A Generalized Pipeline for Creating & Serving High-Resolution Satellite Imagery

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Summer ESIP
July 18, 2012
Agenda

- Goal/purpose
- Details of current pipeline
- Known limitations (a sampling!)
- Additional processing considerations
- Future plans
- Random ending thoughts
(Lofty) Goal

• Cultivate a single pipeline that can efficiently satisfy the majority of imaging requests by PO.DAAC users

I want SSTA imagery for Cyclone Bob

Give me global MODIS SST for today

Yesterday’s ocean winds for Southern California, please
Current System: State of the Oceans

- Google Earth based web interface facilitating daily NRT image access for last 30 days
- Processing pipeline to be separate entity

http://podaac.jpl.nasa.gov/soto
Current Primary Components

1. Tile Creation
2. Image Creation
3. Image Repackaging
• Transforms L2 and L3 science data products into grids of floating-point tiles
• Grids based upon equirectangular projection
• Organized by a hierarchy of directories utilizing common taxonomy
  
  year/day_of_year/global_sizeXY/n_tilesXY/parameter_name/time_of_day/

• Geolocation must exist or be derivable
• L3 reprojected if not equirectangular
Process for Adding a Data Product

- Build (or modify) a reader function
  - Returns product file contents in standardized structure
- Update configuration file

### CONFIG FILE
- Product ID
- Location
- Reader module
- Processing level
- Parameters
- Tile size
- Spatial resolution
Tiling Example: Level 2 File

• Tradeoff between minimizing “low coverage” tiles and total number of tiles in grid.
• Merges and converts tiles into images
  – Based upon space/time/scale/color parameters
• Coincident tiles can be averaged or follow precedence rule (latest/earliest)
• Can combine multiple products
Floating-point Tiles to Images
• Converts imagery into format suitable for efficient web access
  – Currently KML pyramids
Current System Control

- Check for new science data
- Check for new tiles
- Check for new images

Hourly cron jobs

Tile Creation → Image Creation → Image Repackaging
Some Known Limitations

- Differences in L2 and L3 time resolution
  - Current categories are day, night, daynight
  - L2 tiles retain time stamp in filename
- Binding tiles to equirectangular grid
  - Polar grids better for data at extreme latitudes
- Handling unique characteristics
  - Properly interpreting geometry
  - Destriping
  - Currently occurs in readers
Additional Processing Considerations

• Reprojection (again)
  – Assumption: resampling data more than once does not significantly degrade image quality

• Filling areas of missing data
  – Spatiotemporal functions

• Advanced averaging
  – Time adjusted for synoptic images
Future Plans (Short-Term)

• Transition image repackaging to Tiled WMS
  • Developed at JPL
  • Resolves KML pyramid limitations (I/O, flexibility)
  • Server already installed
  • More information on Tiled WMS and sample clients: *Interactively Browsing NASA Imagery in Full Resolution* (Ryan Boller, Geospatial Session)

• Ingest imagery into PO.DAAC archive with metadata and provenance information
Future Plans (Long-Term)

- Vector data pipeline upgrades
  - Transition from KML placemarks
  - Possible enhancements to Tiled WMS package
- Enable dynamic specification of scaling, colorizing, projection, and time range
  - Increased latency, maybe exposed as separate service
- Explore better/alternative ideas to reprojecting
  - Plotting L2 footprints
Random Ending Thoughts

• Fuzzy definition of “high resolution” warranting this approach
  – Straight WMS may be better suited at lower spatial resolutions
• Single pipeline framework may not allow all of the flexibility required by users
• More control = more specialized processing
• This is all a work in progress, any comments/suggestions/critiques appreciated!