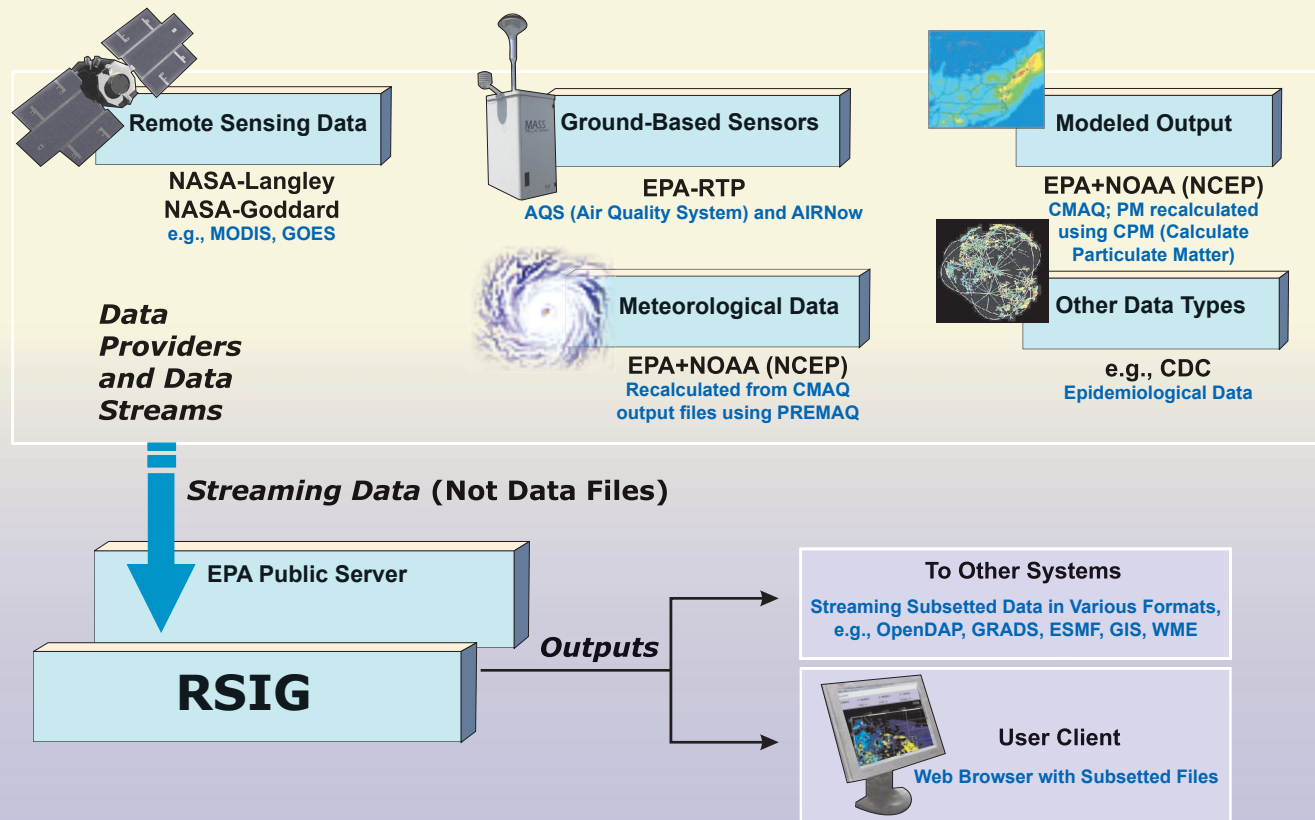


# Remote Sensing Information Gateway Components



## Current and Future Plans

The RSIG is focusing on air quality data as a first step because the relevant datasets are particularly large and complex, thus providing the best test case for truly integrating data. In the long-term, RSIG can be extended to access and integrate any kind of environmental data, such as groundwater modeling output or buoy monitoring data.

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To learn more about GEOSS visit: <http://www.epa.gov/geoss/>



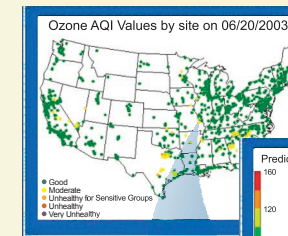
# Remote Sensing Information Gateway: A Joint Agency Information Gateway

Environmental researchers and decision-makers have an abundance of air quality data at their disposal—gigabytes, terabytes, and even petabytes of remote sensing, ground sensing, and model output data. But getting that data is not simple: datasets exist on remote servers, recording formats differ between different sensing instruments, and the environmental information for a specific time period or region could require weeks or months of downloading hundreds or thousands of separate files and then parsing them individually for the relevant data.

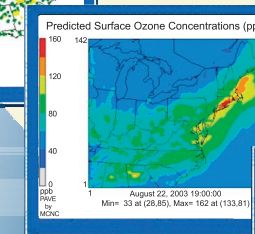
The Remote Sensing Information Gateway (RSIG) offers a new way for users to get the multi-terabyte, environmental datasets from which they want to extract specific data. The RSIG provides an interactive, Web browser-based interface with which users can easily select and stream to their desktop data files from multiple remote sources, and do it in minutes—a task that often used to take days.

The RSIG also allows users to integrate their selected datasets into a unified visualization. Users can tap into a wide range of key

## Monitoring



## Modeling



## Satellite



and Atmospheric Administration's (NOAA) air quality forecasts, the U.S. Environmental Protection Agency's (EPA) Community Multi-scale Air Quality (CMAQ) model output, and EPA's Air Quality System (AQS) observation data. The RSIG visualizes each dataset and overlays them on a map of the selected region. The RSIG automatically aligns information from various spatial positions and temporal scales into a unified structure.

Users and consumers of environmental data benefit from fast acquisition of only the data they want to see, in a standard format they can save to their desktop computers.

## The RSIG'S Role in Supporting GEOSS

The RSIG is one of the Office of Research and Development's key components of

the Global Earth Observation System of Systems (GEOSS), an initiative supported by 46 international governmental and private organizations and 71 countries.

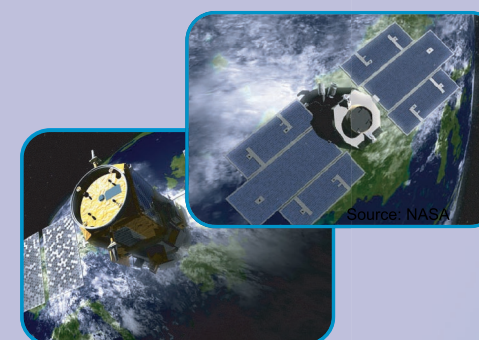
GEOSS is a large national and international cooperative effort to bring together existing and new hardware and software, making their outputs compatible, and supplying the data and information at no cost. Its aim is to build upon and improve coordination and centralization of Earth observation activities, datasets, and data management systems.

EPA is strongly committed to the GEOSS initiative, which supports the Agency's goals of protecting human health and the environment.

The RSIG is one of EPA's value-added contributions to the GEOSS effort that encourages exploration of vast environmental datasets using conventional Internet services. Users can combine and visualize datasets, transform that data into new knowledge, and transfer that knowledge into Agency decision-support systems, thereby improving the scientific foundation of environmental decisions.

## The RSIG and Interagency Partnerships

A key contributor to RSIG's success relies on EPA's data-sharing



environmental models and data, such as satellite data from the National Aeronautics and Space Administration's (NASA) Moderate Resolution Imaging Spectroradiometer (MODIS) and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) projects, the National Oceanic



collaborations with NASA and NOAA and leveraging resources already in place within the three federal agencies. EPA is working with consortia such as the Environmental Science Information Partnership (ESIP) to coordinate efforts across agencies.

NASA's participation involves making available atmospheric data collected from its space-based sensors. For example, CALIPSO and its companion satellite-based system, CloudSat, capture high-resolution, three-dimensional descriptions of clouds and aerosols around the globe. These data will provide vertically resolved estimates of the moisture content present in Earth's clouds and an indirect estimate of how clouds and aerosols contribute to atmospheric warming.

NOAA is a partner in computing the daily Air Quality Forecasts (AQF) by applying EPA's CMAQ model. The RSIG provides satellite-derived Aerosol Optical Depth (AOD) data in a format that NOAA and EPA's air quality modelers can use immediately, without the need for additional formatting or conversion.

EPA programs that could benefit from RSIG data feeds include EnviroMapper, Window to My Environment (WME), and Envirofacts. These applications are already interlinked, with EnviroMapper and WME using data provided by Envirofacts. The RSIG can supply satellite data to overlay current data in both WME and EnviroMapper to enrich the overall information value.

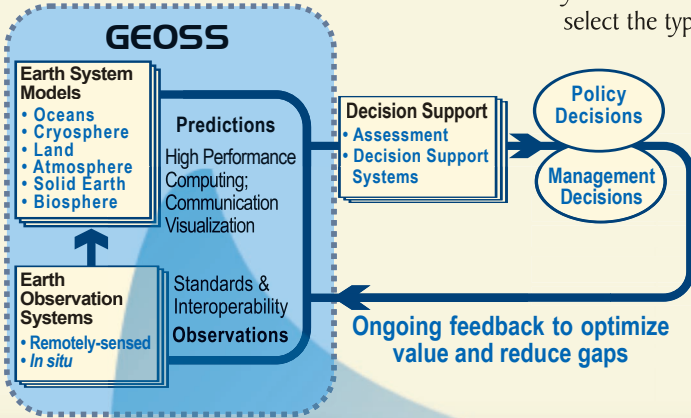
Using Portal and Science Connector to Access RSIG

The RSIG became available to internal EPA users in FY2007. In order to support the collaborative goals of RSIG, the system will be made accessible to outside users in FY2008 by way of the Agency's Portal (<http://portal.epa.gov>) and the Office of Research and Development's Environmental Science Connector.

How Does RSIG Work?

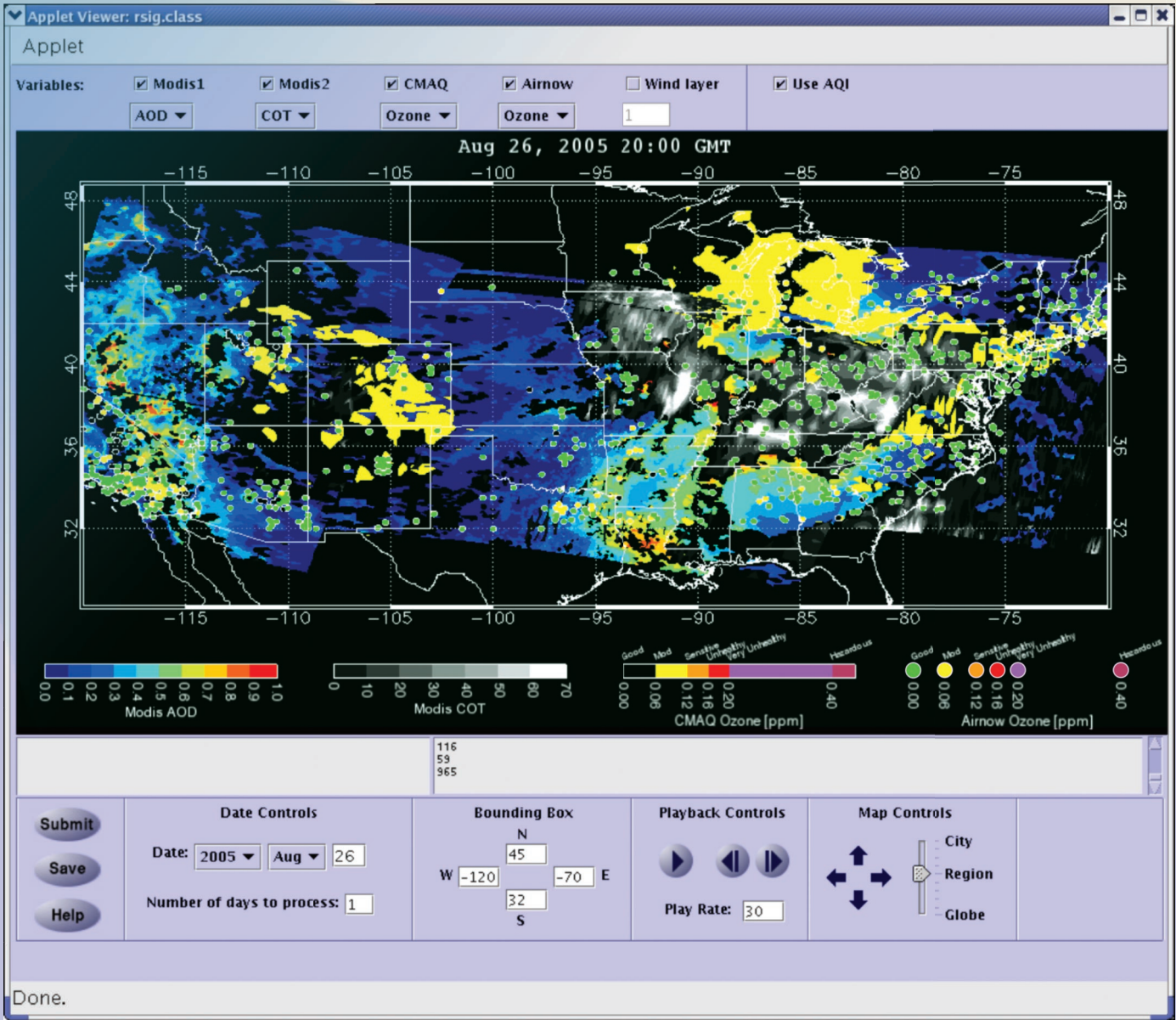
The RSIG is not a single program, but a set of many programs running on servers at selected EPA, NOAA, and NASA data centers. All NOAA and NASA data reside at their agencies' respective servers.

Part of the RSIG collaboration involves agreements with other agencies to place these small programs on an area of their servers so their data can be shared via RSIG.



Here's how users will work with RSIG:

1. At the EPA's RSIG Web site, click a link to start the application—which runs inside your browser—and, with the mouse, select the types of data you want to see: CMAQ, MODIS, AQS, and so on.
2. With the mouse, select an area on the map for which you want to see data, and then select the time period you are interested in—one day, two days, and so on.
3. After you click the Submit button, RSIG sends your requests to the NASA, NOAA, and EPA servers where the selected data resides.
4. The RSIG programs on those remote servers parse the multiple data files so that only the data you request is retrieved.
5. The remote RSIG programs stream the selected data back to the RSIG Web server at EPA, where another RSIG program builds the images and streams those images to your computer, where they are compiled in memory and displayed as an animation.



6. At this point, you can save the data and images in any of several standard formats. No files are saved to your computer until you click the "save" button.

Key Features of RSIG:

**One access point to many data sources.** The RSIG provides a single Web site that serves as a selective access point to many kinds of data.

**Streams only the needed data.** The RSIG subsets large numbers of files selected by the user from diverse sources, and streams the user-selected data back to the user's desktop. Streaming works in the same way as streaming audio works on the Web: the data goes directly to the client computer and is discarded unless the user saves it to a file.

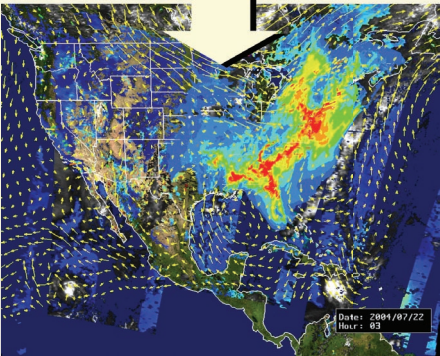
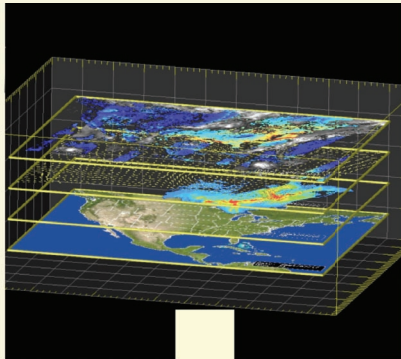
**Aggregates separate data files into a single stream.** The RSIG aggregates the multiple files of a given data type into a single entity, reducing the download burden and simplifying data analysis.



**Built-in visualization.** The RSIG can immediately integrate multiple selected datasets into a single MPEG animation. For example, EPA AQS data can be layered over NASA's MODIS satellite data, or a user can compare CMAQ predicted outputs alongside actual ground sensor data. The user can also save the animation or individual images to the client computer.

**Saves data to standard formats.** Users can save the data or visualization—or both—to their local computers in such standard formats as portable binary, ASCII, NetCDF, and MPEG. They can export the selected datasets from RSIG into other applications—such as Geographic Information Systems tools—for further analysis.

In the latest version of RSIG, version 2.0, users can save data files into the KMZ format, a compressed version of the Keyhole Markup Language (KML), which can be viewed in Google Earth.™



**Fast.** The RSIG accomplishes all of this far faster than a lone user could with currently available means. For example, RSIG can capture a week of MODIS AOD data in a few minutes, compared to two months using conventional methods.

