

Support for OGC standards in Metview 4

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THE OPEN Geospatial Consortium (OGC) defines a number of standards for serving and retrieving geospatial data over the web. These standards have become increasingly popular over the last decade since they can offer an easy way for organisations within different domains to share geospatial information and thus enhance interoperability. In the meteorological domain these standards open up new possibilities, such as exchanging observations and forecast data with other user domains and showing meteorological and non-meteorological data together (see Box A).

To support the meteorological community in adopting the OGC standards, the MetOcean Domain Working Group was established within the OGC. ECMWF is an active participant of this working group and this article briefly describes the development within Metview 4 to support OGC standards.

Keyhole Markup Language

The Keyhole Markup Language (KML) format was originally developed for use within Google Earth and later it became an official standard of the OGC. At present, KML is widely used to define two- or three-dimensional geospatial information that can be displayed in Google Earth, Google Maps and other similar applications. Metview 4 offers various ways of supporting KML. First, KML files are represented by an icon in the Metview desktop, which users can *edit* and *visualise* with an external viewer (by default it is Google Earth – see Figure 1). Secondly, through its use of Magics++ for its plotting, geographical contour plots can be written in KML format both in the interactive user interface and in Metview Macro. Lastly, Geopoints files, which are Metview's custom format to store scattered georeferenced data, can be converted into KML using the *GeoToKML* module (Figure 2a).

Web Map Service

OGC's Web Map Service (WMS) standard focuses on the generation and retrieval of geo-referenced map images over the web. A key concept of WMS is that of a layer representing a basic unit of geographical information that a WMS client can request as a map image from a WMS server. A client can send at least two types of requests to the server: a *GetCapabilities* request, to acquire information about the available layers, and a *GetMap* request, to generate a map image for a particular layer using a specified geographic co-ordinate reference system and graphical style. As for the visualisation, this means that the client can be relatively simple since it only has to deal with static map images, while the hard and complex task of data access and map image rendering is performed by the server.

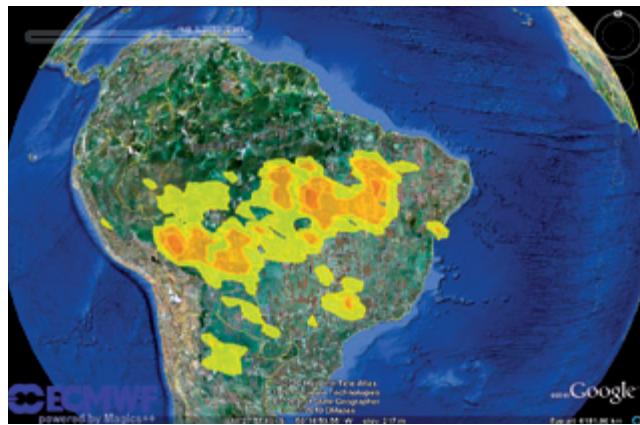


Figure 1 Snapshot of Google Earth showing the biomass burning product of the MACC (Monitoring Atmospheric Composition and Climate) project visualised through KML generated by Metview (download from <http://gmes-atmosphere.eu/fire>).

Users of WMS should be aware that not all providers guarantee the availability of their services, and network status and bandwidth can also affect performance.

WMS client in Metview 4

Client-Server architectures, such as used in WMS, fit very well into the service-oriented design of Metview. The Metview WMS client, whose icon can be seen in Figure 2b, was designed as a standard Metview module to provide an easy and powerful way to incorporate WMS map images into the Metview environment. The client offers a high-level user interface to build and perform the *GetMap* request. Also it is able to send the resulting map images to Metview's Display Window, which can overlay them with other sources of data.

The WMS icon editor provides two ways for users to generate a *GetMap* request: an interactive and a plain mode. In the interactive mode the editor resembles a web browser as shown in Figure 3. Once the WMS server's URL is typed in at the top of the interface, the client performs the *GetCapabilities* request and populates the user interface with the resulting list of layers and their meta-data. The available layer hierarchy is shown in the left-hand pane. When a layer is selected its properties can be further specified by the users: the map portrayal style and the various layer dimensions, which can typically specify the time and elevation of the layer, can all be set. Users can



Figure 2 Icons representing the *GeoToKML* module and WMS client in Metview 4.

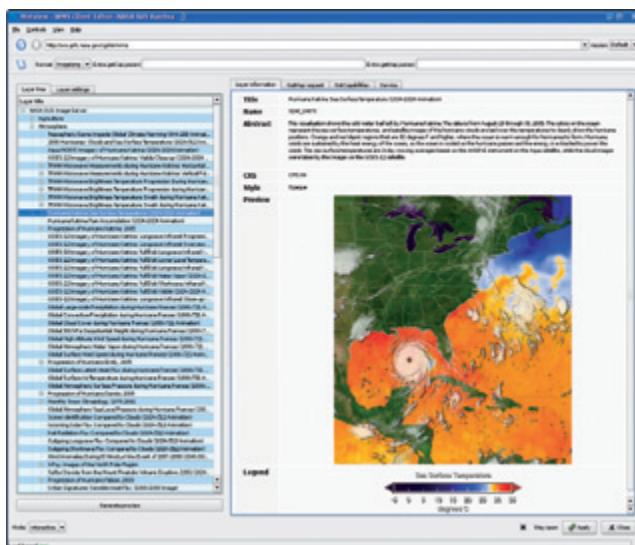


Figure 3 The WMS client's user interface in interactive mode to select and preview the layers provided by a WMS server, in this case NASA's Science Visualization Studio. The layer selected here is a composite image from various satellites showing the cloud system of Hurricane Katrina and the sea surface temperature.

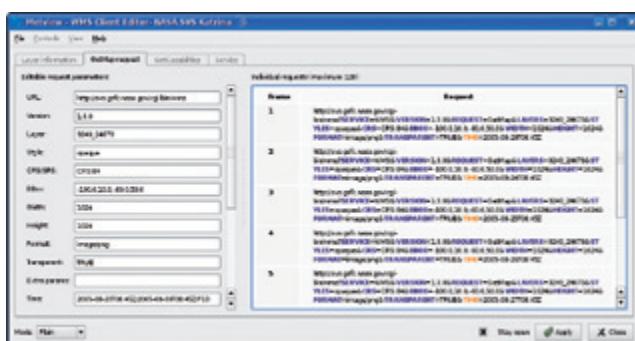


Figure 4 The WMS client's user interface in plain mode allowing the manual editing of the GetMap request.

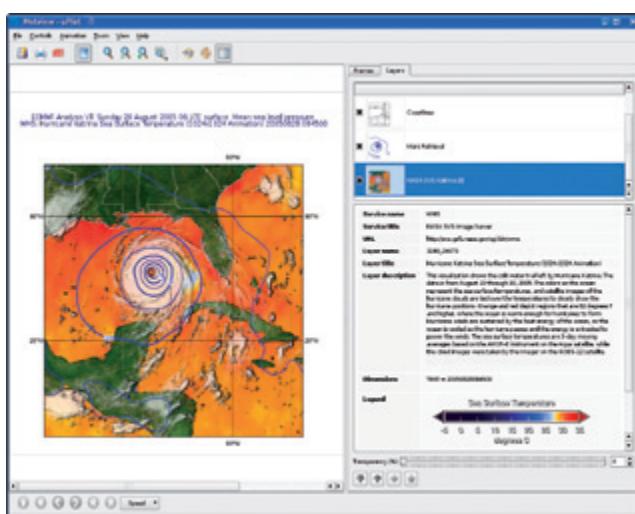


Figure 5 The WMS map image visualised in Metview 4, based on the GetMap request shown in Figure 4, overlaid with the corresponding mean-sea-level pressure analysis from ECMWF's MARS archive.

generate a preview at any time to see how the map image would look if the current settings were used. This preview, complemented with various layer meta-data, is displayed in the right-hand pane.

The *GetMap* request itself, built by the client, can also be inspected in the user interface but users need to switch to the plain editor mode to be able to manually change the request (Figure 4).

Once the *GetMap* request is defined it can be run and visualised by either right-clicking on the icon and selecting *visualise* from the context menu or simply dropping the icon into an existing Metview plot. The resulting WMS map image appears in Metview's Display Window and can now be overlaid with any other Metview charts (Figure 5). The meta-data associated with the WMS map image is displayed in the Layers tab of the display window.

Metview users will find a tutorial that goes into more detail how to use the WMS client on the Metview documentation web page at:

- <http://www.ecmwf.int/publications/manuals/metview/documentation.html>

The WMS client has been extensively used to test ECMWF's new WMS server (see the article in *ECMWF Newsletter No. 126*, 23–27) and to contribute to the work of the MetOcean Domain Working Group at the OGC. In this context, tests with various servers were made whose outcome is documented at the MetOcean DWG webpage at:

- http://external.opengis.org/twiki_public/MetOceanDWG/MetocWMS_WMS_IE_Retex

Ongoing work

Work on Metview's WMS client is still ongoing with a special focus on the support for various geographical co-ordinate reference systems and the caching of the WMS images. Parallel to this work clients are under development to access remote services of gridded data, similar to the MARS retrieval module. To be compatible with the EU INSPIRE directive, which establishes an infrastructure for spatial information in Europe to support environmental activities, it is also planned to access catalogue services from within Metview.

Meteorology and Oceanography Domain Working Group

The Meteorology and Oceanography Domain Working Group (Met Ocean DWG) is a community orientated working group of the Open Geospatial Consortium (OGC). The group does not directly revise OGC standards, but rather enables collaboration and communication between groups with meteorological and oceanographic interests.

The Met Ocean DWG maintains a list of topics of interest to the meteorological and oceanographic communities for discussion, defining feedback to the OGC Standards Working Groups (SWG), and performing interoperability experiments.