

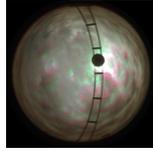
An Atmospheric Visualization Collection for the NSDL

Christopher Klaus, Keith Andrew, Gerald Mace, and Erik Vernon

What is in the Atmospheric Visualization Collection (AVC)?

The AVC contains (or will contain):

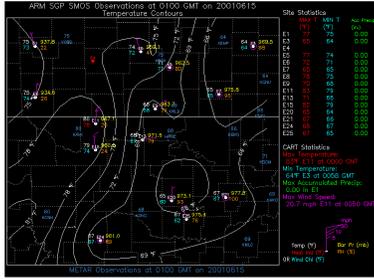
1. weather images of observational data from the Southern Great Plains (SGP) for use in research and education,
2. a repository of visualization codes used to form these images,
3. a web forum for collaborative discussions, and
4. lesson plans using these images at various education levels.



Weather images that stretch to each horizon forming animations of daily cloud cover.

Collaborations

1. National Science Digital Library (NSDL) projects
 - a. Development of a NSDL white page.
 - b. University Corporation for Atmospheric Research (UCAR)
 - c. Sharing of visualization tools.
 - d. Working together to make this collection part of the Digital Library of Earth Science Education (DLESE).
3. Los Alamos National Lab (LANL) / ARM Outreach
 - a. Sharing text lessons for web based development.



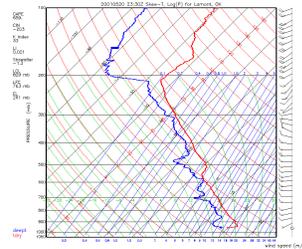
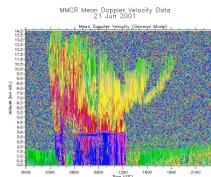
Contour Plots

- Barometric Pressure
- Temperature
- Relative Humidity
- Precipitation
- Dewpoint Temperature
- Wind Chill / Heat Index



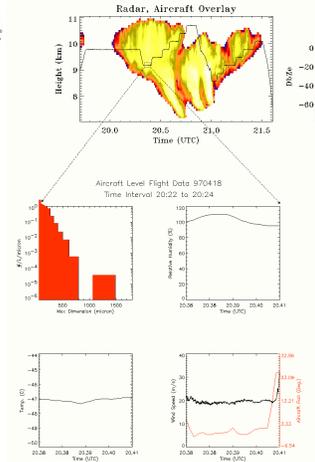
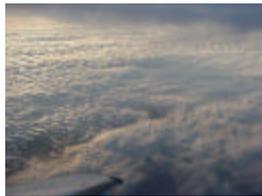
Cloud Images

Aerial and ground based data for investigating clouds.



Basic models

Calculations to develop common meteorological tools like Skewt plots.



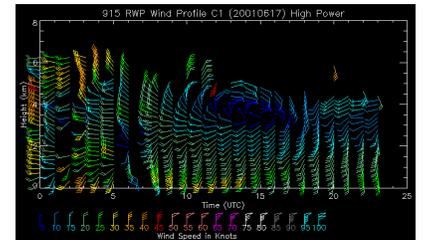
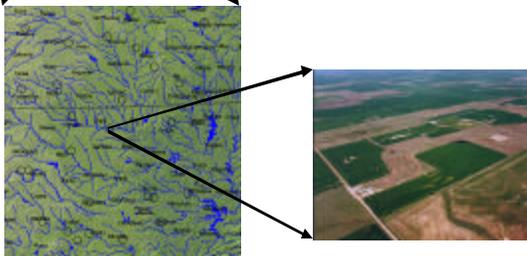
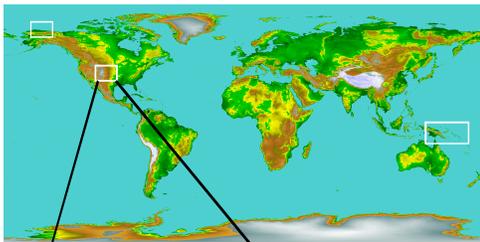
Why focus on SGP data?

The SGP site is part of the Atmospheric Radiation Measurement (ARM) Program, which is the largest global change research program. During the course of the year the SGP site plays host to virtually every cloud type, as well as providing various climates. Over the last 10 years, ARM has collected over 13 terabytes of field measurements of which the majority is from the SGP. In addition to the qualitative and quantitative benefits of SGP data, the images can be produced in near real time.

Development of a Software Repository

A software repository is being developed to allow access to visualization codes for both the educational and research community. The quote below reflects the ARM Working Group's belief that such a repository is needed by the ARM Scientists. We believe open access for everyone to such codes will encourage future development efforts of better visualization capabilities.

"Establish a web-accessible repository for PI developed data handling software (shareware)"
 The ARM IRF Working Group 2000: A Summary of Accomplishments, Strengths, Weaknesses, and Ideas for Future Activities, page 10.



Funded by the NSF National Science Digital Library (NSDL) program and the DOE Atmospheric Radiation Measurement (ARM) program.



Profile Plots

1. Vector Wind Fields
2. Temperature
3. Pressure
4. Water Vapor
5. Reflectivity
6. Vertical Velocity

An Atmospheric Visualization Collection for the NSDL

Christopher Klaus, Keith Andrew, Gerald Mace, Tim McCollum

Our user community has started with an outreach program to middle school and high school physical science teachers. These teachers are initiating classroom and student based atmospheric projects that will use a wide range of weather images available through this collection. These instructors are establishing connections to students, other teachers, and are preparing to expand to a national base of users. The teachers will author, contribute, and evaluate material being developed for this growing community.

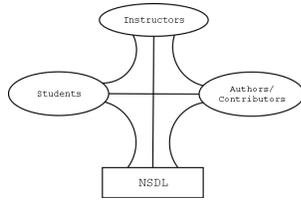


Figure 1. A General Model for Website Evaluation

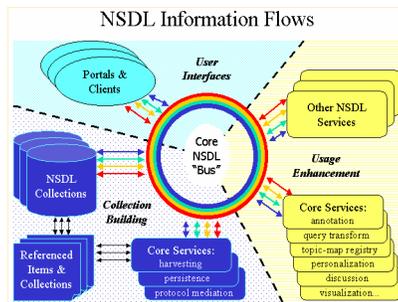


Opportunities for Community Development

1. Teachers interact with scientists and students.
2. Teachers interact with teachers.
3. Teachers become authors and reviewers.
4. Students mentored by teachers.
5. Students develop nontraditional learning groups.
6. Students become authors and evaluators.
7. Learning communities may be unstructured, independent of age training and ability, sharing a common interest.

Educational Outreach

1. In-service teachers
2. Undergraduate students
3. K-12 students
4. Graduate students
5. Community outreach

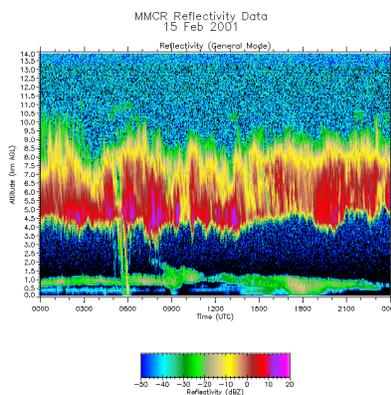


Graduate Program for in-service teachers EIU- MSNS Program

1. Courses based on ARM weather data.
2. Web based courses using ARM data.
3. Teachers developed lesson plans.
4. Opportunities for teacher authorship with scientists.
5. Teacher assessments of weather images.
6. Projects applying data in K-12 classes.
7. Annual NSDL seminars.
8. Graduate assistantships for atmospheric studies.
9. Thesis opportunities.

Students predict cloud formation

1. Wet and dry bulb temperatures used in lab.
2. Dew points and lapse rates defined and plotted.
3. Computer generates humid air-mass.
4. Students interactively locate cloud boundary.
5. Examine cloud properties from ARM data.
6. Calculate lifting condensation level.

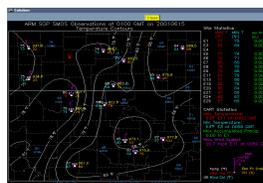


Interactive Empirically Based Education Modules

1. Graduate students design a small scale weather grid, the "nanonet".
2. Each school collects data and contributes to the local nanonet database.
3. Students opportunities to construct and design weather instrumentation.
4. AVC coordinates collection and sharing of data for schools.
5. Students interact with scientists and utilize ARM data for classrooms.

Development of Isoleths and Lessons

1. Barometric pressure
2. Temperature
3. Relative humidity
4. Precipitation
5. Dewpoint temperature
6. Wind chill / Heat index



Students Interactively Construct Contour Plots

1. Near real time data of SGP site presented
2. Students interactively place contours on the map
3. Program constructs solution contour map
4. Compare student and solution maps

Assessment of Activities

- Evaluation Rubric for development of materials pioneered by teachers
- Lesson plans evaluated by teachers prior to posting
- Web base rubrics for evaluations.
- Usage statistics for data and educational materials compiled for several years
- Evaluation in conference-workshop and classroom settings

