MODIS Web Services

Enabling Automated Access and Post-Processing of MODIS Science Data
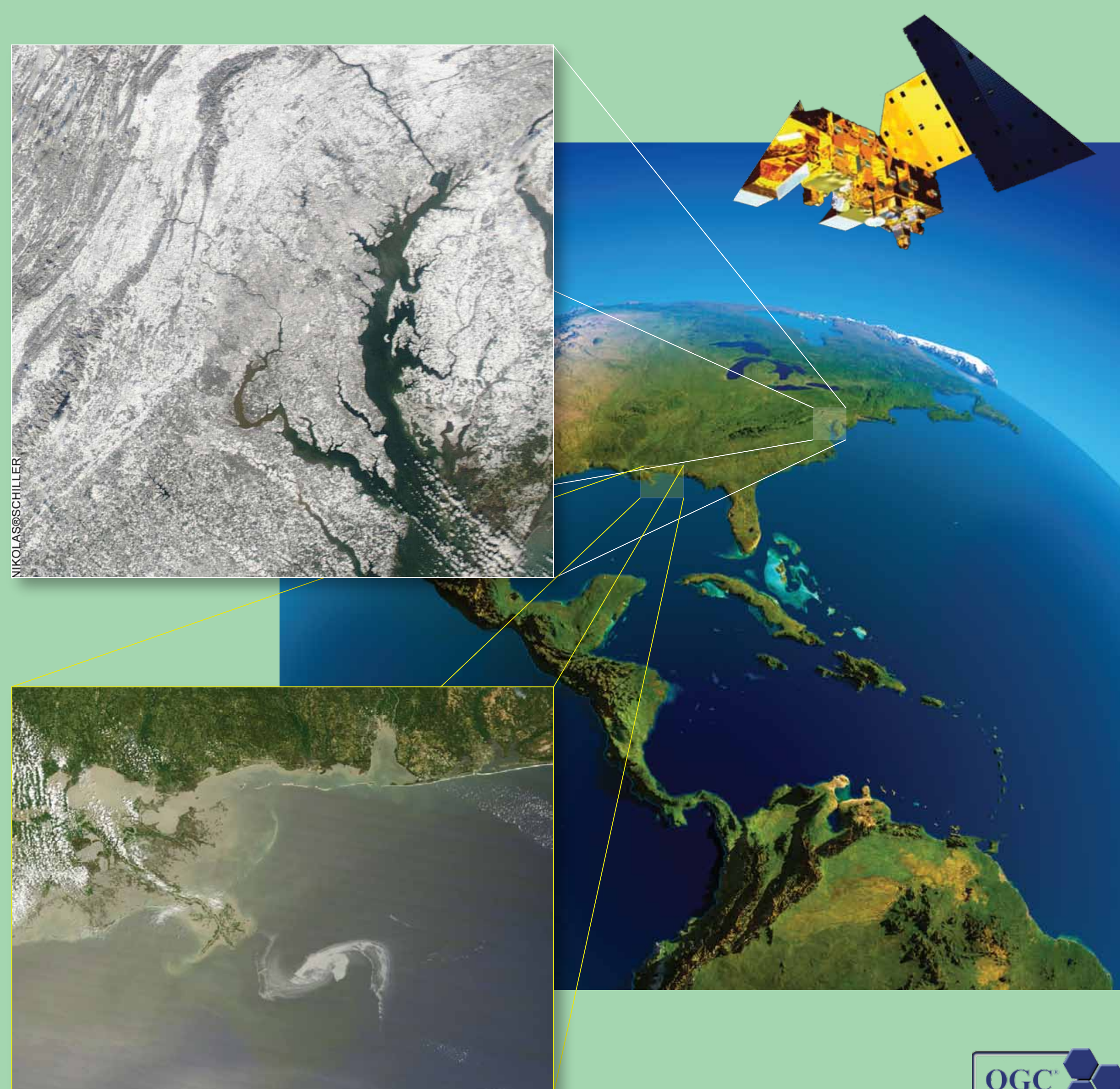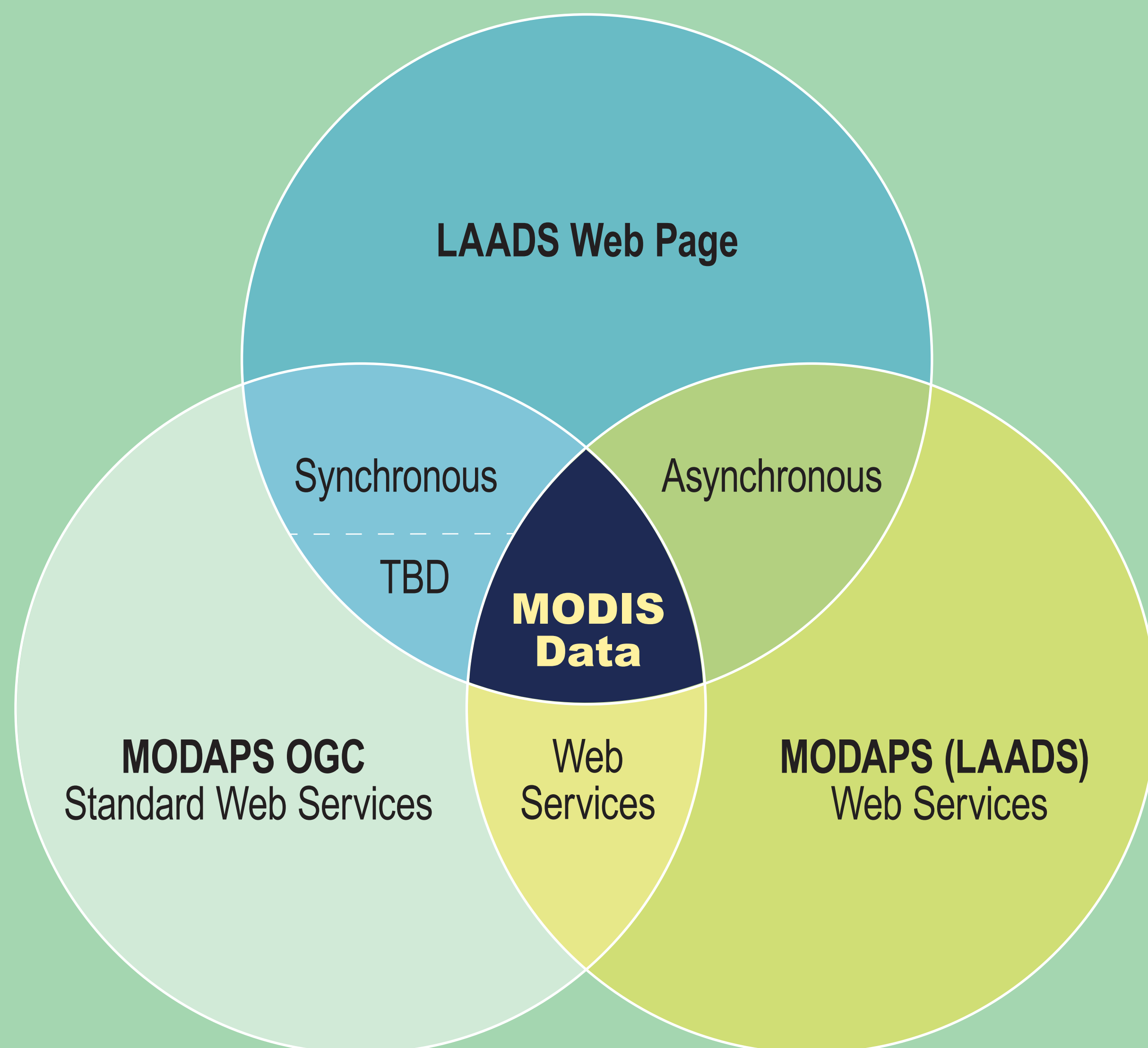
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Web Services are available for Moderate Resolution Imaging Spectroradiometer (MODIS) Level 1 and atmospheric data archived at NASA GSFC in the MODIS Adaptive Processing System (MODAPS). Since its release in early 2010, the Level 1 and Atmospheric Archive and Distribution System (LAADS) web services interface has provided the same capabilities for accessing MODIS data as the standard user-interactive GUI. This web service interface allows users to automate MODIS data search and ordering, as well as post-processing activities which include subsetting, reformatting and reprojection. In addition, web clients customized to specific user needs can now include MODIS data in their list of products. MODAPS now supports both SOAP- and REST-based web service calls, as well as standards such as OpenSearch.

MODAPS will deploy Open Geospatial Consortium (OGC) compliant Web Coverage and Map Services (WCS, WMS). These new web services allow for immediate delivery of products to meet users' needs. Included will be an upgrade of the current asynchronous "batch" post-processing architecture to a synchronous capability that returns data within the current browser session.

LAADS Web Page

Synchronous

Asynchronous

TBD

MODIS Data

MODAPS OGC Standard Web Services

Web Services

MODAPS (LAADS) Web Services

LAADS Web Service

The LAADS Web Service provides machine-to-machine access to MODIS Level 1b data and atmospheric data products. This web service provides similar feature and function as the LAADS web forms, but through a programmable interface which enables interrogation and retrieval of MODIS products and access to geospatial routines. This new service supports Earth science data workflows as well as other client-side implementations and tools.

LAADS Web Service uses industry standard technologies to provide a robust, system-independent interface to the MODAPS data processing utilities. The web service provides standard SOAP and REST protocols as well as Earth science data access standards, such as OpenSearch and FederatedOpenSearch.

Submit an Order

This pseudo code demonstrates using the Web Service to automate searching for two files and ordering the files mosaiced together.

Search and order

```
@files1 = $SOAP->searchForFiles( 5, "MOD021KM", "2012-06-27", -20,-35,10,-15","coords");
@files2 = $SOAP->searchForFiles( 5, "MOD021KM", "2012-06-27", -25,-35,15,-15","coords");
...
$SOAP->orderFiles( @files1, @files2, "<email address>","doMosaic=1" );
```

A file ID is returned from each searchForFiles call. The file ID is submitted in the order, with an email address and a "mosaic" post-processing flag. Upon completion, an email is sent containing an FTP link to the result data file.

Alternatively, the files could be retrieved programatically by:

```
@url1= getFileUrls( @files1 );
`wget $ ( @url1 );
```

Response

```
@files1= 296029820
@files2= 296029836
...
FTP://ladsweb.../alldata/.../MOD021KM.45.56.hdf
```

Web Coverage

The MODAPS team is developing OGC compliant services to provide another mechanism to interrogate and obtain information and data.

Our implementation of the Web Coverage Service (WCS) will provide a standard interface and operations which enable interoperable access to geospatial "coverages" available from MODAPS. A coverage is "digital geospatial information representing space-varying phenomena." Our WCS will allow a client to select portions of the MODAPS data holdings based on spatial, temporal and spectral constraints. The WCS provides available data together with detailed descriptions; allows complex queriers against these data; and returns data with its original semantics, which can be interpreted, extrapolated and rendered.

Each standard provides for: **interrogating the service capabilities** through *GetCapabilities*; **accessing metadata** on a data item through *DescribeCoverage*; and **retrieving a data item** (WMS Map image or WCS Coverage data file) through *GetMap* or *GetCoverage*, respectively.

Get a Coverage

Submit request providing spatial and temporal parameters in an XML document.

Submit request

```
<wcs:GetCoverage version="1.0.0" service="WCS"
        xmlns:gml="http://www.opengis.net/gml" xmlns:wcs="http://www.opengis.net/wcs">
<wcs:sourceCoverage>EV_250_Aggr1km_RefSB</wcs:sourceCoverage> <!-- SDS name -->
<wcs:spatialSubset><gml:Envelope srsName="WGS84(DD)"> <!-- lon_min, lat_min -->
<wcs:temporalSubset><gml:timePosition>2012-10-23T00:00:00</gml:timePosition>
```

Response

WCS streams back the binary data file to the client.

Web Map Services

The Web Map Service (WMS) filters and portrays spatial data to return static "picture" maps such as PNG or JPEG. WMS focuses on rendering custom maps and is an ideal solution for dynamic data or custom styled maps.

Additionally, we are implementing a tailored version of the map service called OpenGIS® Web Map Tile Service (WMTS). A WMTS-enabled server application can serve map tiles of spatially referenced data using tile images with predefined content, extent and resolution.

WMTS trades the flexibility of custom map rendering for the scalability possible by serving of static data (base maps) where the bounding box and scales have been constrained to discrete tiles. The fixed set of tiles allows for the implementation of a WMTS service using a web server that simply returns existing files. The fixed set of tiles also enables the use of standard network mechanisms for scalability such as distributed cache systems.

This OGC standard includes both resource (RESTful approach) and procedure oriented architectural styles (KVP and SOAP encoding) in an effort to harmonize this interface standard with other specification.

Global sets of tiles for 18 MODIS atmospheric data products will be generated during the upcoming sixth reprocessing session. Some of these data products are: MOD04 Aerosol support and MOD05 Near-IR atmospheric water vapor. Global tiles will be produced in multiple resolutions and compatible with Google Maps projection.

OGC COMPLIANT

NASA