbook at pp. 2 and 60), ending in March or April 2023, in middle of FY 2023, of which FY 2021 is “second” year. But MT Survey field work gets done mainly during warmer months of calendar year (each campaign season beginning in March or April).

⁸ Determined for every USGS Program per OMB formula. See USGS Greenbook table at p. 116.

⁹ The Greenbook merely states (at p. 62): “In 2021, the USGS will continue to operate 14 geomagnetic observatories, delivering data to the NOAA Space Weather Prediction Center, the US Air Force 557th Weather Wing, and numerous other customers, and will develop geoelectric hazard maps, develop existing data sets needed to estimate Earth surface impedance, and develop computer-based tools need for real-time mapping of geomagnetic and geoelectric field variation.”

Respectfully submitted, *David Jonas Bardin* [davidbardin@aol.com] ¹⁰

**USGS GEOMAGNETISM PROGRAM BUDGETS UNDER NATURAL HAZARDS
MISSION, 2008-2020, COMPARED WITH 2021 REQUEST PROPOSALS**
(See <https://www.usgs.gov/about/organization/science-support/budget/usgs-budget-archives>)
Dollars to closest 1/10th of a million (\$x.yM)

Fiscal Year	Request (\$ mil)	Enacted	References: "Greenbook", Public Law No.
2008	\$2.1	\$2.1M	https://edit.doi.gov/sites/doi.gov/files/migrated/budget/appropriations/2008/upload/FY2008_USGS_Greenbook.pdf ; Public Law No. 110-161
2009	\$2.1	\$2.1M	https://edit.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/FY2009_USGS_Greenbook.pdf ; Pub. L. 111-8
2010	\$2.1	\$2.1M	https://edit.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/FY2010_USGS_Greenbook.pdf ; Pub. L. 111-117
2011	\$2.1	\$2.1M	https://edit.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/FY2011_USGS_Greenbook_part1.pdf ; Pub. L. 112-10
2012	\$2.1	\$2.1M	https://edit.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/FY2012_USGS_Greenbook.pdf ; Pub. L. 112-74
2013	\$2.2	\$2.0M	https://edit.doi.gov/sites/doi.gov/files/migrated/budget/appropriations/2013/upload/FY2013_USGS_Greenbook.pdf ; Pub. L. 113-6
2014	\$2.1	\$1.9M	https://www.doi.gov/sites/doi.gov/files/migrated/budget/appropriations/2014/upload/FY2014_USGS_Greenbook.pdf ; Pub. L. 113-76
2015	\$1.9	\$1.9M	https://www.doi.gov/sites/doi.gov/files/migrated/budget/appropriations/2015/upload/FY2015_USGS_Greenbook.pdf ; Pub. L. 113-235
2016	\$3.6	\$1.9M	https://www.doi.gov/sites/doi.gov/files/migrated/budget/appropriations/2016/upload/FY2016_USGS_Greenbook.pdf ; Pub. L. 114-113
2017	\$3.6	\$1.9M	https://edit.doi.gov/sites/doi.gov/files/uploads/FY2017_USGS_Budget_Justification.pdf ; Pub. L. 115-30
2018	\$0.0	\$1.9M	https://edit.doi.gov/sites/doi.gov/files/uploads/fy2018_usgs_budget_justification.pdf ; Pub. L. 115-124
2019	\$0.0	\$1.9M	https://edit.doi.gov/sites/doi.gov/files/uploads/fy2019_usgs_budget_justification.pdf ; Pub. L. 116-6
2020	\$1.9 *	\$4.0M	https://edit.doi.gov/sites/doi.gov/files/uploads/fy2020_usgs_budget_justification.pdf ; Public Law 116-194
2021	\$4.1 **	?	https://www.doi.gov/sites/doi.gov/files/uploads/fy2021-usgs-budget-justification.pdf .

* 2020 Minerals Mission Request included \$1,726,000 (\$1.7M) for MT Survey which Pub. L. 116-194 instead funded under Natural Hazards Mission in Geomagnetism Program as a specified part of \$4,000,000 (\$4.0M) total. FY 2020 was first USGS Budget that mentioned MT Survey.

** 2021 Geomagnetism Request would add \$25,000 for Fixed.Costs to \$4.0M enacted for 2020 and also change same upward by +\$114,000 for Observatory Operations (with no cuts specified; but it does not specify any dollar amount for MT Survey).

¹⁰ Retired member of Arent Fox LLP, Washington DC, submitting as a private individual, *pro bono*.