Recommendation 1: Evaluate and update the GHRC mission and objectives in coordination with the UWG members, NASA ESDIS, and Program Managers at NASA HQ.
A draft “Mission and Objective” statement was presented to the UWG. After some iterations among the UWG and GHRC management, the following statement was adopted: “The mission of the GHRC is to provide 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 will focus on lightning, tropical cyclones, and storm-induced hazards through integrated collections of satellite, field experiment, and in-situ data sets”. **This statement effectively closes this recommendation as very similar text had been approved by NASA ESDIS and HQ prior to the Meeting.**

Recommendation 2: Develop a 5-10 year vision for GHRC and ensure the new website reflects that message.

Recommendation 3: GHRC should hold AMS and AGU town halls, develop and distribute information brochures that describe their capabilities to potential data providers (e.g. field campaign PIs) and data users, utilize the NASA hyperwall, and pursue other opportunities (BAMS) to enhance GHRC visibility once the 5-10 year vision is developed and the web page reflects these objectives.
Outreach activity as suggested by the UWG has not yet occurred as the vision and mission statements have only recently been developed. It is thus left open but can be combined with new
recommendation 18.

- Hyperwall
- Formation for Science Outreach team @ AGU
    - Chairing/Presenting
    - NASA Booth
- AMS
- GHRC
    - News blurb Earth Observer
    - Earthdata Webinar
        - FCX
    - Earthdata User Profiles
    - Image of the Week
    - Sensing our planet articles
    - LinkedIn GHRC group
    -

Recommendation 4: Carry out dataset holdings analysis and create a reporting structure that categorizes what is available at GHRC and possibly elsewhere. This compilation should enable prioritization of efforts that will fill the most significant data voids, where these efforts align with the new GHRC mission.

GHRC demonstrated Google Analytics tools that have been used to identify the data sets available by keyword. Other presentations provided some snapshots and references of the products available. They developed a strategy for skimming the community for possible new products to manage that are derived from NASA mission data, many directly related to atmospheric processes and hazards, though some of the hazards are arguably "induced" hazards
caused as a result of atmospheric hazards (e.g. a landslide induced by heavy precipitation during
a hurricane). The first part of the recommendation is therefore met.

Although there were several broad mentions of the types and numbers of data sets held, it would
have been of greater benefit to see a listing of core data sets (satellite, field campaign, etc.) and a
direct linkage (or not) to current and/or future mission focus areas. Previous UWG meetings identified that although they have holdings in passive microwave and various lightning data sets, criticism was levied that these are primarily the result of interests from MSFC-affiliated scientists. It is unclear what data sets would be collected and added from NASA missions and how they align with the current or future missions. The team accurately captured the opportunities available for upcoming field campaign data sets but also correctly acknowledged that these opportunities and continuity for these data sets are somewhat limited versus steady, global collections of satellite data holdings. The effort to fully understand their datasets, the connection to the GHRC goals, and the management of them going forward, was not yet met and
more work is needed in this area.

Continued Work on Recommendation #4: It would be helpful to see their current and/or future mission broken into simple columns on a chart of some kind. This could include data holdings with a simple inventory of where they feel they have holdings that contribute strongly to their mission areas, areas where they know that data sets are forthcoming (e.g. new field campaigns, GPM, etc.), and areas where they would need to "fill in" in order for them to provide meaningful services in these areas. This result should be used to guide a strategic plan and tactical plan that
will seek out partnerships to fill in these data gap areas, either by proposing to host future mission data, or PI-led data sets, field campaigns, or some combination.

Recommendation 5: Update public dataset information pages to include data holding analysis results that might be helpful to the user community.
GHRC presented the Dashboard application, which tracks data holdings and presents a wide variety of statistics. If they move toward events-based data packaging, then they would want some sort of metric to measure the utility of this application. What was not addressed was the 'update public dataset information pages', and the UWG would like clarification on how the GHRC envisions the public using this tool and information. UWG recommends that this effort be continued and specifically *(1) that the results from the data holding analysis be distilled into an annual report for the UWG and that the GHRC consider how often they will review these results - for example for data retirement review, (2) that there are links to the most cited publications per*
dataset on the landing pages, thus giving public users an understanding of dataset maturity, (3) that they be clear on who the users will be for this dashboard - internal or external, and (4) that statistics on international users be compiled. This recommendation therefore remains open.

Recommendation 6: Determine a set of useful user metrics, with feedback obtained from the UWG that can be routinely updated and made available to the NASA sponsor, UWG and broader
community. Analysis of these metrics should inform the 5-10 year plan.
A number of statistics based on data usage were shown in the GHRC Data Holdings Dashboard.
The Dashboard facilitates user exploration of GHRC data usage metrics. One drawback was that
the Dashboard page was very busy. Perhaps a few plots summarizing the most important metrics
could be displayed on the front page, with another link provided if one wants more specific information. For example, this link could be used to evaluate which datasets users download most often, to track dataset use over time, the effectiveness of publicizing dataset, and for evaluating when a dataset might be retired. Most of these ideas were presented or talked about during the GHRC presentation. Overall the GHRC has generated many metrics; but questions remain. For example, how many users fill out surveys on data usage? How many don't? There is
still a need to determine which metrics are most important. The GHRC presented a list of things they still want to do with the metrics and they should continue pursuing these. Overall the GHRC addressed this issue well, and seem to have a solid plan going forward. The recommendation is nonetheless kept open until these final issues are resolved.

Recommendation 7: Review the "NOAA Procedure for Scientific Records Appraisal and Archive Approval" (https://www.ngdc.noaa.gov/wiki/images/0/0b/NOAA_Procedure_document_final.pdf) and the PODAAC Data lifecycle

Recommendation 8: Create a data lifecycle process for GHRC that can be applied to current and
future holdings. Ask NSIDC and PODAAC for their policies and assess utility within GHRC.

Publish the data lifecycle on the website, along with a contact, to provide clarity on the process for investigators interested in providing data.
The GHRC has created a data lifecycle plan that was provided in a document to the UWG prior to the meeting, and presented to the group during the meeting. The plan is comprehensive and covers the process for acquisition and implementation of new datasets and updated versions of current holdings, as well as the strategies for retiring datasets. It very clearly outlines the role within these processes for the data providers, dataset coordinator, documentation lead, and UWG. It is well described and just needs to be implemented for all new data. This part of the recommendation has been met. They have also identified priority levels (1-5) that can be assigned to potential datasets; NASA satellite, instrument, and airborne validation datasets have
the highest priority, while commercial access datasets and other operational data (e.g., GOES imagery, NWS radar) are identified as lower priority. In addition, the GHRC has outlined levels of service that can be assigned to new datasets.
They have also developed an online questionnaire to be filled out by potential data providers. This questionnaire still needs further development, and would benefit from experimental use by UWG members and/or a few current/future data providers. One review is provided as Appendix A to this document. The questionnaire has the potential to satisfy their goals to semi-automate data ingestion, to minimize collection redundancy, and minimize required interactions with the provider. When complete, the questionnaire can be shared with other DAACS. The data lifecycle
plan also has not yet been published on the website. **The website does not yet have a clear location where a potential data provider can obtain information on the services the GHRC can provide, nor how to submit a request (the questionnaire) to archive their dataset.** For these reasons, the recommendation remains open.

<<SAUS>>

Recommendation 9: Assess what might be useful in the NODC netCDF data template and develop some guidelines or work flows for GHRC to handle future field campaign data.
The GHRC has created a comprehensive data lifecycle plan for new and existing reprocessed data. It is well described and just needs to be implemented for all new data. They have developed an online data questionnaire form that should be developed further and shared with other DAACS. This recommendation remains open.

<<SAUS, LoS for netCDF >>

Recommendation 10: Develop a data maturity model for GHRC data. Provide this on website and include maturity information for each dataset provided. Review NOAA's data maturity model (http://www1.ncdc.noaa.gov/pub/data/sds/maturity-table-6level.pdf) as a starting point.
GHRC has reviewed both NOAA and NASA data maturity models. No action has been taken in implementing a model to the datasets yet. *UWG recommends that GHRC continue working on*

applying the NASA data maturity model to all the datasets, taking the advantage of the data usage statistics in the maturity assessment. This recommendation remains open.

<<tie into levels of service - assess maturity of higher LOS datasets>>

Recommendation 11: Determine LIS technical specifications for data products, latency, formats, etc. Publicize this future data source at appropriate venues.
This recommendation addresses the future importance of LIS on ISS data to the GHRC, also emphasizing outreach with regard to the GHRC's lightning holdings. There was no mention of LIS on ISS in the presentations, though the outreach aspect overlaps with Recommendation 3. While LIS on ISS is an upcoming mission, the UWG would like to see the GHRC be more proactive about future data holdings, and this is a prime example. *To close the recommendation, the UWG would like to see this future dataset publicized and technical specifications of the data products and latency available to potential users before the start of the mission.* This recommendation remains open.

GET NRT ISS LIS PRESENTATION

<< NEED A MAILING LIST, WITH OPT IN OPTION WHEN PEOPLE DOWNLOAD>>

Recommendation 12: Develop a single tool that can provide broad use to multiple field campaigns and data types.
The GHRC showed excellent progress in the development of their field campaign visual explorer and are working to develop APIs and data recipes that facilitate end user adoption of these tools and the underlying datasets. This work is on the right track, and the UWG recommends these efforts be continued. As the GHRC continues to build out these tools, the UWG sees the opportunity to develop advocates for these tools among science teams. *Development of a user community can be spurred by focusing on documentation to support users in their use of the tool (including example code and recipes), and by providing a mechanism by which the GHRC might begin accepting user contributions (including bug reports, new algorithm contributions, examples, and refinements to documentation). The recommendation remains open.*

Data Recipes

Python Libraries

FCX

- Webinar
- Deb attending Hurricane meeting
- User doc
- Alpha release with Feedback button (Kayako)

Recommendation 13: Update the ‘cite our data’ webpage to include DOI in all the examples given and include a link to the ‘cite our data’ page on individual dataset information pages.
GHRC now highlights and encourages the use of DOI and, as requested, provides examples and
links to the “cite our data” for all datasets. Thus, this recommendation has been successfully accommodated and is closed.

Recommendation 14: Communicate with the LPDAAC to understand their transition to HTTPS process. Provide highly visible examples, links to examples via email, and as much visibility as possible to ease the transition. A page with examples of different methods to download data, accompanied by example code, would be helpful.
GHRC is presently addressing the transition from FTP (including secure forms such as FTPS and
SFTP) to a HTTPS process. Examples of the GHRC efforts to date were presented to the UWG. Since a transition to the HTTPS process is effectively being mandated by NASA IT for its higher inherent security, this effort would have been initiated even if a recommendation had not been made by the UWG. It may be valuable to provide information on GHRC web site to both help and encourage data customers to move from FTP to HTTPS. Providing the means to download small as well as large data sets by this method should be pursued. This recommendation remains
Open.

Recommendation 15: Look at netCDF4 as an internal data format, define common CF-compliant

Recommendation 16: Explore and identify future users of possible mobile apps for NRT data. An
assessment of how GHRC ingests format requirements could be used to broaden app utility. The committee heard little about this topic but felt it could be delayed while GHRC worked on more immediate issues. The recommendation remains open.

2b. New Recommendations
The strength of the new mission and focus on hazardous weather is GHRC’s ability to bring together diverse data sets needed to better understand the fundamental processes underlying these phenomena from satellite data, field experiment, and in-situ data. Even model data may be
relevant in certain cases. Such one-stop shopping was viewed as incredibly powerful by the UWG. From this came a recommendation to demonstrate this capability as quickly as possible.

Recommendation 17: Create data bundles for scientists who want to study processes. Demonstrate such bundling capabilities for review by the UWG.
As part of the new vision and mission, the GHRC would benefit greatly by having a really good

visualization on its web page that connects the vision with the data holdings and the idea that data bundles are available for studying atmospheric processes.

- VC
- Python
- Microarticles

Recommendation 18: Develop an attractive visualization that goes along with the new mission and vision statement that would help audiences associate the GHRC with its vision and mission statement.
Flood data from the SWOT mission (planned for launch around 2020) seems very appropriate for
the GHRC data holdings. Given that satellite data archives are decided early in the mission definition process, the UWG is recommending that the GHRC pursue the land/flood part of the SWOT data for primary storage at GHRC. Data archives need to intuitively connect to users and having both lightning data and flood data begins to clearly connect GHRC to hazardous weather Events.

- AGU Video

Recommendation 19: Discuss the possibility of getting land data from the SWOT mission archived at GHRC to complement hazardous weather related to floods caused by excess precipitation. This would complement other flood and extreme event (including precipitation) data sets.
As a hazardous weather DAAC, and because of MSFC's tradition of holding lightning data, the GHRC is strongly encouraged to make GLM data from GOES-R available to their customers. The UWG is sensitive to the nature of the data and thus is silent on whether this involves data holdings, pointers to another archive, or a combination of these things.

- SWOT data analysis
    - Ongoing discussion with ESDIS
- GLM - ongoing (but has to go thru acq process)

Recommendation 20: GHRC should include GOES GLM data in its portfolio of accessible data, whether stored in house or as a virtual data set. Functionality should be seamless with other holdings.

- GLM - ongoing (but has to go thru acq process)