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ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)**

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Contribution by USA

to the CSTD 2023-2024 priority themes on “Data for Development” and “Global cooperation in science, technology and innovation for development”

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American Geophysical Union Peer-Reviewed Publications and Author Guidelines requiring Data and Software Sharing

At the American Geophysical Union, improving access to the data that supports research articles has been a major focus for some time. In 2019 we moved the Data Availability Statement to the Open Research Section of the paper, making this information openly available to all researchers. Here is where authors are required to include information for the reader on how to find and access data and software associated with a publication. To assist the editor, author and peer-reviewer we developed [best practices](#) on what elements should be included. Despite robust [data and software publishing guidelines](#), authors continued to request support from staff and editors. To help provide common practices across all of our journals, in January 2022 we began a pilot to provide additional staff support to help authors and ensure Availability Statements and citations are complete for both data and software.

We track several metrics of compliance and have seen a tremendous increase in the consistency of data and software sharing resulting from these efforts. Papers with Availability Statements that include in-text references to data and software have doubled from 2021 to 2023. We are continuing to monitor progress and improvement.

Our early measures show that sharing your data offers post-publication benefits to AGU authors and the broader research community. Papers in AGU's 23 journals that included a data citation in the References section from 2020-2021 have received, as of November 2023, on average 5 more citations per paper than those that did not include a data citation. Our rapid-publication letters journal, *Geophysical Research Letters*, saw on average 11 more citations per paper during this time period. These early results are very promising on the impact a society journal can have when their publications' policies on citation of research articles align with FAIR Guiding Principles and Open Science practices.

American Geophysical Union Fellows Recognition for Open Science

Our AGU Fellows are selected yearly from AGU members who have made outstanding contributions to science and innovation. Since 1962, less than one tenth of 1% of AGU members have been selected to receive this prestigious honor each year. In 2021, AGU Honors and Recognition Committee voted to adjust the [criteria for being a fellow](#) to include the elements of Open Science, including sharing data and software. Nominees are expected to have shown leadership in following and promulgating AGU values. This leadership may include but is not limited to fostering equity, integrity, diversity, and open science; mentoring; public engagement; and communication. We have received highly positive feedback from the AGU community on these changes and we expect it to lead to increased diversity of experience, viewpoints, and representation in our Fellows.

The American Geophysical Union's Open Science Recognition Award

In 2022, AGU's Honor and Recognition Committee approved a new award recognizing researchers who are [advancing Open Science](#). A common barrier for researchers adopting Open Science best practices is the lack of incentives by institutions, societies, and others in recognizing the value of these methods. This new award is meant to address this issue and bring recognition to the importance of researchers incorporating and advancing elements of Open Science, including data and software sharing as desirable research practices.

CAPACITY BUILDING: [SERVIR](#), a partnership between the [United States Agency for International Development](#) (USAID) and [NASA](#), supports locally-led efforts to strengthen climate resilience, food and water security, forest and carbon management, and air quality. SERVIR and the [Group on Earth Observations](#) (GEO), in collaboration with the [National Oceanic and Atmospheric Administration](#) (NOAA) and [Brigham Young University](#) (BYU), developed [GEO Global Water Sustainability](#) (GEOGloWS), a streamflow monitoring tool for water and flood management. In Ecuador, data from GEOGloWS informed the design and construction of an agricultural irrigation project in the Azuay province, supporting 5,000 farmers, most of whom are women.

CAPACITY BUILDING – INTERNATIONAL SCIENCE + EDUCATION: The [Global Learning and Observations to Benefit the Environment](#) (GLOBE) Program is a worldwide science and education program that provides opportunities to better understand, sustain, and improve Earth’s environment at local, regional, and global scales. Since the Program launched in 1995, GLOBE has provided authentic environmental science learning experiences for over 1 million students, educators, scientists, and citizen scientists of diverse background from 127 countries. GLOBE is led by [NASA Earth Science Division](#), with support from [National Oceanic and Atmospheric Administration](#) (NOAA), the [National Science Foundation](#) (NSF), and the [U.S. Department of State](#) (DOS). In 2023, GLOBE supported four U.S. Student Research Symposia and also presented at the Science Summit at the 78th UN General Assembly highlighting how GLOBE implementation supports [Sustainable Development Goals](#) (SDGs), including 4: [Quality Education](#); 6: [Clean Water and Sanitation](#), 14: [Life Below Water](#); 15: [Life on Land](#).

CAPACITY BUILDING – DISASTER RESILIENCE: [NASA’s Disasters Program](#) and ImageCat, Inc., in collaboration with partners in India and Mexico, developed and implemented the use of the Global Economic Disruption Index (GEDI) into their disaster resilience planning. The GEDI tool leverages satellite data, artificial intelligence, and socioeconomic data to provide a comprehensive analysis of the extent of disruption to economies from acute disasters, including inland and coastal flooding, hurricanes, earthquakes and tsunamis, can have on local communities. The tool also enables reinsurance companies to develop parametric risk profiles to define thresholds (or parameters) for releasing funds quickly to communities and rapidly begin to recover from disasters.

CAPACITY BUILDING – DISASTER RESPONSE: The Disaster Response Coordination System (DRCS) of [NASA’s Disasters Program](#) provides near-real-time geospatial support to domestic and international emergency responders, supporting their need to understand how a disaster is evolving over time and their ability to rapidly deploy support in areas that need it most. In 2023, Türkiye and Syria were struck by a series of high magnitude earthquakes and subsequent aftershocks leading to significant destruction to communities and the surrounding region. Across the 6-week emergency response efforts, the DRCS supported multiple operational responders in country with imagery on landslides and related damage to secondary transportation routes, damage and flood extent assessments to understand extent of impact and damage in the region. Partners included the [U.S. Department of State](#) (DOS), the [United States Agency for International Development’s](#) Disaster Assistance Response Team (USAID DART), the [United States Geological Survey’s National Earthquake Hazards Reduction Program](#) (USGS NEHRP), [World Central Kitchen](#), [Team Rubicon](#), [Miyamoto Global Disaster Relief](#), and the [California Seismic Safety Commission](#). These efforts not only support direct response requests, but also serve to advance the science of understanding seismicity and the likelihood for future potential earthquakes and aftershocks across this active region.

OPEN SCIENCE + DATA: On December 4, 2023, at COP28, the virtual [Earth Information Center](#) and the [US Greenhouse Gas Center](#) system were launched. NASA collaborated with EPA, NOAA, and NIST to develop the system which is designed to offer comprehensive environmental data and information. The system is built using open science principles and Visualization, Exploration, and Data Analysis (VEDA) platform. [VEDA](#) is an open platform that brings key Earth science datasets next to open source tools for data processing, analysis, visualization, and exploration in a managed and more accessible computing environment.

CAPACITY BUILDING: In 2023, NASA released a free, public massive online course '[Open Science 101](#)'. This [community-developed](#) open science curriculum introduces those beginning their open science journey to important definitions, tools, and resources; and provides participants at all levels recommendations on best practices from global subject matter experts.

POLICY: NASA updated their Scientific Information Policy ([SPD-41a](#)) to provide guidance on the open sharing of publications, data, and software created in the pursuit of scientific knowledge. SPD-41a builds upon the core principles of openness, equity, and security for NASA's Scientific Mission Directorate funded research.

DATA: In 2023, [NASA](#) and the [U.S. Mission to International Organizations in Vienna](#) (UNVIE), in collaboration with the [UN Office for Outer Space Affairs](#) (UNOOSA) organized the Pale Blue Dot: Visualization [Challenge](#) to create a visualization using Earth observation data that advances at least one of the following [Sustainable Development Goals](#) (SDGs) (2: [Zero Hunger](#), 6: [Clean Water and Sanitation](#), 13: [Climate Action](#)).

OPEN SCIENCE: In 2023, the U.S. White House Office of Science Technology and Policy along with 16 other federal agencies announced a [Year of Open Science](#) to spark change and inspire open science engagement through events and activities that will advance adoption of open, equitable, and secure science. As one of many activities, there was an [Open Science Recognition Challenge](#) that had over 140 submissions highlighting the role that open science and open data benefit science and society.

DATA: In 2023, NASA released the [Science Discovery Engine \(SDE\)](#), an interdisciplinary science data search engine that includes open data and information across the Earth and Space sciences. Empowering open science, this new tool allows you to explore the universe, from the tiniest of cells to the vastness of space, through discovery of NASA's science data, documentation, and code.

DATA: Every year, NASA, and its Space Agency Partners from around the world invite thousands of makers, builders, artists, coders, entrepreneurs, designers, and storytellers to participate in the [NASA International Space Apps Challenge](#), the largest annual global hackathon. These diverse participants solve real-world challenges we face on Earth and in space using NASA's free and open data and Space Agency Partner data and expertise. To date, the NASA Space Apps Challenge has engaged 280,000+ registrants from 185+ countries/territories - fostering interest in Earth and space science, technology, and exploration and encouraging the growth and diversity of the next generation of problem solvers, innovators, leaders and entrepreneurs.