

IIIF-compliant multi-resolution access to spatio-temporal data and its application to Himawari-8 data

*Asanobu Kitamoto¹

1. National Institute of Informatics

Earth environmental data is large in space and time, and software for accessing data into arbitrary parts with arbitrary resolutions has been requested by many people. Various software systems that have been developed so far tried to fulfill those needs. Firstly, Google maps, and similar Web map services, proposed an access method called tiling that takes advantage of Web technologies. It standardized the unit of data access to a tile to enable the off-line rendering of huge number of tiles, the utilization of cache using fixed URIs, and succeeded in efficient data transmission by combining them with asynchronous access (called AJAX). These set of ideas are now standardized as Tile Map Service by Open Source Geospatial Foundation, and widely used as a standard spatial data service in the age of Web.

On the other hand, temporal data has not been standardized as spatial data. Several open source software libraries to visualize timeline are available, but none of them is regarded as the standard one. The author also worked on this issue in 2011 by developing software called SyncReel, which is used for multi-resolution access to temporal data such as weather chart data for 100 years, or AMeDAS data for 40 years. However, the variety of time series data makes it difficult to standardize the format to describe various events on the same timeline.

Our idea is to take advantage of an international protocol for accessing images called IIIF (International Image Interoperability Format), which was originally proposed for cultural heritage domains such as museums. We tried to apply this protocol to earth environmental data for multi-resolution access in space and time. IIIF is an international community whose activity has increased since around 2014. IIIF defines the JSON-LD format of information that data providers should offer, and a client that interprets the format can enjoy interoperability between different data providers and reduction of cost for implementing viewers. The most basic service is called IIIF Image API, which defines the standardized URI for accessing arbitrary parts of the image. This API does not depend on the type of images, so our idea is that this can be used as a basis for multi-resolution spatial access to earth environmental data.

We introduced this IIIF standard to a system for browsing visible images of Himawari-8 satellite. This system is composed of two sub-systems of a server and a client. The server system uses software called IIPIImage, which is compatible with IIIF Image API. IIPIImage was originally a high-performance image server developed for browsing high-resolution images in astronomy, but since version 1.0, it has functionality for IIIF. The client system uses software called Leaflet IIIF. Leaflet is a JavaScript library to work with tiled maps, so it matches well to IIIF which also uses tiled access, and it also offers advantage such as using libraries developed around Leaflet. These open source libraries enable us to develop a multi-resolution viewer with zoom-in/out functionality to access Himawari-8 visible images having the size of 11000 by 11000 pixels.

We developed this viewer more to release a new service called Himawari-8 Clipping. This is a service for clipping and a storing a rectangular region drawn on the viewer using a Leaflet-related library called Leaflet Draw. A clipped image is given a new URI with metadata, which may be useful for making the catalog of Himawari-8 images collecting meteorologically relevant scenes through collaborative work on

the Web.

In contrast to multi-resolution access in space, its extension in time is left for future work. The reason is the lack of time-series data in cultural heritage domains, where IIF was originally developed. However, time-series data is prevalent in scientific domains such as earth environment, and the necessity for standardizing access to time series is significant. Extension into this direction is now under study, but the presentation will refer to recent progress on this issue.

Keywords: multi-resolution access, spatio-temporal data, IIF, Himawari-8, standardization, image data