

**AUTHENTIC RESEARCH EXPERIENCES FOR STUDENTS USING EDGCM TO SIMULATE EARTH THROUGH TIME.** M.A. Chandler<sup>1</sup>, L. E. Sohl<sup>1</sup> and J. Zhou<sup>1</sup>, <sup>1</sup>Columbia University and NASA Goddard Institute for Space Studies, 2880 Broadway, New York, New York, 10025, mark.chandler@columbia.edu

**Introduction:** The main objectives of the Educational Global Climate Modeling project include:

- 1) Providing training to educators in the use of a Global Climate Model (GCM), with the intent of immersing teachers and their students in authentic research experiences that employ planetary simulators. Such experiences involve students in the full scientific process: hypothesis development, experiment design, running simulations, data analysis and visualization, and finally, reporting results.
- 2) Facilitating subject matter learning in key science disciplines such as computer modeling, climate change, and the search for habitable planets. The goal being to promote science literacy in these highly public disciplines, but also to encourage more students to pursue STEM disciplines as careers.

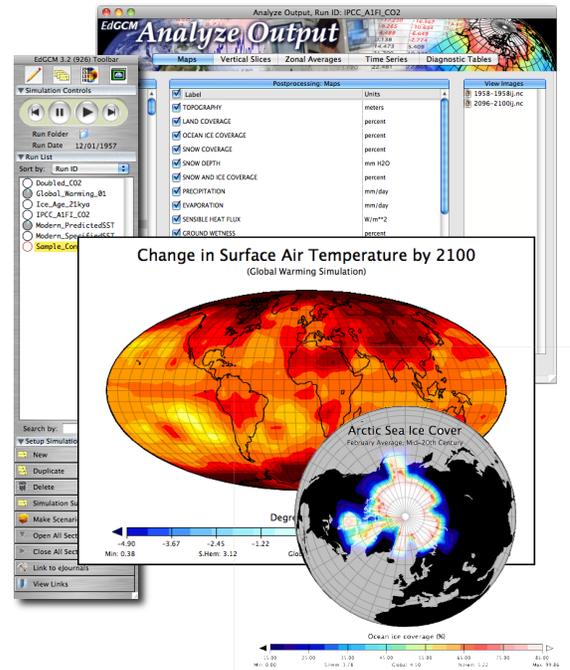
In order to accomplish this the EdGCM project created a suite of tools and Web 2.0 utilities that make it possible to operate a desktop version of the NASA-GISS Global Climate Model in a classroom setting. An authentic research experience can be accomplished using computing resources already available at most schools. Internet connectivity enhances the level of support and communication with NASA scientists, but is not necessary for a complete research experience given that the tools are user-friendly and there is an existing library of pre-set simulations.

The EdGCM Project is specifically designed to allow teachers and students to explore the fundamentals of climate science utilizing the tools identical to those used by major national climate-change research programs. Many basic experiments are possible (e.g., how does the sun warm the earth?), but it is also possible to conduct in-depth, research quality investigations.

Included pre-set scenarios cover topics as far ranging as future global warming to ancient snowball earth episodes in geologic history. However, teachers and students can easily construct their own research scenarios to satisfy individual curriculum needs, to explore current event topics, or to align with new science initiatives, such as exoplanetary research.

Extreme climate simulations allow students to explore the potential for GCMs to simulate the habitability of Earth through time, as well as habitable planets elsewhere in the universe. This puts students at the forefront of an exciting, cutting-edge field that climate modelers are themselves just beginning to explore.

**The EdGCM Software.** Since EdGCM is a tightly integrated suite of software, it simplifies the management of a research-quality climate model by using a traditional point-and-click interface (see figure). Experiments are automatically archived in a searchable database and easy-to-use utilities aid students in the analysis and visualization phases of a project. The software is also flexible enough to allow teachers to configure the interface for different levels or topics and to incorporate their own instructional materials (text, charts, images). EdGCM also allows teachers and students to produce reports (text and images) and export them to the web in the format of a scientific manuscript so they can complete the scientific process by communicating their results to a broader audience.



With this type of research-quality resource in place, it becomes possible to link student research projects in the classroom to research projects at national labs and universities. The EdGCM project strongly encourages and facilitates such collaborations through online professional development, electronic forums, and many direct partnerships. Ultimately remote groups of students could even work together on projects and share their experiments and scientific findings in a truly authentic experience that mimics how teams of scientists work in large-scale research programs.