

# Web Based Atmospheric Radiation Measurement Satellite and Mesonet Data Viewers ([http://www.xdc.arm.gov/sisg/data\\_viewers](http://www.xdc.arm.gov/sisg/data_viewers))

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## Abstract

The implementation of a set of web-based viewers for mesonet and satellite data is presented. The mesonet data viewers were created to allow data users to plot different variables contained within a data set. The satellite data viewers were created to give a data user a quick overview of the conditions, data quality, and data availability during a particular time period as depicted by the satellite imagery. The overall aim of the web-based data viewers was to reduce duplication of effort by investigators, allow assessment of data quality and availability, and depict prevailing conditions while keeping the minimum amount of data online. This paper also addresses issues in using commercial software and alternate methods of implementation using public domain software.

## Introduction

Given the plethora of data that is available to an investigator, it is often advisable to take a quick look at the data to assess the quality and appropriateness to the study in question. On other occasions the motive for quick looks is to obtain prevailing conditions of the geographic area of investigation as depicted by the data set. However, a user may often balk at the time-consuming effort needed to take even a cursory look at the data. Often the effort undertaken in taking quick looks are duplicated by many investigators involved in parallel or similar studies.

The aim of the implementation of the Atmospheric Radiation Measurement (ARM) data viewers was to reduce the effort for investigators to assess 1) the availability and quality of the data and 2) the conditions during a particular time period for

experimental sites, as depicted by the parameters within the data set (Stokes and Schwartz 1994). An efficient method of displaying the satellite data had to be developed in order to minimize the online storage requirements. The data reduction and viewing scheme implemented for the satellite data has the added advantage of depicting the availability of the data over the time period shown.

## ARM Data Sets

The ARM project collects a multitude of data and provides them to investigators. Hourly National Weather Service data and 5-minute, 15-minute and hourly mesonet data at the Southern Great Plains (SGP) site have been chosen to be implemented for viewing over the web. The SGP data sets are in NetCDF format and consist of parameters ranging from 10-m winds, pressure and temperature to soil temperature at 10-m depth. File name conventions enable quick location and extraction of the data for the time period and location requested by the user. Geostationary Operational Environmental Satellite (GOES-8) and Geostationary Meteorological Satellite (GMS-5) hourly satellite infrared and visible data sets are used to provide an overview of the conditions at the SGP and Tropical Western Pacific (TWP) experimental sites.

## Viewer Implementation Method

All data viewers consist of a Hyper Text Markup Language (HTML) based web page, Perl routines in the Common Gateway Interface (CGI) and Interactive Data Language (IDL; Research Systems, Inc. 1996) procedures.

## SGP Data Viewers

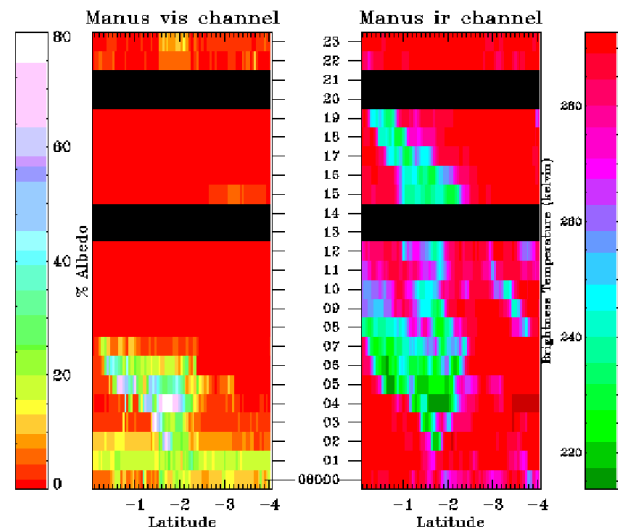
The user makes a selection in the HTML web page. The Perl routines in the CGI script interpret the output from the HTML web page and reformat the instructions for input into IDL procedures. The IDL procedures take the instruction, open the appropriate data set, create the plot and save it as an image in Graphics Interchange Format (GIF). The Perl routines then create an HTML page with a link to the plot image. The initial guidelines for incorporation of IDL routines into a real-time data viewer over the Web were obtained from OMNIWeb and COHOWeb, two data browsing and retrieval systems. (Mathews and Towheed 1995).

## TWP and SGP Satellite Data Viewers

The sheer volume of hourly geostationary satellite data (> 400 mb/day) necessitates data reduction while still preserving information on the conditions at the experimental sites. The method chosen for data reduction was to create Hovmuller diagrams from the hourly imagery for each experimental site. A Hovmuller diagram consists of 2D-images with one spatial and one temporal dimension (Figure 1). The latitudinal Hovmuller diagram for Julian day 80 1996 shows that cold clouds formed over the 147E at 02:00 GMT. In addition, the Hovmuller diagram shows that there were no satellite imagery available during the hours of 13:00, 14:00, 20:00 and 21:00 GMT. The satellite data are ingested and the Hovmuller diagrams in GIF format are created for each day. The ingest process includes routines that will automatically update and incorporate the days processed into the web viewer. The user can access the web page, choose the location, the day, and the type of Hovmuller diagram.

## Alternate Methods for Implementation

Often web services are a public service offered by an agency or educational institute and are run on shoestring budgets. A drawback in using commercial software for interactive plot creation over the web is that the number of users able to simultaneously access the service is limited by the number of runtime licenses available for the software. Each additional user requires that there be one more license on the machine. This either limits the number of simultaneous users,



**Figure 1.** GMS 5 Visible and IR Hourly Image Hovmuller Diagrams for Julian Day 080 1996 (Manus is located 15 147.0E 2.1S).

or necessitates the purchase of additional runtime licenses, which could be costly. Public domain graphics and plot packages may be the alternative to purchasing costly additional commercial software licenses. Alternative packages for graphics and plot creation are Generic Mapping Tools (GMT) (Wessel and Smith 1995) and PlotPlus (Denbo 1996). GMT creates plots and graphics in postscript, which would need to be converted to a web standard such as GIF through the use of low cost or free use software such as ghostscript (Aladdin Enterprises 1996) and imconv (San Diego Supercomputer Center 1996). PlotPlus combines the functionality of a data manipulation and creation of graphics and is a compatible alternate to commercial software such as IDL (Research Systems, Inc. 1996) and MATLAB (MathWorks 1996). Commercial software vendors could also consider offering their graphics and plot packages with the basic options at reduced cost for web use.

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