

2017 ANNUAL REPORT



This photograph, taken during an extra-vehicular activity at the International Space Station, shows the STP-H5 (Space Test Program-Houston 5) payload package in the top left, just in front of a solar panel. The Lightning Imaging Sensor (LIS) is located at the bottom of STP-H5, pointing toward Earth.

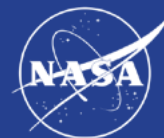
EST **1991**



The Global Hydrology Resource Center (GHRC) is one of twelve NASA Distributed Active Archive Centers (DAACs), and is managed jointly by the Earth Science Department at NASA's Marshall Space Flight Center and the University of Alabama in Huntsville's Information Technology and Systems Center. GHRC is a member of national and international data organizations including NASA's Earth Science Data and Information System (ESDIS), the Federation of Earth Science Information Partners (ESIP), and the International Council for Science (ICSU) World Data System (WDS).

MISSION STATEMENT

"The GHRC provides a comprehensive active archive of both data and knowledge augmentation services with a focus on hazardous weather, its governing dynamical and physical processes, and associated applications. Within this broad mandate, GHRC focuses on lightning, tropical cyclones and storm-induced hazards through integrated collections of satellite, airborne, and in-situ data sets."



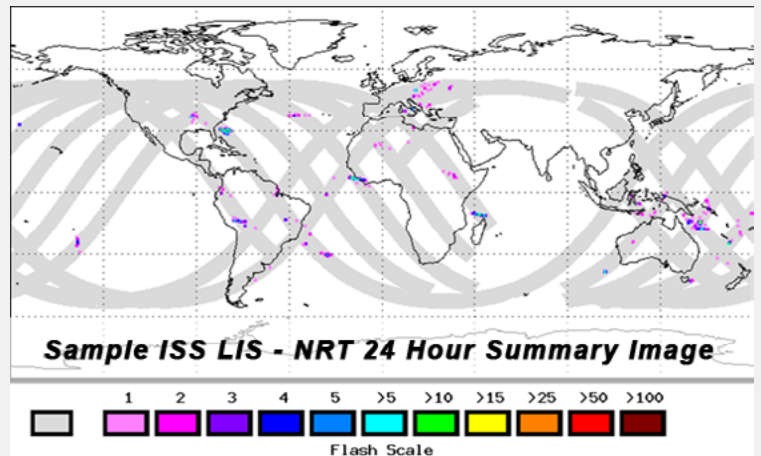
COVER STORY – LIGHTNING OBSERVATIONS FROM THE INTERNATIONAL SPACE STATION

The GHRC DAAC announced the public “beta” release of data from the Lightning Imaging Sensor on the International Space Station (ISS LIS) on August 22nd. The SpaceX Dragon mission carrying the Lightning Imaging Sensor (LIS) to the International Space Station (ISS) was launched earlier this year, on February 19. Four members of the GHRC DAAC team – ISS LIS project manager Will Ellett, Michele Garrett, Mary Nair and Amanda Weigel – were able to attend the launch. A week later, on February 27, the DoD STP-H5 (Space Test Program-Houston 5) payload package containing the LIS was successfully installed on the Station and powered on. Lightning data products have been generated from March 1 forward. Data from ISS LIS will

- Build upon the solid foundation of space-based observations begun with LIS on NASA’s TRMM satellite and its OTD predecessor
- Extend LIS time-series observations from TRMM, allowing scientists to better interpret the interrelationships between lightning and climate variation
- Expand latitudinal coverage poleward to 54°, allowing observations of mid-latitude storms
- Lead to enhancements in regional and global weather, climate, and chemistry models, studies, and assessments

Near real-time (NRT) lightning observations and background data files are generated every two minutes, within three to four minutes of observation. These data will remain available for seven to ten days after observation. Note that there may be data dropouts due to the nature of real-time data transmission. A browse web page¹ shows the most recent two minutes of lightning data on a map, along with a composite image showing lightning observations for the past 12 hours. In addition, a *preliminary standard product* is created daily, after all raw observations for the day have been acquired from ISS. These data are more complete than NRT, but have not had manual review to assure data quality. The near real-time and non-quality-controlled data are appropriate for applications requiring low data latency, but for scientific research the standard data product should be used.

¹<https://lightning.nsstc.nasa.gov/isslisib/isslisnrt.html>



After these beta lightning data products are validated, there will also be a final version of standard products, which will undergo a manual quality control (QC) step to flag any bad data. This version will be archived for the long term and is most appropriate for research. The ISS LIS datasets available now are:

- NRT Lightning Imaging Sensor (LIS) on International Space Station (ISS) Science Data²
- NRT Lightning Imaging Sensor (LIS) on International Space Station (ISS) Backgrounds³
- Non-Quality Controlled Lightning Imaging Sensor (LIS) on International Space Station (ISS) Science Data⁴
- Non-Quality Controlled Lightning Imaging Sensor (LIS) on International Space Station (ISS) Backgrounds⁵

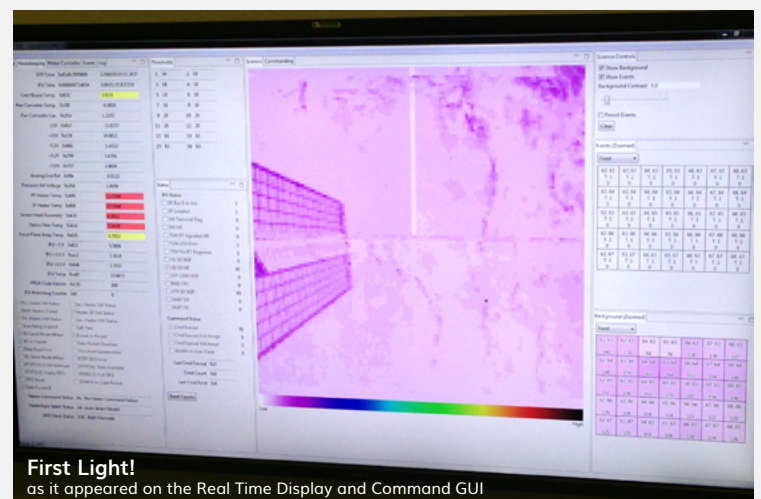
Check out our lightning web site
<https://lightning.nsstc.nasa.gov/>

²DOI: <http://dx.doi.org/10.5067/LIS/ISSLIS/DATA202>

³DOI: <http://dx.doi.org/10.5067/LIS/ISSLIS/DATA102>

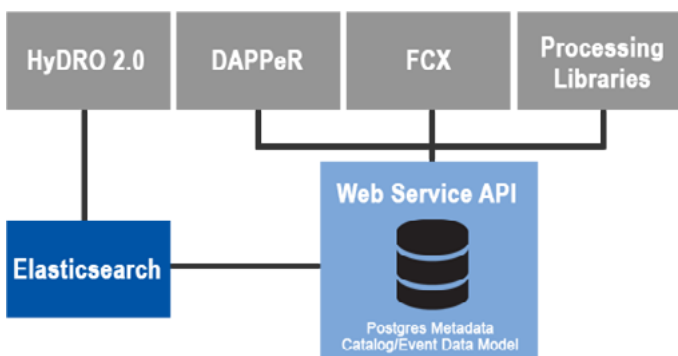
⁴DOI: <http://dx.doi.org/10.5067/LIS/ISSLIS/DATA203>

⁵DOI: <http://dx.doi.org/10.5067/LIS/ISSLIS/DATA103>



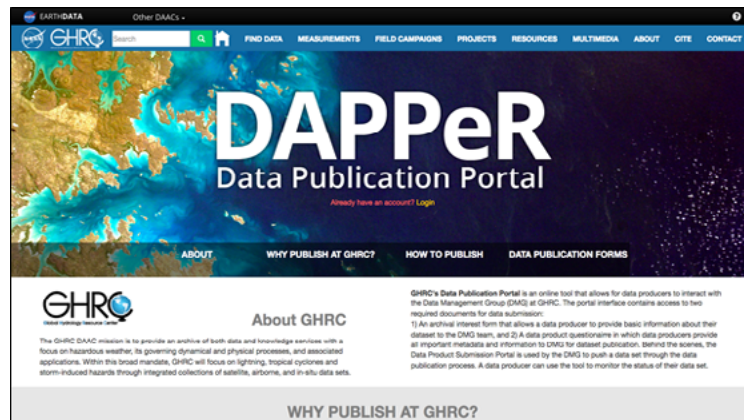
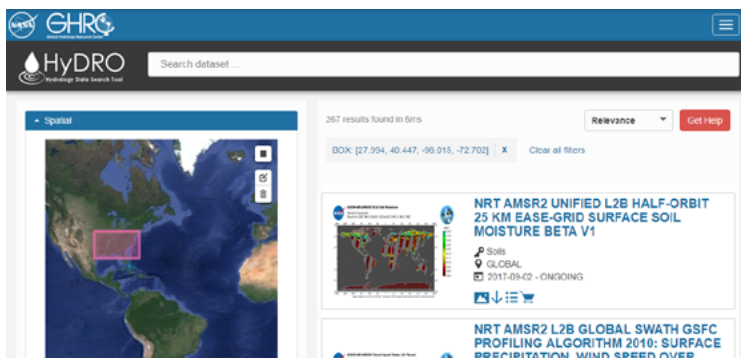
INFRASTRUCTURE UPGRADES AND NEW USER TOOLS FOR GHRC

In the past year, GHRC has made many changes in order to support more efficient DAAC operations, which in turn will facilitate better service to our users. Internally, we have migrated our metadata catalog from the Oracle database we've used for many years to the open source Postgres database. As part of this move we have also updated metadata content and organization, and improved and extended database access services. Metadata review and improvement continues though the database transition is complete. This evolving infrastructure supports new and updated user tools. ▼



The latest version of our data discovery tool, HyDRO 2.0, now provides a full-text search of all metadata contents in addition to keywords as well as improved spatial queries. Behind the scenes, Elasticsearch is used for quicker response times. Most important, the elegant new user interface displays the user's search interface and data result list on the same web page, for better interaction as users filter their search results. Key design goals of the original HyDRO remain: all information about a dataset is available from its "landing page", and users can get to the landing page, file inventory, browse images, or data downloads with one click from the results list.

▼ HyDRO: <https://ghrc.nsstc.nasa.gov/hydro/>



Our newest tool is the DAPPeR data publication portal, which helps to streamline and automate the data publication workflow. DAPPeR is integrated with the new database infrastructure, and publishes collection metadata and documentation to the GHRC's local catalog and NASA's Earth Science Data and Information System (ESDIS) Common Metadata Repository (CMR). This centralized system supports multiple user communities with

- Data submission forms for data providers
- Metadata and documentation forms for curators
- Status tracking for managers

▲ DAPPeR: <https://ghrc.nsstc.nasa.gov/data-publication/>

PREPARING FOR DAAC OPERATIONS IN THE CLOUD

GHRC is now using Amazon's Glacier cloud archive service as an off-site backup for our archive. This means that our data are protected in case of catastrophic failure here. In addition, the fact that our archive is already replicated in the Amazon Web Services cloud should make eventual migration of DAAC operations to the AWS cloud smoother. GHRC continues to participate in the ESDIS Cumulus prototype for cloud-based data ingest, archive, distribution and management, providing requirements for implementing GHRC systems and testing Cumulus' data operator tools. DAAC Manager Dr. Rahul Ramachandran leads the Cumulus activity with ESDIS.




WEB FEATURES AND SOCIAL MEDIA

GHRC continues to add science features to the website. Micro articles are short documents describing key science concepts related to GHRC's data and science thematic areas. These documents are curated by both Earth and data scientists to ensure the accuracy and trustworthiness of the provided information, and each article is directly related to specific GHRC datasets. Micro articles published in 2017 have focused on lightning, including the phenomenon itself, lightning detection instruments and related corner stone research publications. The GHRC's User Working Group has been especially active in helping to prepare these articles. Data recipes are tutorials or step-by-step instructions developed by GHRC staff to help users learn to discover, visualize and use new data, information, software and techniques. These recipes cover a variety of datasets, processing languages and software.

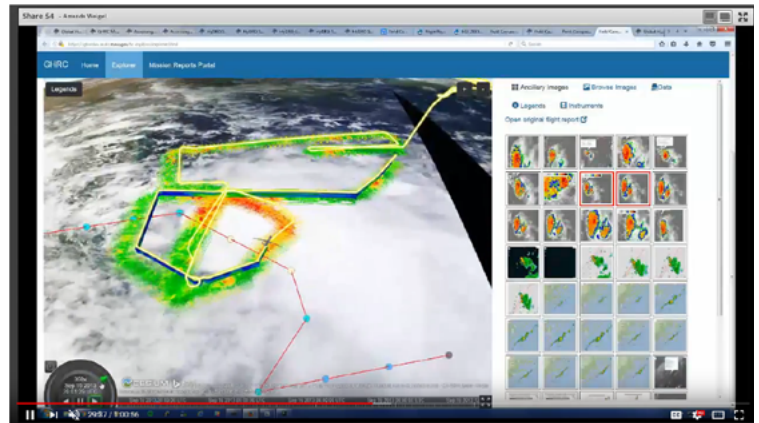
- <https://ghrc.nsstc.nasa.gov/home/micro-articles>
- <https://ghrc.nsstc.nasa.gov/home/data-recipes>

In 2017, GHRC established a LinkedIn group, in addition to our social media presence on Facebook, Twitter and YouTube.

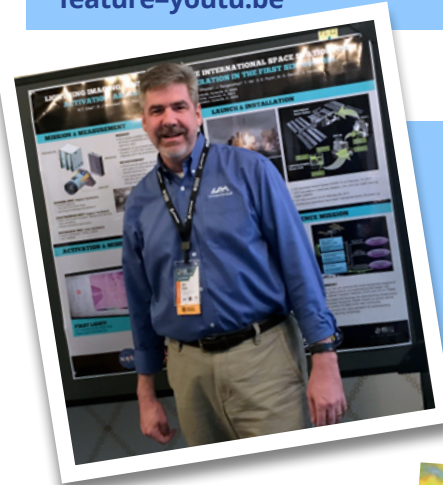
 Join the group!
<https://www.linkedin.com/groups/7069041>

 @ghrcdaac

 @ghrc.nsstc



In February, the GHRC's Outreach team developed and presented a webinar providing an overview of new user tools and other resources at the DAAC for accessing data related to hazardous weather, its governing dynamical and physical processes, and associated applications. You can watch the webinar on YouTube here:
<https://www.youtube.com/watch?v=lyYBi4ttpmk&feature=youtu.be>



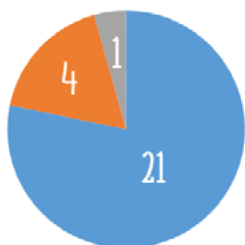
Will Ellett presenting the Lightning Imaging Sensor on the International Space Station (ISS LIS) at the 6th Annual International Space Station Research and Development Conference, held July 17-20 in Washington DC.

CONGRATULATIONS to Ajinkya Kulkarni! Ajinkya has played a critical role in improving GHRC infrastructure and tools, bringing hard work, innovation and enthusiasm to the job. In September he was recognized by colleagues with MSFC's Science and Technology Office Peer Award for Innovation

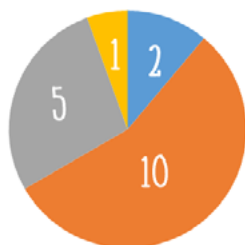


44 NEW AND UPDATED DATASETS FOR 2017

26
New Datasets



18
Version Updates



● GPM Ground Validation
 ● Lightning
 ● Hurricane and Severe Storm Sentinel

● GPM Ground Validation
 ● Lightning
 ● Others (GRIP)
 ● Hurricane and Severe Storm Sentinel



Kaylin Bugbee presenting the adventures of "Dizzy the Disdrrometer" in the Research as Art session at the 2017 Earth Science Information Partners (ESIP) Summer Meeting in Bloomington, IN, July 25-28.