

P1.3 MAKING NASA EARTH OBSERVING SYSTEM SATELLITE DATA ACCESSIBLE TO THE K-12 AND CITIZEN SCIENTIST COMMUNITIES

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1. INTRODUCTION

The Atmospheric Sciences Data Center (ASDC) at NASA's Langley Research Center houses over 700 data sets related to Earth's radiation budget, clouds, aerosols and tropospheric chemistry. These data sets were produced to increase academic understanding of the natural and anthropogenic perturbations that influence global climate change. Though extremely useful, the native data format and large file sizes of these data are often daunting and confusing to educators and the general public. Therefore, the "Mentoring and inquiry using NASA Data on Atmospheric and earth science for Teachers and Amateurs" (MY NASA DATA) project has been established to systematically support educational activities at all levels of formal and informal education by reducing these large data holdings to 'microsets' that will be easily accessible and explored by the K-12 and citizen scientist communities. This manuscript reports the status of the MY NASA DATA project and the recent success of the first annual MY NASA DATA Summer Teacher Workshop, which was held in August 2004.

2. THE MY NASA DATA WEB SITE

The educational microsets are being made available on the MY NASA DATA Web Site, established in December 2003 (see Figure 1). The site is also being populated with lesson plans, computer tools, data documentation, and an earth science glossary. The URL for the Web Site is <http://mynasadata.larc.nasa.gov>. Currently, the MY NASA DATA Web site caters to K-12 educators, but a new area of the website is planned for 2005 to draw specialized interest from amateur scientists. More advanced project ideas and computer tools are being investigated for this area of the site.

An open source component of the Web site will enable practicing teachers or citizens to submit lesson plans or tools that they have created and/or utilized with the data for sharing with other users. Also, the MY NASA DATA project will be reaching out to the citizen scientist community, both as data users and a source for project ideas. An online registration and submission

form is now available and entries are highly encouraged. The MY NASA DATA team analyzes all submissions for correctness and relevance before they are included in the public materials.

3. MICROSETS AVAILABLE

Both static and custom microsets are available for analysis and download from the MY NASA DATA Web site. The static microsets have been created in simple ASCII text format and serve to investigate a single parameter, event or region for a variety of educational topics. Parameters include basic science quantities such as temperature, cloud cover and ozone amount. Corresponding lesson plans are also supplied to assist in teaching and are directly linked to national standards of learning. Most lesson plans also engage students in the use of computers and the Internet to collect and compare informational resources.

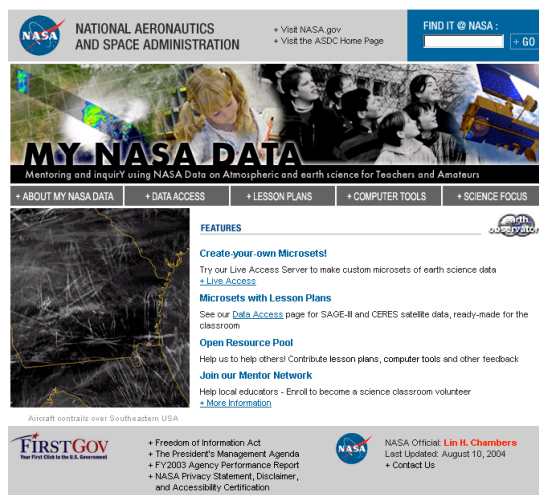


Fig. 1. The MY NASA DATA Web site

Special MY NASA DATA microsets will also be made in support of NASA's GLOBE project. The GLOBE project has over 14,000 registered school locations that have logged millions of environmental observations since 1995. MY NASA DATA microsets will correspond to the locations and times of GLOBE student observations of cloud cover for starters. GLOBE schools will then be able to retrieve and

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visualize Clouds and Earth's Radiant Energy System (CERES) satellite data, for example, on the GLOBE site specifically for their site location. The same microsetting process will be applied to Students' Cloud Observations On Line (S'COOL) site locations. S'COOL currently has a membership of 1700 schools having reported over 30,000 observations since 1997. Over 9000 of these observation reports have corresponding satellite data, with more to come.

A Live Access Server (LAS) has also been implemented on the MY NASA DATA Web site. LAS is a user interface to data created by NOAA/PMEL for data visualization and analysis (see Figure 2). LAS allows

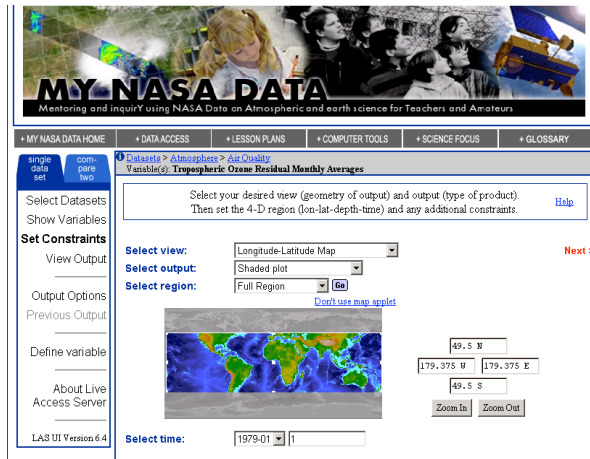


Fig 2. The Live Access Server (LAS) User Interface

users to create custom plots or text output of a selected parameter for any region or time period covered by the selected dataset. The colored plots can be maps, line plots or Hovmoller diagram (parameter for latitude or longitude versus time). Five ASDC data projects are currently available in LAS, making over 148 parameters

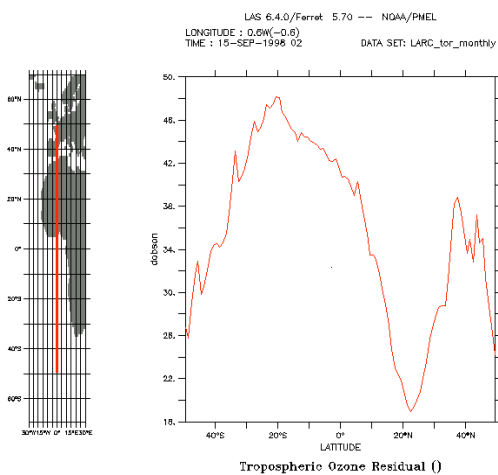


Fig 3. Example of a LAS line plot, in this case, Tropospheric Ozone Residual vs. Latitude

available for possible microsets and plots. The projects include CERES, the International Satellite Cloud Climatology Project (ISCCP), the Surface Radiation Budget project (SRB), the Multi-angle Imaging Spectrometer instrument (MISR), and Tropospheric Ozone Residual (TOR). The parameter selection within the interface is governed by Global Change Master Directory (GCMD) data categories. Quick links to the user interface help, data documentation, and the MY NASA DATA earth science glossary are available from the LAS interface. Example plot output is provided in Figures 3, 4 and 5.

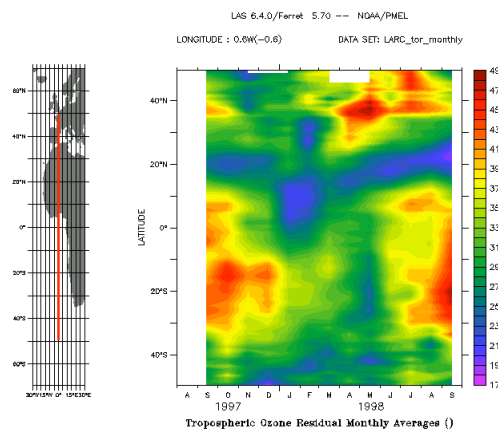
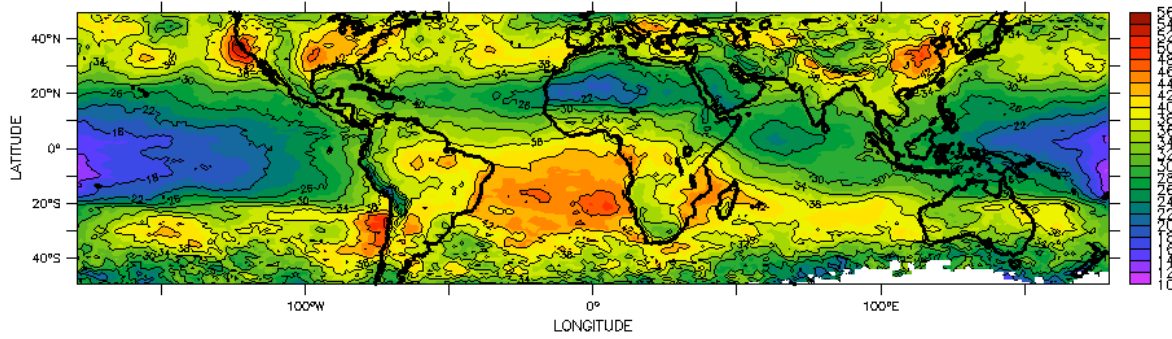


Fig 4. Example of a LAS Hovmoller diagram, in this case, Tropospheric Ozone Residual at a given longitude vs. time

4. LESSON PLANS AND COMPUTER TOOLS

Lesson plans and computer tools, designed for the K-12 education community, are being made available on the MY NASA DATA Web site. Using the requirements stated in the national science, math and computer technology Education Standards, materials are being developed with the objective of incorporating authentic data into the classroom where arbitrary data is often used for analysis and teaching. After a particular learning objective or education standard has been targeted for lesson development, available microsets are explored to determine which microset, within appropriate parameters, would most effectively meet the data-application portion of teaching the objective. A problem- or inquiry-based lesson is then developed following a teacher-developed lesson plan template. Extension activities are included to challenge the student to access and analyze additional related data.

Additionally, to motivate student interest in data analysis as a learning tool, computer software applications used in authentic scientific analysis, such as Excel, IDL Virtual Machine, and ArcVoyager GIS are available for teachers to introduce and utilize within the curriculum. For some lessons, the computer tool is incorporated into the procedure of the main lesson. In other cases, the computer tool is suggested as a method of implementing the Extension Activity. All



Tropospheric Ozone Residual Monthly Averages ()

Fig. 5. Example of a LAS map, in this case, Tropospheric Ozone Residual for September 1998

lesson plans and tools aim to be age-appropriate at the teacher's discretion. Again, educators and amateur scientists are encouraged to submit lesson plans and tools that have been demonstrated as successful methods of using MY NASA DATA microsets in the classroom.

5. TEACHER WORKSHOPS

The first annual MY NASA DATA Teacher Workshop was held at NASA Langley Research Center on August 4-11, 2004. Seventeen participants from twelve states and Puerto Rico (Fig. 6) included middle school and high school math and science educators, along with teachers of upper-elementary gifted students. The objectives of the workshop focused on accessing microsets of atmospheric data, exploring model lessons using microsets, exploring data-collection methods used by scientists, and integrating examples of data collection and analysis into the curriculum. Each participant had an opportunity to access MY NASA DATA microsets, as well as to analyze real-time data using the computer tools available on the Web site. An opportunity was provided for cooperative planning for microset application within the curriculum.

To gain relevant math and science content, participants explored topics in atmospheric science, use of weather measurements and hands-on classroom activities. Participants experienced meaningful field trips and benefited from the expertise of nationally recognized atmospheric researchers. Each day, the participants contributed feedback and suggestions about workshop and instructional materials. Participant feedback and curricular contributions will be enlisted as further development of microsets continues. Already, participants have requested a MY NASA DATA presenter's packet to be created such that they may serve as "ambassadors" to present MY NASA DATA materials during local or regional in-service training, as well as presenting at regional and state conferences.

While technical and content-related support of the first summer workshop graduates continues, plans are underway for next summer's workshop. Lessons learned, feedback and lesson contributions from workshop participants, and suggestions for improvement from MY NASA DATA team members are being studied for feasibility of inclusion in future workshops. Application packets will be developed and posted on the MY NASA DATA Web site in the next few months.



Fig 6. Teacher Workshop Participants and Staff for the first MY NASA DATA teacher workshop.

6. MENTOR NETWORK

Sometimes teachers are required to educate their students in science without specific training in certain scientific concepts or educational materials, and often these teachers can spare little time to seek resources to improve their science teaching. Therefore, the MY NASA DATA project will also focus upon establishing a mentor network where local citizen scientists can register and be matched to local K-12 teachers to assist with science education inside or outside the classroom. Potential mentors will be solicited through the Society for Amateur Scientists (SAS) at their annual meeting next week in Las Vegas (January 13-16, 2005). The local teacher or parents of students may also identify other mentors. Again, an online registration form has been implemented on the MY NASA DATA Web site for easy identification and matching.

7. CONCLUSION

Mentoring and inquiry using NASA Data on Atmospheric and earth science for Teachers and Amateurs (MY NASA DATA) is a web-based source of NASA satellite-derived data and instructional guidance for education and the general public. The data on the Web site are actually microsets of larger data sets available from the Atmospheric Sciences Data Center at NASA Langley Research Center. The MY NASA DATA project welcomes relevant contributions of corresponding lesson plans, computer tools and project ideas to share with others - especially successful uses of the MY NASA DATA resources in the classroom. A mentor network is also included as a possible resource for teachers and citizen scientists for sharing knowledge and opportunities to incorporate real data into classroom curriculum. Please contact the MY NASA DATA development team for further information, assistance or to provide feedback, suggestions or ideas (email: mynasadata@larc.nasa.gov).

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