Analyzing NASA Earth Observation Data with ArcGIS Technology

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Outline

- ❑ Who Are We (GES DISC)
- ❑ GES DISC EO Data Characteristics
- ❑ Application Examples Through ArcGIS
- ❑ Upcoming GES DISC GIS Data Support

GES DISC EO Data Products

Atmospheric Data

- Total Ozone Mapping Spectrometer (TOMS)
- Upper Atmosphere Research Satellite (UARS)
- Solar Radiation and Climate Experiment (SORCE)
- Aura: Ozone Monitoring Instrument (OMI),
  - High Resolution Dynamics Infrared Sounder (HIRDLS),
  - Microwave Limb Sounder (MLS)
- Historical datasets from Nimbus, Tiros, others
- SNPP Ozone Mapping & Profiler Suite (OMPS)
- Total and Spectral Solar Irradiance Sensor (TSIS)*
- Sentinel 5P (TROPOMI)*
- Cloud Absorption Radiometer (CAR)

- TIROS Operational Vertical Sounder (TOVS)
- Aqua: Atmospheric Infrared Sounder (AIRS)
- SNPP/JPSS : Cross-track Infrared Sounder (CrIS)

- Atmospheric CO2 Observations from Space (ACOS)
- Orbiting Carbon Observatory 2 (OCO-2)
- Carbon Monitoring System (CMS)

Modeling

- Modern-Era Retrospective Analysis For Research and Applications (MERRA/2)
- Global Land Data Assimilation System (GLDAS)
- North American Land Data Assimilation System (NLDAS)

Precipitation

- Tropical Rainfall Measuring Mission (TRMM)
- Hydrology Collections
- Global Precipitation Mission (GPM)

MEaSUREs

- MEaSUREs 2006
- MEaSUREs 2012

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EO Data Characteristics - Multi-spatiotemporal

- ➔ Remote sensing, in-situ, modeling
- ➔ Multiple resolutions:
  - ◆ Spatially:
    - o Global grids (raster) with spatial resolution up to 4-km
    - o Higher resolution swath (feature points) data (e.g., 2.2-km)
  - ◆ Temporally:
    - o Half-hourly, 3-hourly, daily, monthly satellite measurements
    - o Hourly, 3-hourly, daily and monthly modeled products
    - o Monthly ground observation archives
    - o Composite Climatology (yearly, monthly)
    - o Near-real-time (NRT) products

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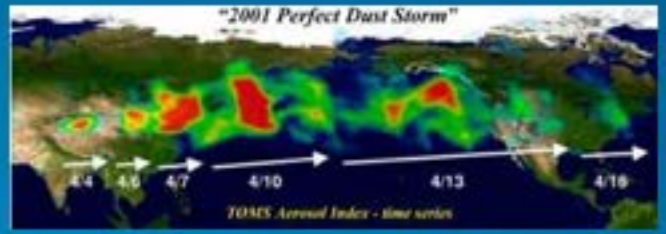
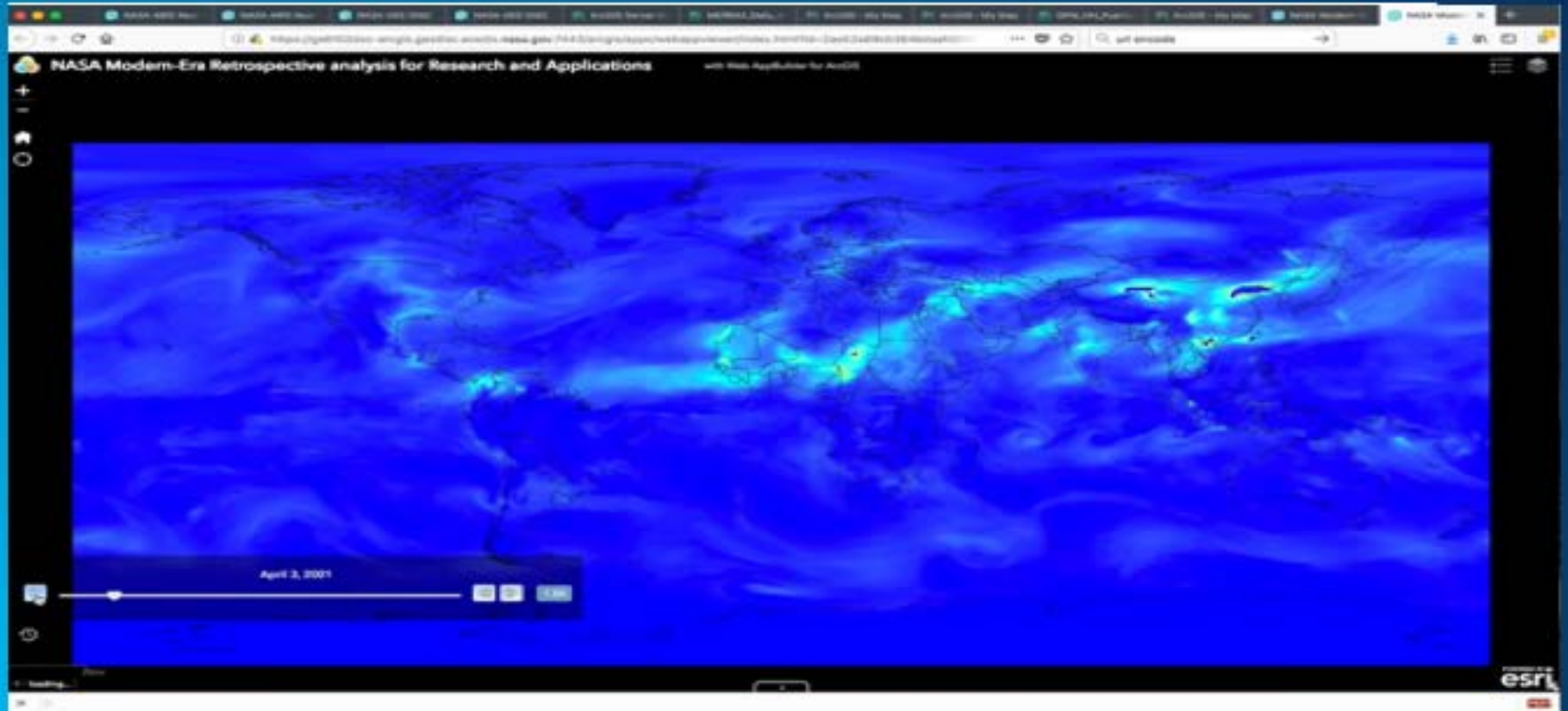
GES DISC EO Data Application via ArcGIS

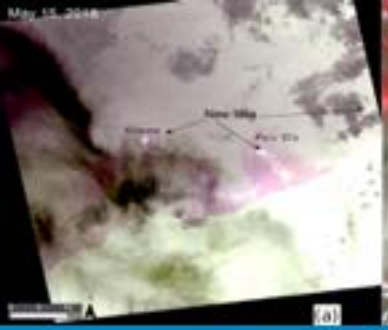
- → Data Transformation to be GIS interoperable (WCS/WMS/GeoTIFF)
- → Image Service in ArcGIS
- → Potential data application in GIS :
  - Precipitation (TRMM/GPM)
  - Hydrology (Land Data Assimilation System data (LDAS) with numerous land parameters)
  - Modern Era Retrospective-Analysis for Research and Applications data assimilation data (MERRA/2), with numerous land, ocean and atmospheric parameters
  - Atmospheric Compositions
    - Volcano Eruption (SO2: AIRS/OMI/OMPS/MEaSURES)
    - Dust Storm/Air Quality (AOD/AI/NO_2/PM: TOMS/OMI/OMPS/MERRA-2/TROPOMI...etc)
  - Extreme Weather Events
  - Climatic Anomaly

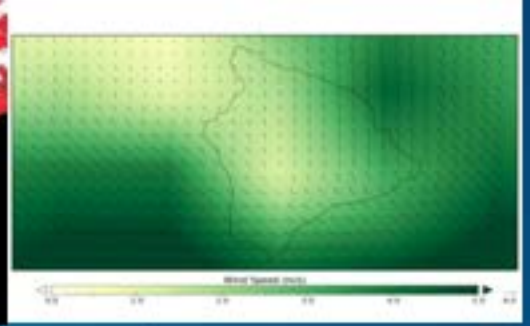
Air Quality Application



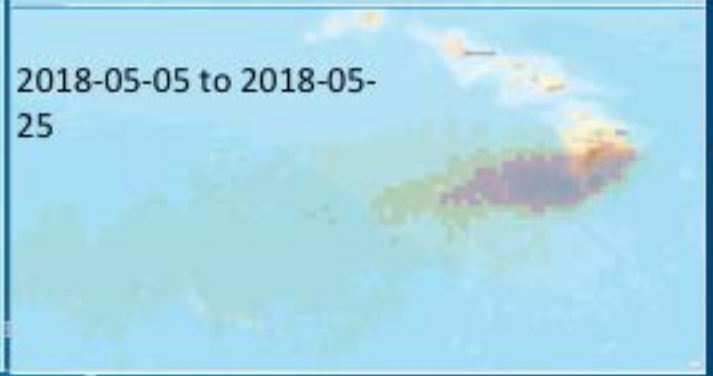
Perfect Dust Storm in 2001 April 3-15
Daily Avg AOD from MERRA-2







Kilauea Volcanic Eruptions in May 2018

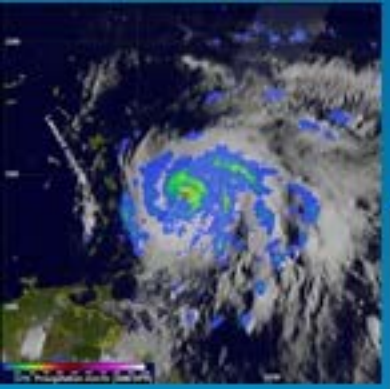


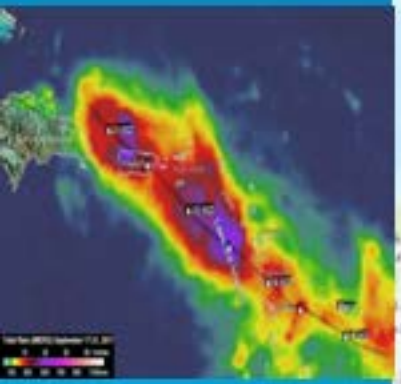
Extreme Weather Events:

Hurricane Maria

Hurricane Harvey

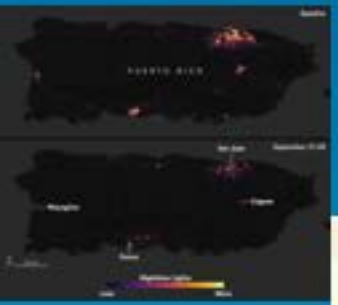
Movie of GPM Precipitation for Hurricane Maria (2017-09-17 00Z to 2017-09-22 2330 Z)

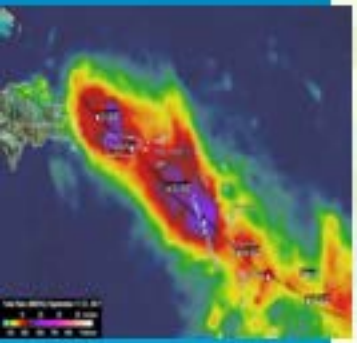


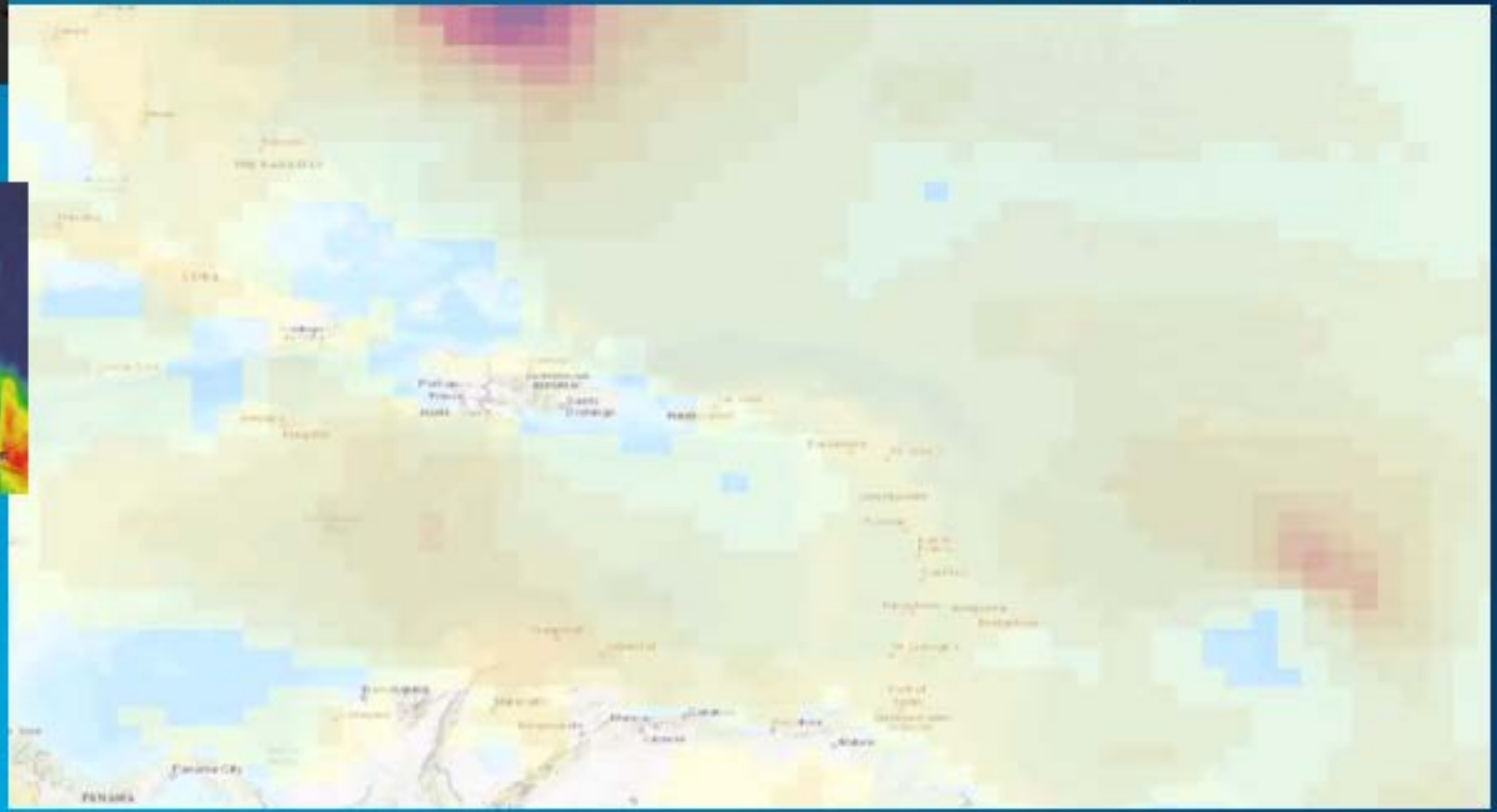


GES DISC Goddard Earth Science Data and Information Services Center
https://disc.gsfc.nasa.gov

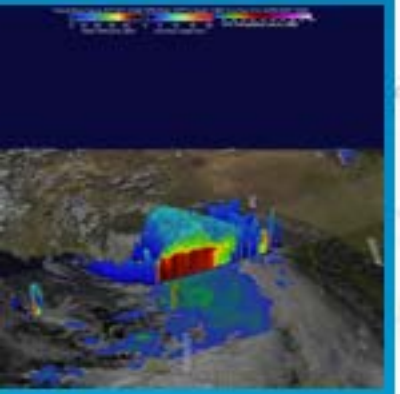
Movie of MERRA-2 Surface Wind During Hurricane Maria (2017-09-17 00Z to 2017-09-22 23Z)



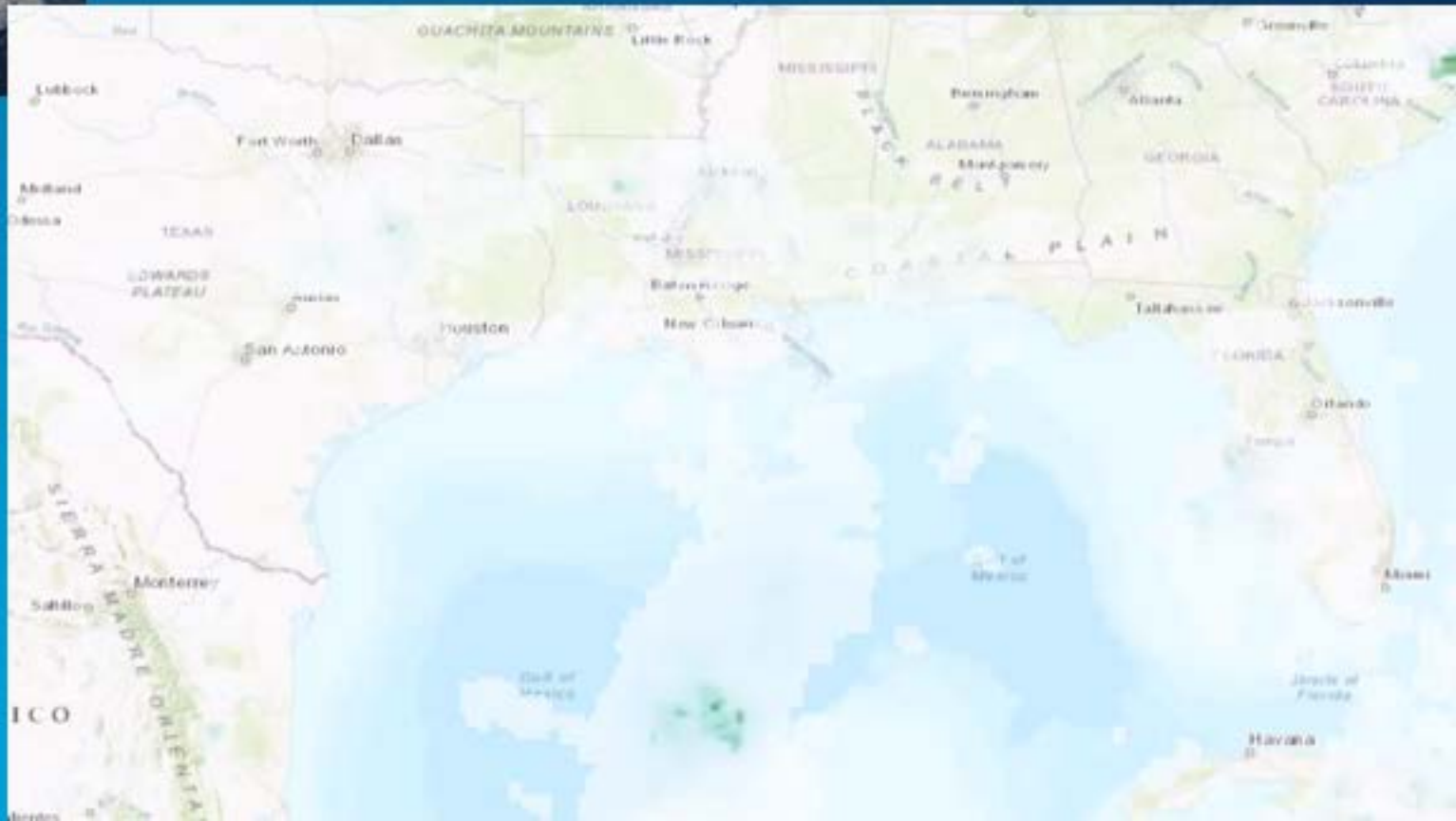




Movie of GPM Precipitation for Hurricane Harvey (2017-08-24 00Z to 2017-08-30 23:30 Z)



Historical Flood in Texas

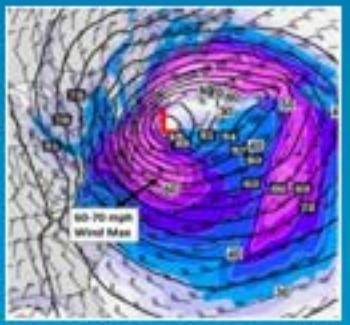


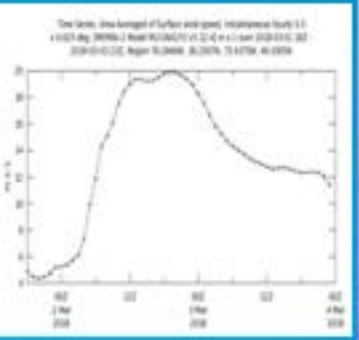
Other Application: Wind/Energy

Drought/Flash Flood

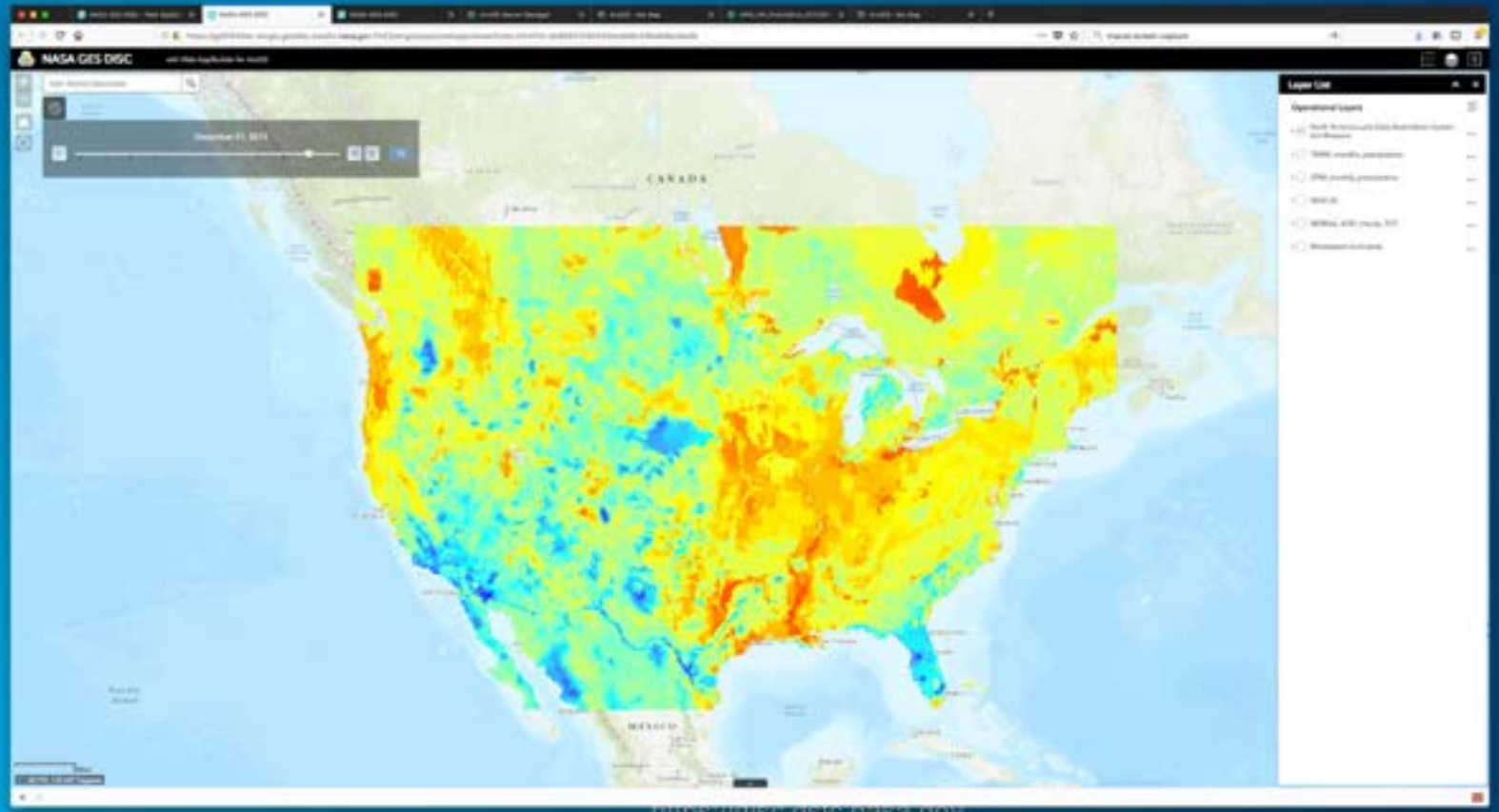
March 2018 Came In With a Historic Wind Event in DC-MD-VA

MERRA-2/NLDAS 2018-03-01 00Z – 2018-03-03 23Z





North American Soil Moisture Monitoring from NLDAS for 65 years data record



Upcoming GES DISC GIS Data Support

- Implement ArcGIS Image Service
- Implement ArcGIS Portal
- Publish GES DISC's Image/WCS/WMS services
- Experiment ArcGIS Feature Service
- Experiment ArcGIS Geoprocessing

Are there any questions?

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