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GHRC - NASA's Hazardous Weather Distributed Active Archive Center

The Global Hydrology Resource Center (GHRC; ghrc.nsstc.nasa.gov) is one of NASA's twelve Distributed Active Archive Centers responsible for providing access to NASA's Earth science data to users worldwide. Each of NASA's twelve DAACs focuses on a specific science discipline within Earth science, provides data stewardship services and supports its research community's needs. Established in 1991 as the Marshall Space Flight Center DAAC and renamed GHRC in 1997, the data center's original mission focused on the global hydrologic cycle. However, over the years, data holdings, tools and expertise of GHRC have gradually shifted. In 2014, a User Working Group (UWG) was established to review GHRC capabilities and provide recommendations to make GHRC more responsive to the research community's evolving needs. The UWG recommended an update to the GHRC mission, as well as a strategic plan to move in the new direction. After a careful and detailed analysis of GHRC's capabilities, research community needs and the existing data landscape, a new mission statement for GHRC has been crafted: 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, airborne, and in-situ data sets. The new mission was adopted at the recent 2015 UWG meeting. GHRC will retain its current name until such time as it has built substantial data holdings aligned with the new mission.

A strategic plan was also developed to align GHRC's capabilities with this new mission. First, a list of prioritized data sets for acquisition was developed based on relevance to NASA's science objectives in extreme weather and weather hazards. This list will be evaluated and updated by UWG annually. Based on this list, GHRC recently acquired

the Tropical Rainfall Measuring Mission (TRMM) Tropical Cyclone Precipitation Feature (TCPF) Database - Level 1. The TCPF database provides TRMM-based tropical cyclone data in a common framework for hurricane science research, aggregating observations from each of the TRMM instruments for each satellite orbit that was coincident with a tropical cyclone in any of the six cyclone-prone ocean basins (See Figure 1). These swath data are co-located and subsetted to a 20-degree longitude by 20-degree latitude bounding box centered on the tropical storm, which is typically large enough to observe the various sizes of tropical cyclones and their immediate environments. The TCPF Level 1 dataset was created by researchers at Florida International University (FIU) and the University of Utah (UU) from the UU TRMM Precipitation Feature database. TCPF marks the shift in GHRC's direction towards the new focus of hazardous weather.

Second, GHRC's Data and Information System is being redesigned to support analysis of hazardous weather events. The redesign is evolving both the foundational data stewardship lifecycle services and value-added knowledge augmentation services. Data stewardship improvements include supporting data preservation using systematic processes, providing event based data search and access capabilities, using common data formats and access mechanisms to improve data usability, maintaining data quality, and supporting science reproducibility by recording data provenance. The new knowledge augmentation services will enable easy discovery, access and analysis of data centered around events. These services will include curation and aggregation of distributed resources including data, tools and documents, and tools to enable exploratory data analysis via visualization for case study analysis.

NASA's DAACs are pathfinders in providing free and open access to NASA's Earth science data. GHRC's new mission and strategic plan add to that legacy, and will serve the Earth science community well into the future.

For further reading:

Jiang, H., C. Liu, and E. J. Zipser, 2011: A TRMM-based Tropical Cyclone Cloud and Precipitation Feature Database. J. Appl. Meteor. Climatol., 50,1255-1274.

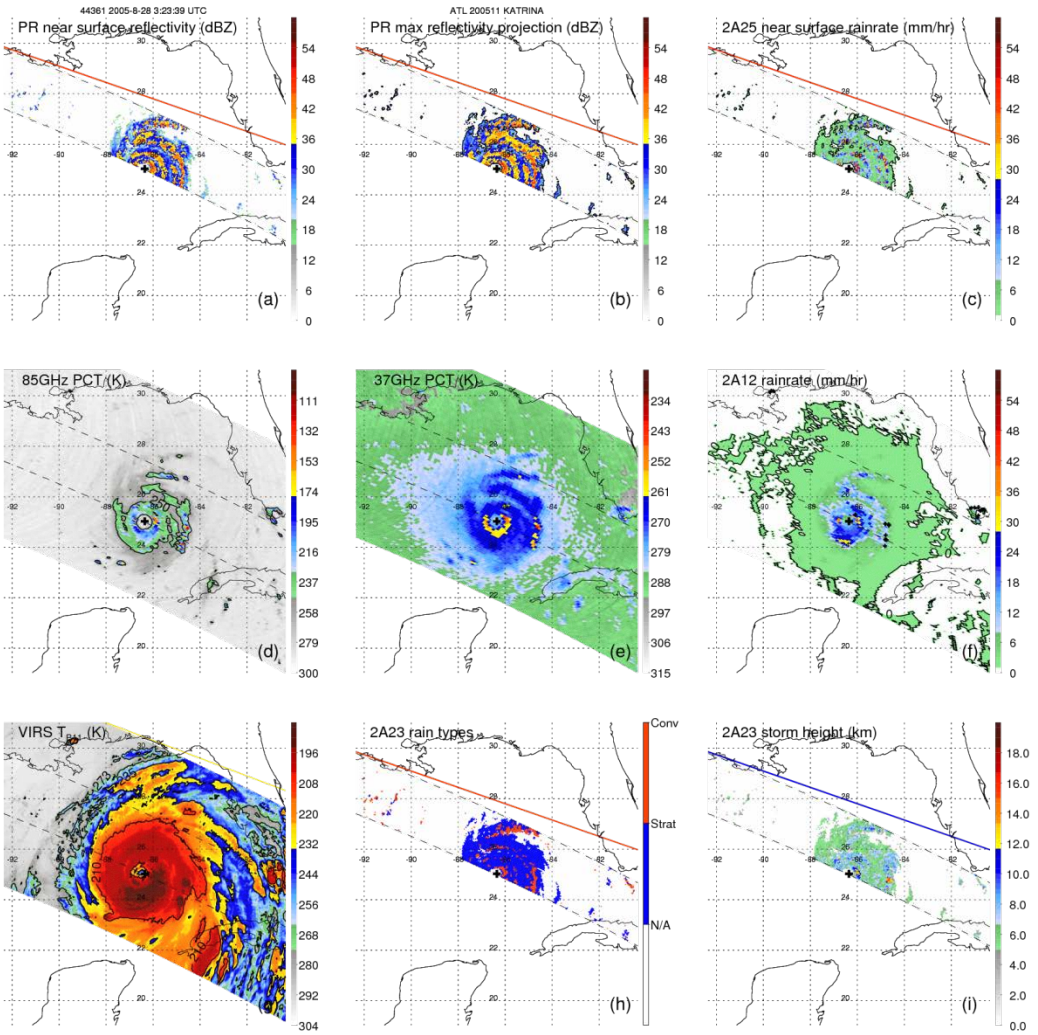

Figure 1: Sample image of TCPF data depicting a TRMM overpass of Hurricane Katrina on 08-28-2005 at 3:23:39 UTC. (a)Precipitation Radar near surface reflectivity (dBZ). The black contour defines reflectivity>20 dBZ. (b)Precipitation Radar max reflectivity projection (dBZ). The black contour defines reflectivity>20 dBZ. (c)TRMM 2A25 Precipitation Radar near surface rain rate (mm/hr). The black contour line defines rain rate > 0 mm/hr. (d)TRMM 1B11 TRMM Microwave Imager (TMI) 85 GHz polarization corrected brightness temperature (PCT, K). The black contour line defines 85 GHz PCT< 250 K . (e) TRMM 1B11 TMI 37 GHz PCT (K). (f) 2A12 TMI-based rain rate (mm/hr). The black contour line defines rain rate > 0 mm/hr. Black dots indicate the location of lightning flashes as detected by the Lightning Imaging Sensor (LIS). (g) TRMM 1B01 Visible and Infrared Sensor (VIRS) temperature brightness in 10 μm channel (TB11, K). The black contour lines indicate areas where TB11 is less than 210 K, 235 K, and 273 K. (h) TRMM 2A23 rain types (i)TRMM 2A23 storm height (km).The cross at the center of (a)-(i) is the hurricane center location. The dash line in each is the edge of the PR swath.