Web-Based Geospatial Visualization of GPM Data with CesiumJS

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Outline

- GPM Data – What is it?

- CesiumJS – What is it? How can I use it?

- Putting the Two Together!
About GPM

- GPM: Global Precipitation Measurement Mission Core Satellite
- Contains Two Instruments: GPM Microwave Imager (GMI) and Dual-frequency Precipitation Radar (DPR)
- Orbits every ~90 minutes between ±67° Latitude
GPM Products

https://storm.pps.eosdis.nasa.gov

- Level 1: Raw Swath-Based Data
  - Counts from DPR
  - Brightness Temperature from GMI (and partner instruments)
- Level 2: Derived Swath-Based Data
  - Precipitation Variables from DPR and GMI (and partner instruments)
- Level 3: Aggregated Lat/Lon Gridded Data
  - Precipitation Variables from DPR and GMI (and partner instruments)
About CesiumJS

https://cesiumjs.org

- Open Source JavaScript Library for Visualizing Data On, Above, and Below the Earth’s Surface
- Everything is Online
- Works with Time-Varying Data
- Moving Toward 3DTiles for Point Clouds, Vector Tiles, and 3D Shapes
https://cesiumjs.org/demos
https://cesiumjs.org/demos
CesiumJS Examples

https://cesiumjs.org/demos
When I came to NASA, project scientists were making decisions about data acquisition based on static images.
Putting Them Together

https://storm.pps.eosdis.nasa.gov/storm/GPMNRTView.html

Near Real Time Viewer
Virtual Globe

https://storm.pps.eosdis.nasa.gov/storm/Tools.jsp
Putting Them Together

https://storm.pps.eosdis.nasa.gov/storm/Analysis.jsp

Swath-Based Analysis Tool + Virtual Globe
Putting Them Together

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Swath-Based Analysis Tool + Virtual Globe
Putting Them Together

https://pmm.nasa.gov/storm-viewer/EventViewer.html

Event Viewer

National Aeronautics and Space Administration

STORM Event Viewer

Franklin
2017-08-09 1611-1641UTC

Approaching hurricane force, Franklin has sustained winds around 60 knots near the center, as observed by the Hurricane Hunters. The storm appears lopsided, with dry air impinging on the northwestern side, while the southeastern side features intense rainfall, observed by GMI. DPR shows a tall cell (above 15km) in the eye wall, with deep convection in outer bands as well. The storm is expected to continue intensifying into a Category 1 storm before it makes landfall on the Mexican coast less than 24 hours from now.

Want to see other events in STORM Event Viewer? Have questions about the technology behind it?

Curator: Matt Lammers
NASA Official: Erich Stocker

Privacy Policy and Important Notices

NASA/JAXA - Source: DigitalGlobe, GeoEye, Earthscape Geographics, CNES/Spot, NASA, U.SGS, Meteo France, GFZ, University of Washington

CESIUM - STORM Home
Putting Them Together

https://pmm.nasa.gov/storm-viewer/EVMini.html

EV Mini/EV Micro

moved from Mexico’s Yucatan Peninsula into the southwestern Gulf of Mexico’s Bay of Campeche. GPM’s Microwave Imager (GMI) and Dual-Frequency Precipitation Radar (DPR) data showed that Franklin contained a few heavy bands of convective rainfall. DPR found rain falling at a rate of over rain 2-4 inches (62 mm) per hour in bands of intense storms moving around the southwestern side of the storm.

This 3-D view of tropical storm Franklin was derived from GPM’s Radar (DPR Ku
Putting Them Together

https://storm.pps.eosdis.nasa.gov/storm/cesium/Spiral.html

GMI/HRRR Spiral
Putting Them Together

IMERG Time Lapse (Point Clouds)
Conclusion

- We have tons of precipitation-related satellite products from the last two decades
- Even if you don’t use precipitation information, think about how your data can be made more interactive and displayed more fully using new technologies like CesiumJS
- Happy to discuss technical details rest of week

Questions?

matthew.r.lammers@nasa.gov
https://storm.pps.eosdis.nasa.gov
https://cesiumjs.org
Conclusion

Extra Slides...
Acquiring GPM Files

https://storm.pps.eosdis.nasa.gov
Acquiring GPM Files

https://storm.pps.eosdis.nasa.gov

STORM Swath-Based Analysis Tool

This tool enables comparisons between domain-aggregated values from different GPM and Partner Instruments. Select one or more instruments, a date range, and a geographic domain. The tool will display statistical values on an interactive graph, with the ability to change what statistics, what instruments, and what colors are displayed. All values are aggregated from swath pixels within the geographic domain selected.

Available Instruments:
- GPM/GPR
- GPM/H scheduling
- GPM/Ku
- TRMM-TMB
- NPP-TAMS
- OC/IM/AM2
- NOAA19-MHS
- NOAA18-MHS
- NOAA17-MHS
- NOAA16-MHS
- METOP-MHS
- F13-SM1
- F14-SM1
- F15-SM1
- F17-SM1
- AQUA-AHRE

Date Range:
Valid Range is between 1997/12/01 and 2018/03/04

Start Date/Time: 2017/03/01 00:00
Stop Date/Time: 2018/03/02 23:59

Geographic Domain:
Use the buttons on the top left to select a geographic area, or type the box into the inputs below.

Lat/Lng:

Table:

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Acquiring GPM Files

https://storm.pps.eosdis.nasa.gov

STORM Swath-Based Analysis Tool

STORM Near-Real Time Download Page

Available Instruments:
- GPM-GPR
- GPM-HMS
- GPM-MU
- NOAA-15-AMSUB
- NOAA-18-AMSUB
- NOAA-17-AMSUB
- NOAA-19-MHS
- NASA-2-SMMI
- NASA-1-SMMI
- NASA-2-SMMI
- NASA-1-SMMI
- AQUA-AHGRE

Date Range:
- Start Date/Time: 2017/04/01 00:00
- Stop Date/Time: 2017/04/30 23:59

Geographic Domain:
- Use the buttons on the top left to select a geographic area, or type the box into the inputs.

Input your NRT Registered Email: matthew.lammers@nasa.gov
Submit

Register Your Email HERE. Make sure you Check that you are interested in NRT products.

Use the interface below as if it is a directory tree. Click on a filename to initiate the download process (which will occur in a new tab).

You can also acquire files programmatically using the API that drives this site. An example request would be: https://storm.pps.eosdis.nasa.gov/storm/NRT?email=your.email&filename=data/documentation/MERG_doc.pdf. Replace the [your.email] with your registered email and use the directory tree here to ensure the filename path is correct.

```plaintext
- data/UC
- data/UCR
- data/combine
- data/documentation
- data/GM processing
- data/GRDCF
- data/MERG
  - merged
    - early
    - qhs
      - 01
      - 02
      - 2014
      - 2015
      - 2016
      - 2017
      - 2018
    - early
      - 2014
      - 2015
      - 2016
      - 2017
      - 2018
  - 35-HR E-EMS MRRG: 20180301-50000000-2002959:0000.005:30.00:30.00
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```

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Point Clouds