Working with Scientific Data using Mosaic Dataset

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Scientific Data

Data used in Ocean, Weather, Land, Atmosphere, and etc.

- **Multidimensional**
  - Variables are captured in multiple times and depths
    - Temperature / Time
    - Salinity / Depth
    - Pressure / Altitude

- **Stored in multidimensional formats**
  - netCDF (NetWork Common Data Format)
  - HDF (Hierarchical Data Format)
  - GRIB (General Regularly-distributed Information in Binary form)
Multidimensional Mosaic Dataset

Unified data model for multidimensional data in ArcGIS

- Created with netCDF, GRIB, and HDF raster types
  - Define variables when adding data
- Each row is a 2D raster with variable and dimension values
Multidimensional Mosaic Dataset - Aggregation

Aggregate data spatially, in time and vertical dimension
Multidimensional Mosaic Dataset - Visualization

- Visualize variables at any time and vertical dimension
  - Layer’s Multidimension tab
- Visualize temporal change of a variable
  - Time slider
- Visualize wind and ocean current
  - Vector Field Renderer
  - Wind barbs, Beaufort wind, Ocean current symbols
Multidimensional Mosaic Dataset – On-The-Fly Processing
Model scientific phenomena using Raster Function Template (RFT)

- RFT: a raster function template defines how to process raster
- A scientific model = RFT
  - Windchill = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})

- Produce analysis result on-the-fly
  - Set mosaic dataset properties
  - Use in adding raster data

- RFT created with Function Template Editor
  - Raster functions
  - Variables
  - Group name field
Multidimensional Mosaic Dataset - Analysis

Perform analysis using GP tools

- Use a slice in a Geoprocessing tool
  - Mosaic dataset path\objectid=2
  - Mosaic dataset path\Name="elev"

  ```python
  ```

- Use Make Mosaic Layer tool
  - Select one or set of slices
  - Use mosaic method to get the statistics of a set of slices
    - Minimum, maximum, mean
Multidimensional Mosaic Dataset - Serving

- Image services can be multidimensional
  - Published from multidimensional mosaic dataset
  - Aggregation, visualization, analysis and modeling
  - REST API
    - /ImageServer/multiDimensionInfo
    - /ImageServer/GetSamples
- Support WMS time and elevation request
  - GetCapabilities
  - GetMap
    - Time=2012-10-17&Elevation=20
Visualize Ocean Data

NCOM stored in 6 netCDF files:
- Sea temperature
- Salinity
- Surface elevation
- Current (magnitude and directions)
Model with Weather Data

NDFD (National Digital Forecast Data)
daily forecast data in GRIB format:
  temperature
  wind speed
  relative humidity

Raster Processing Templates:
  wind chill index
  heat index
  Fire weather forecast
Analyze with Land Data

MODIS products in HDF format
MCD12C1 (land cover)
MOD13C2 (NDVI, EVI)

Mosaic dataset and image service
Land Cover (yearly, 1001-2012)
EVI and EDVI (monthly, 2009-2014)
Thank you...

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