ARSET
Applied Remote Sensing Training
http://arset.gsfc.nasa.gov
@NASAARSET

Overview and Access to GPCP, TRMM, and GPM Precipitation Data Products
Outline

• Remote Sensing of Precipitation

• Global Precipitation Climatology Project (GPCP)

• Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurements (GPM) Missions

• TRMM and GPM Data Products

• TRMM/GPM Data Access: Demonstration of Precipitation Processing System/STORM
Remote Sensing of Precipitation
Precipitation Remote Sensing

**Passive Remote Sensing**: Inferred indirectly from emitted infrared radiation by clouds
Precipitation Remote Sensing

Passive Remote Sensing: Inferred indirectly from emitted infrared radiation by clouds

http://missionscience.nasa.gov/ems/09_visiblelight.html
**Passive Remote Sensing**: Estimated from microwave radiation emitted or scattered by precipitation particles

- The lower frequencies, referred to as “emissions channels” measure precipitation mainly from energy emitted by raindrops (37 GHz)
- The higher frequencies, or “scattering channels” gather energy scattered by ice particles above the freezing level (85 GHz)
Precipitation Remote Sensing

**Active Remote Sensing**: Estimated from back-scattered microwave radiation transmitted by radars

- NASA Satellites TRMM and GPM use K-band radar
- K-band generally has a frequency range within 27-40 GHz and 12-18 GHz

http://pmm.nasa.gov
Global Precipitation Climatology Project (GPCP)
Global Precipitation Climatology Project (GPCP)

http://precip.gsfc.nasa.gov/gpcp_v2.2_comb_new.html

- Established by the World Climate Research Program (WCRP)
- Attached to the Global Energy and Water Exchange (GWEX) program
- Quantifies global rainfall from satellite measurements
- The longest satellite-based precipitation data record covering 30+ years from 1979-present
GPCP

http://precip.gsfc.nasa.gov/gpcp_v2.2_comb_new.html

GPCP combines precipitation information from several satellites and gauges to derive a merged data set using:

• The passive microwave estimates are based on the series of Defense Meteorological Satellite Program (DMSP)
  – Special Sensor Microwave/Imager (SSMI)
  – Special Sensor Microwave Imager/Sounder (SSMIS) data
• The infrared (IR) precipitation estimates are based on
  – Geostationary satellites from U.S., Europe, and Japan
  – NOAA-series polar orbiting satellites:
    • Television Infrared Observation Satellite Program (TIROS), Operational Vertical Sounder (TOVS), NASA Aqua Satellite Atmospheric Infrared Sounder (AIRS)
  – Rain gauge data from the Global Precipitation Climatology Center (GPCC)
# GPCP Sources and Techniques

<table>
<thead>
<tr>
<th>Technique</th>
<th>Precip Rate [p]</th>
<th>Random Error [e]</th>
<th>Source [s]</th>
<th>Number of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSMI(SSMIS) Emission [se]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>55 km images</td>
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<tr>
<td>SSMI(SSMIS) Scattering [ss]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>overpass days</td>
</tr>
<tr>
<td>SSMI(SSMIS) Composite [sc]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>55 km images</td>
</tr>
<tr>
<td>TOVS(AIRS) [tv]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Merged SSMI(SSMIS)/TOVS(AIRS) [st]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>OPI [op]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>GPI [gp]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>2.5° images</td>
</tr>
<tr>
<td>AGPI [ag]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Multi-Satellite [ms]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>GPCC-Gauge [ga]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Satellite-Gauge [sg]</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

**Final Product**
### GPCP Sources and Techniques

- GPCP is based on a different mix of observations in space and time.
- No microwave observations are available before 1986.
- TOVS/AIRS from polar orbiting satellites provide infrared observations.
- Geostationary infrared based GPI available only in 40°S – 40°N.

<table>
<thead>
<tr>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSMI(SSMIS) Emission [se]</td>
</tr>
<tr>
<td>SSMI(SSMIS) Scattering [ss]</td>
</tr>
<tr>
<td>SSMI(SSMIS) Composite [sc]</td>
</tr>
<tr>
<td>TOVS(AIRS) [tv]</td>
</tr>
<tr>
<td>Merged SSMI(SSMIS)/TOVS(AIRS) [st]</td>
</tr>
<tr>
<td>OPI [op]</td>
</tr>
<tr>
<td>GPI [gp]</td>
</tr>
<tr>
<td>AGPI [ag]</td>
</tr>
<tr>
<td>Multi-Satellite [ms]</td>
</tr>
<tr>
<td>GPCC Gauge [ga]</td>
</tr>
<tr>
<td>Satellite-Gauge [sg]</td>
</tr>
</tbody>
</table>
GPCP Data Information

More information on GPCP data sources can be obtained from

- http://precip.gsfc.nasa.gov

- https://pmm.nasa.gov/education/videos/nasa-scientists-research-global-precipitation

Average monthly rainfall for February from 1979-2006. sv.svs.gsfc.nasa.gov
GPCP Data Information

More information on GPCP data sources can be obtained from:

- http://precip.gsfc.nasa.gov
- https://pmm.nasa.gov/education/videos/nasa-scientists-research-global-precipitation
### GPCP Data Products

<table>
<thead>
<tr>
<th>Product Name and Version</th>
<th>Spatial Resolution and Coverage</th>
<th>Temporal Resolution and Coverage</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPCP Version 2.2</td>
<td>2.5° x 2.5° Global</td>
<td>5-day Mean Monthly (1979-2015) Climatology based on (1979-2011)</td>
<td>Binary with ASCII Header</td>
</tr>
<tr>
<td>GPCP Version 1.2</td>
<td>1° x 1° Global</td>
<td>Daily (10/1996-10/2015)</td>
<td></td>
</tr>
</tbody>
</table>

**Detailed Documentation**
- [ftp://meso.gsfc.nasa.gov/pub/1dd-v1.2/1DD_v1.2_doc.pdf](ftp://meso.gsfc.nasa.gov/pub/1dd-v1.2/1DD_v1.2_doc.pdf)
## GPCP Data Access

<table>
<thead>
<tr>
<th>Product Name and Version</th>
<th>Data Access File Name Convention</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPCP Version 2.2 Monthly</td>
<td>ftp://precip.gsfc.nasa.gov/pub/gpcp-v2.2/psg/</td>
</tr>
<tr>
<td></td>
<td>• gpcp_v2.2_psg.YYYY.gz</td>
</tr>
<tr>
<td></td>
<td>• gpcp_v2.2_esg.YYYY.gz (Error)</td>
</tr>
<tr>
<td></td>
<td>• gpcp_pen_v2.2_sgi_YYYY.gz</td>
</tr>
<tr>
<td>GPCP Version 1.2</td>
<td>ftp://meso.gsfc.nasa.gov/pub/1dd-v1.2</td>
</tr>
<tr>
<td></td>
<td>• gpcp_1dd_v1.2_p1d_YYYY.gz</td>
</tr>
</tbody>
</table>

psg: Precipitation Satellite – Gauge; pid: Precipitation 1 degree
Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurements (GPM)
Tropical Rainfall Measurement Mission (TRMM)

http://trmm.gsfc.nasa.gov

- The first satellite dedicated to measuring tropical and subtropical rainfall
- Launched 27 November 1997 and ended 15 April 2015
- First satellite to carry a microwave precipitation radar
- Predecessor to Global Precipitation Measurement (GPM) Mission

A joint mission between NASA and JAXA (Japanese Space Agency)
TRMM Satellite & Sensors

http://trmm.gsfc.nasa.gov

• In a non-polar, low-inclination orbit
• Altitude of approximately 350km, raised to 403km after Aug 23, 2001
• Spatial Coverage
  – 16 TRMM orbits a day covering global tropics between 35°S – 35°N latitude
• Sensors:
  – TMI (TRMM Microwave Imager)
  – PR (Precipitation Radar)
  – VIRS (Visible and InfraredScanner)
  – LIS (Lightening Imaging Sensor)
  – CERES (Clouds and the Earth’s Radiant Energy System)
TRMM Microwave Imager (TMI)

http://pmm.nasa.gov/TRMM/TMI

- Spatial Coverage and Resolution:
  - Coverage: -180°-180°, 35°S-35°N
  - Swath: 760km (878km after 8/2001)
  - Vertical Resolution:
    - 0.5 km from surface – 4 km
    - 1.0 km from 4-6 km
    - 2.0 km from 6-10 km
    - 4.0 km from 10-18 km
- Temporal Coverage and Resolution:
  - Nov 27, 1988 Apr 15, 2014
  - 16 orbits per day

Channel Frequencies
- 10.7, 19.4, 21.3, 37, 85.5 GHz
Precipitation Radar (PR)
http://pmm.nasa.gov/TRMM/PR

• Spatial Coverage and Resolution:
  – Coverage: 35°S-35°N
  – Swath: 215km (247 after 8/2001)
  – Spatial Resolution: 4.3km (5km)
  – Vertical Resolution: 250m (from 0-20km)

• Temporal Coverage and Resolution:
  – ~16 orbits per day

• Frequency:
  – 13.6 GHz

GPM Satellite & Sensors

http://pmm.nasa.gov/GPM

- GPM core satellite is in a non-polar, low inclination orbit
  - Altitude: 407km
- Spatial Coverage:
  - 16 T orbits a day covering global tropics, between 65°S-65°N
- Along with constellation of satellites, GPM has revisit time of 1-2 hrs over land
- Sensors:
  - GMI (GPM Microwave Imager)
  - DPR (Dual Frequency Precipitation Radar)
GPM Microwave Imager (GMI)
http://pmm.nasa.gov/GPM/flight-project/GMI

- Spatial Coverage and Resolution:
  - Coverage: -180°-180°, 65°S-65°N
  - Swath: 885km
  - Spatial Resolution: 4.4-32km
  - Vertical Resolution:
    - 0.5 km from surface – 4 km
    - 1.0 km from 4-6 km
    - 2.0 km from 6-10 km
    - 4.0 km from 10-18 km
- Temporal Coverage and Resolution:
  - Feb 2014 – present
  - ~2-4 hr observations

Channel Frequencies:
- 10.6, 18.7, 23.8, 36.5, 89, 166, 183 GHz
Dual Precipitation Radar (DPR)

http://pmm.nasa.gov/GPM/flight-project/DPR

- Spatial Coverage and Resolution:
  - Coverage: -180°-180°, 65°S-65°N
  - Swath: 120km (Ka) and 245km (Ku)
  - Spatial Resolution: 5.2km
  - Vertical Resolution: 250m (from 0-20km)

- Temporal Coverage and Resolution:
  - Feb 27, 2014 – present
  - ~2-4 hr observations

- Frequency:
  - 13.6 and 35.5 GHz
TRMM and GPM Comparison

- TRMM measurements are limited to the tropics
- GPM measurements span middle & high latitudes

- GMI & DPR
  - provide improved reference standards for inter-calibration of constellation precipitation measurements
  - Better accuracy measurements
- GMI has a higher spatial resolution than TMI
- Improved light rain and snow detection in GMP
- DPR has better identification of liquid, ice, mixed-phase precipitation particles
TRMM and GPM Data Products
Importance of TRMM Data Products

TRMM has ended, but it’s important to learn about TRMM data because:

• TRMM provides high resolution precipitation data for 17 years
  – Useful for detecting and understanding climate variability and change

• Many applications are developed from TRMM data and still have to transition to using GPM data
  – extreme rain, flood, and drought monitoring and mapping
  – Agriculture
  – Health

• GPM algorithms are conceptually similar
  – TRMM and GPM data will be inter-calibrated to provide a combined long-term precipitation record
Precipitation Algorithms for TRMM and GPM

http://pmm.nasa.gov/science/precipitation-algorithms

• There are 4 major algorithms used to obtain precipitation estimates from GPM/TRMM observations
  – Radar Algorithms
  – Radiometer Algorithms
  – Combined Radar + Radiometer Algorithms
  – Multi-Satellite Algorithms
• TRMM and GPM Core are used as a calibrator for multiple national and international constellation satellites
### Summary of TRMM Level-2 Precipitation Products

<table>
<thead>
<tr>
<th>Sensor/Product Name</th>
<th>Spatial Resolution &amp; Coverage</th>
<th>Temporal Resolution</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR only: 2A25</td>
<td>• 5km x 5km</td>
<td>• 7-day latency for Near Real-Time</td>
<td>HDF4</td>
</tr>
<tr>
<td></td>
<td>• Single orbit</td>
<td>• 3-hour, 2-day, 5-day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 orbits/day (35°S-35°N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMI only: 2A12</td>
<td>• 5km x 5km</td>
<td>• 3-hour, 2-day, 15-day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Orbital</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 orbits/day (38°S-38°N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined TMI &amp; PR: 2B31</td>
<td>• 5km x 5km</td>
<td>• 7-day latency for Near Real-Time</td>
<td>HDF4</td>
</tr>
<tr>
<td></td>
<td>• Orbital</td>
<td>• 3-hour, 2-day, 5-day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 orbits/day (38°S-38°N)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Summary of TRMM Level-3 Precipitation Products

<table>
<thead>
<tr>
<th>Sensor/Product Name</th>
<th>Spatial Resolution &amp; Coverage</th>
<th>Temporal Resolution</th>
<th>Data Format</th>
</tr>
</thead>
</table>
| TMPA: 3B42RT & Final 3B42 | • 0.25° x 0.25°  
• 50°S x 50°N | • RT is NRT with 8 hr latency  
• 3-hourly | • RT data in binary and OpenDAP |
| TMPA: 3B43          |                               | • Monthly  
• 2 month latency | • HDF4  
• NetCDF          |
| PR only: 3A12       | • 0.5° x 0.5° and 5° x 5°  
• 37°S x 37°N | • Monthly | • HDF4  
• OpenDAP          |
| TMI only: 3A12      | • 0.5° x 0.5°  
• 38°S x 38°N | • Monthly | • HDF4  
• OpenDAP          |
| TMI-PR Combined: 3B31 | • 5° x 5°  
• 40°S x 40°N | • Monthly |                                |
## Summary of GPM Level-2 Precipitation Products

<table>
<thead>
<tr>
<th>Sensor/Product Name</th>
<th>Spatial Resolution &amp; Coverage</th>
<th>Temporal Resolution</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPR Ku-only: 2A-Ku</td>
<td>• 5.2km x 125m</td>
<td>• 20-120 minutes</td>
<td>• HDF5</td>
</tr>
<tr>
<td>DPR Ka-only: 2A-Ka</td>
<td>• Single orbit</td>
<td>• 24 hrs</td>
<td>• OpenDAP</td>
</tr>
<tr>
<td>DPR Ku &amp; Ka: 2A-DPR</td>
<td>• 16 orbits/day (70°S-70°N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMI/2A-GPROF</td>
<td>• 4km x 4km</td>
<td>• 2-40 hrs</td>
<td></td>
</tr>
<tr>
<td>Combined GMI+DPR:</td>
<td>• Orbital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A-CMB</td>
<td>• 5km x 5km</td>
<td>• 3-40 hrs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Orbital (70°S-70°N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Coincident Ku-Ka GMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>footprints</td>
<td></td>
<td></td>
</tr>
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</table>
Summary of GPM Level-3 Precipitation Products

<table>
<thead>
<tr>
<th>Sensor/Product Name</th>
<th>Spatial Resolution &amp; Coverage</th>
<th>Temporal Resolution</th>
<th>Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMERG</td>
<td>• 0.1° x 0.1°&lt;br&gt;90°S-90°N</td>
<td>• 30 min (NRT)&lt;br&gt;6 hr, 16 hr, &amp; 3 month latency</td>
<td>• HDF4&lt;br&gt;NetCDF&lt;br&gt;OpenDAP&lt;br&gt;ASCII&lt;br&gt;+.gif,.png&lt;br&gt;KML (Google Earth)</td>
</tr>
<tr>
<td>Combined GMI + DPR Rainfall Averages: 3-CMB</td>
<td>• 0.1° x 0.1°&lt;br&gt;70°S-70°N</td>
<td>• Monthly</td>
<td></td>
</tr>
<tr>
<td>DPR Rainfall Averages: 3-DPR</td>
<td>• 0.25° x 0.25°&lt;br&gt;5.0° x 5.0°&lt;br&gt;Daily: 67°S-67°N&lt;br&gt;Monthly: 70°S-70°N</td>
<td>• Daily &amp; Monthly</td>
<td></td>
</tr>
<tr>
<td>GMI Rainfall Averages: 3-GPROF</td>
<td>• 0.25° x 0.25°&lt;br&gt;90°S-90°N</td>
<td>• Daily &amp; Monthly</td>
<td></td>
</tr>
</tbody>
</table>
Multi-Satellite Algorithms for TRMM and GPM

http://pmm.nasa.gov/science/precipitation-algorithms

- TRMM & GPM Core satellites are used to calibrate microwave observations from a constellation of national and international satellites
- Allow improved spatial and temporal coverage of precipitation data
- TRMM Multi-satellite Precipitation Analysis (TMPA)
  - Widely used for applications
- TMPA will be extended to match Integrated Multi-satellitE Retrievals for GPM (IMERG)
TMPA

http://precip.gsfc.nasa.gov/trmm_comb.html

• TMPA combines PR & TMI rain rates
• Inter-calibrates passive rain rates from other satellite sensors
  – TMI, SSM/I, AMSR, AMSU-B, MHS, IR radiometers*
• Inter-calibrates with national and international geostationary and NOAA low-earth orbiting satellites infrared measurements by using VIRS
• Final rain product is calibrated with rain gauge analyses on a monthly time scale

* AMSR: Advanced Microwave Scanning Radiometer – onboard NASA Aqua Satellite
  AMSU: Advanced Microwave Sounding Unit – onboard NOAA operational satellite
IMERG

• Conceptually similar to TMPA

• GPM constellation satellites include:
  – GCOM-W
  – DMSP
  – Megha-Tropiques
  – MetOp-B
  – NOAA-N’
  – NPP
  – NPOESS

• Final rain product is calibrated with rain gauge analyses on monthly time scale
IMERG


- **Multiple runs accommodate different user requirements for latency and accuracy**
  - “Early” – now 5 hours (flash flooding) – will be 4 hours
  - “Late” – now 15 hours (crop forecasting) – will be 12 hours
  - “Final” – 3 months (research data)

- **Native time intervals are half-hourly and monthly (final only)**
  - Value-added products at 3 hrs, 1, 3, and 7 days - .tiff will be available
  - Initial release covers 60°N-60°S – will be 90°N-90°S
## TMPA and IMERG

<table>
<thead>
<tr>
<th></th>
<th>TMPA</th>
<th>IMERG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spatial Resolution</strong></td>
<td>0.25° x 0.25°</td>
<td>0.1°x0.1°</td>
</tr>
<tr>
<td><strong>Spatial Coverage</strong></td>
<td>Global, 50°S-50°N</td>
<td>Global, 60°S-60°N (will be extended from pole-pole)</td>
</tr>
<tr>
<td><strong>Temporal Resolution</strong></td>
<td>3 hours</td>
<td>30 minutes</td>
</tr>
<tr>
<td><strong>Temporal Coverage</strong></td>
<td>12/1997 – Present*</td>
<td>2/27/2014-Present⁺</td>
</tr>
</tbody>
</table>

* TMPA and IMERG combined data will be available in late 2017 at IMERG data resolution
* After 15 April 2015 TRMM climatological calibration is being used to generate TMPA
### TRMM and GPM Data Type Convention


<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Instrument count, geolocated, at instantaneous field of view (IFOV).</td>
</tr>
<tr>
<td>1B</td>
<td>Geolocated, calibrated $T_b$ or radar power at IFOV.</td>
</tr>
<tr>
<td>1C</td>
<td>Intercalibrated brightness temperatures $T_c$ at IFOV.</td>
</tr>
<tr>
<td>2A</td>
<td>Geolocated geophysical parameters at IFOV from a single instrument.</td>
</tr>
<tr>
<td>2B</td>
<td>Geolocated geophysical parameters at IFOV from multiple instruments.</td>
</tr>
<tr>
<td>3A</td>
<td>Space/time averaged geophysical parameters from a single instrument.</td>
</tr>
<tr>
<td>3B</td>
<td>Space/time averaged geophysical parameters from multiple instruments.</td>
</tr>
<tr>
<td>4</td>
<td>Combined satellite, ground and/or model data.</td>
</tr>
</tbody>
</table>
TRMM File Name Convention


Level 2 File Name

2A12.20150408.99100.7.HDF

- Data Level: YYYYMMDD
- Single Sensor: 12=TM, 24=PR, 31=TMI/PRI
- Orbit #: Version #

Level 3 File Name

3B42.19980102.00.7.HDF

- Data Level: YYYYMMDD
- Multiple Sensors: Hour in GMT: 00, 03, 06, etc.
- Version #
GPM File Name Convention

Level 2 File Name

2A.GPM.GMI.GPROF2008.20131101-S235152-E012400.000352.V03C.HDF5

Level 3 File Name

3B-HHR.MS.MRG.3IMERG.20140805-S043000-E045959.0270.V03D.HDF5
Trade-Offs Between Level 2 and Level 3 Precipitation Data Products

- IMERG and TMPA have lower spatial resolutions than Level 2 data
  - E.g. 2A12, 2A25, 2B31, 2A-GPROF, 2A-2DPR, 2BCMB

- IMERG and TMPA have better spatial coverage with no orbit gaps compared to Level 2 and Level 3 radar, imager, and radar/imager combined data

- IMERG and TMPA:
  - are uniformly gridded
  - have uniform with temporal resolution to cover diurnal variations
  - are available in multiple formats
TRMM/GPM Data Access: Demonstration of Precipitation Processing System/STORM
Precipitation Measurement Missions

https://pmm.nasa.gov/

- Home of all information related to TRMM and GPM
- Links to data documentation and access
Precipitation Measurement Missions: Data Access

https://pmm.nasa.gov/data-access

• All about TRMM and GPM data
  – Including updates, news, and FAQ
• Quick data access links and user registration
Precipitation Measurement Missions: Data Sources

https://pmm.nasa.gov/data-access/data-sources
Precipitation Processing System: STORM

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

- All TRMM and GPM data products can be downloaded from STORM
- Data images and HDF5 data viewer are available in STORM

**STORM Demonstration!**
Next a Hands-on Exercise:
Search, Subset, and Download GPM IMERG Data for QGIS Analysis
References for GPCP, TMPA and IMERG

