No Pixel Left Behind: Interactively Visualizing "Everything" from NASA's Earth Observations

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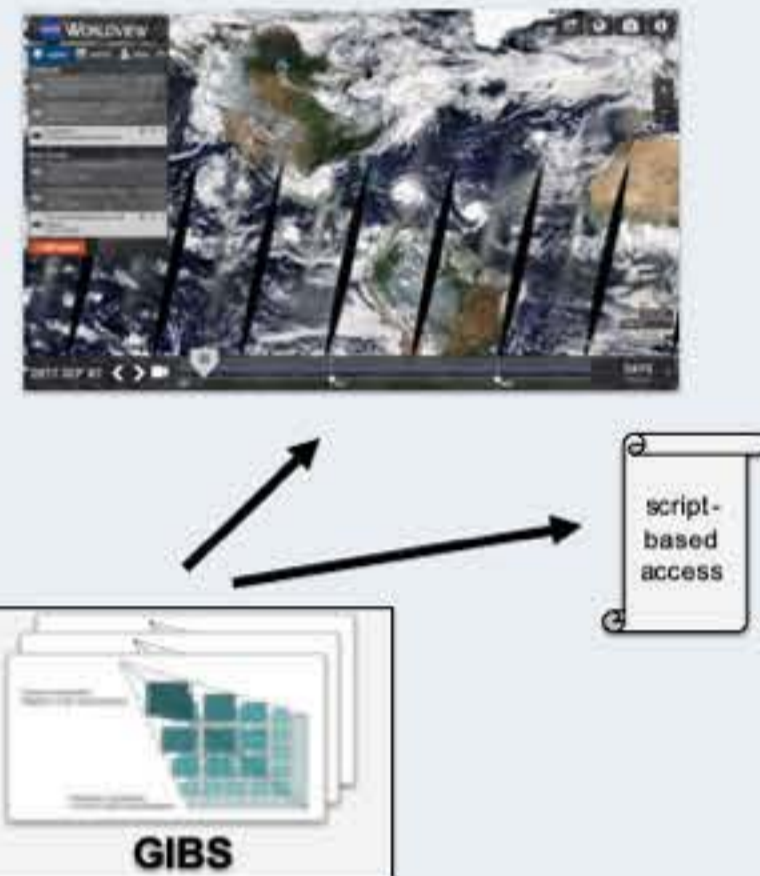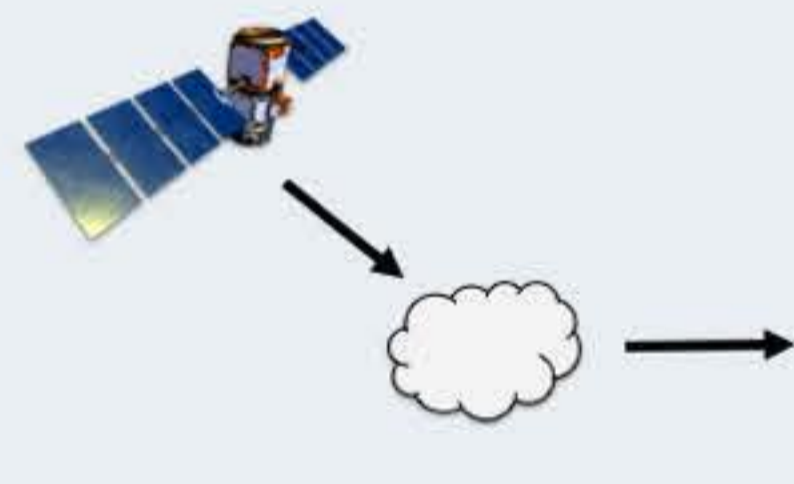
earthdata.nasa.gov/worldview
earthdata.nasa.gov/gibs

Overview

Overview: The problem: satellite swath overlaps. Polar orbiting satellites like Terra, Aqua, and the joint NASA/NOAA Suomi-NPP satellite circle the globe from pole to pole, collecting data daily, swath by swath. Having this density of data is great for building a comprehensive mosaic of the planet, but sometimes there is something interesting occurring in one swath but is covered by a subsequent swath when the satellite passes over 90 minutes later. With our new prototype based on Worldview and the Global Imagery Browse Services (GIBS), we combine the best of both worlds to interactively visualize the entire globe as a mosaic and allow the user to "peel away the overlaps" to see every pixel that was observed by the satellite. This ability to look at every pixel - and to know when they were captured - is especially important near the poles where swath overlaps are most common.

What is Worldview and GIBS?

Worldview and the Global Imagery Browse Services (GIBS) provide a **visual-first** approach to finding and using Earth observations.

Worldview

worldview.earthdata.nasa.gov

Worldview is a **web app** to interactively browse NASA's global satellite imagery within hours of it being acquired

- Interactively explore the Earth as it is "right now" and throughout the past
- Browse over 900 imagery products provided by the Global Imagery Browse Services (GIBS), many of which are available in near real-time via the Land, Atmosphere Near real-time Capability for EOS (LANCE)
- Download imagery and/or the underlying data
- Use the Comparison feature, Animation feature, Events listing, and many more features and tools

Global Imagery Browse Services (GIBS)

gibs.earthdata.nasa.gov

GIBS is a **system** providing fast and open access to 800+ NASA imagery products for Worldview and any other application via standards-based APIs.

- Access imagery through standards-based web services for access through web clients, GIS clients, and scripts
- Imagery is provided in several map projections:
  - Geographic / Equirectangular
  - Web Mercator
  - Arctic Polar Stereographic
  - Antarctic Polar Stereographic

The Problem: Satellite Swath Overlaps

Mosaicking overlapping swaths limit users' ability to access "everything" that a given satellite has acquired, especially in regions where there are likely to be swath overlap from previous overpasses (e.g., near the poles).
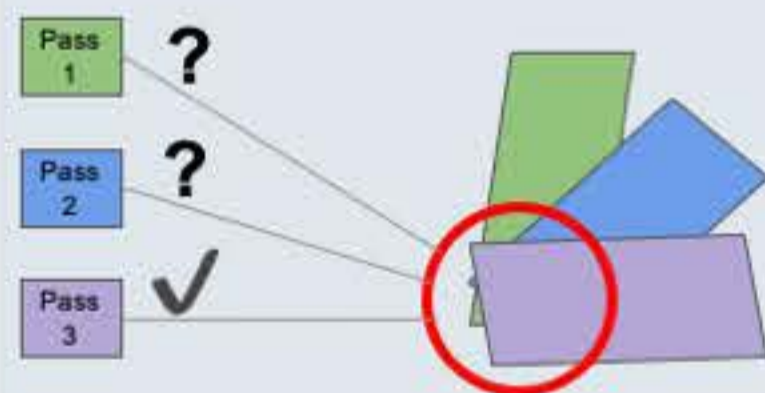
Left: when satellite swaths overlap at the poles, a traditional visualization approach combine all swaths into a single mosaic. In the example at left above, the most recent swath ("Pass 3") is the only swath that is completely visible in the visualization while the previous two swaths ("Pass 1" and "Pass 2") are obscured.

Above: in this arctic fire example, the image on the right was acquired approximately 90 minutes after the image on the left; during that time, the smoke and fire locations have visibly changed; those changes would be impossible to see if the swaths were mosaicked into a single image.

A Solution: Swath Browser Prototype

The vision: to have "no pixel left behind" to better support near real time and science users who monitor rapidly evolving events like fire, cloud, or volcanic activity.

The prototype: a web app based on Worldview/GIBS which uses imagery from NOAA-20 / VIIRS granules generated by the MODIS Adaptive Processing System (MODAPS).
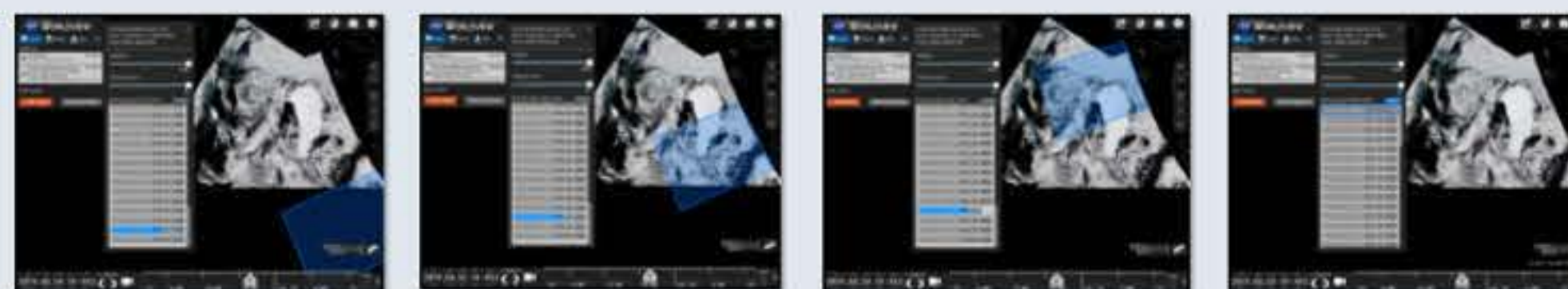
Idea #1: a user can view individual swaths / granules by adjusting the selected time

Idea #2: a user can select how many swaths / granules they would like to view simultaneously; the final image shows a full mosaic

Idea #3: a user can display individual granule footprints and adjust their ordering to compare over time

Questions and Future Work

Questions

- Should the interactions be driven by swaths or by granules?
- Within the Worldview user interface, is there a need to...
  - Individually reorder the granule stacking order?
  - Choose how many granules are shown at a given time?
  - Show granule footprints when hovering over a granule list?
  - Show granule footprints when hovering over the map?
- Which products would be best served by this capability?

Future work:

- Iterate on design and functionality with end users
- Integrate prototype capabilities into production version of Worldview/GIBS

Please contact us if you have suggestions as this is a work in progress!