Visualizing Data – I can see what?!!

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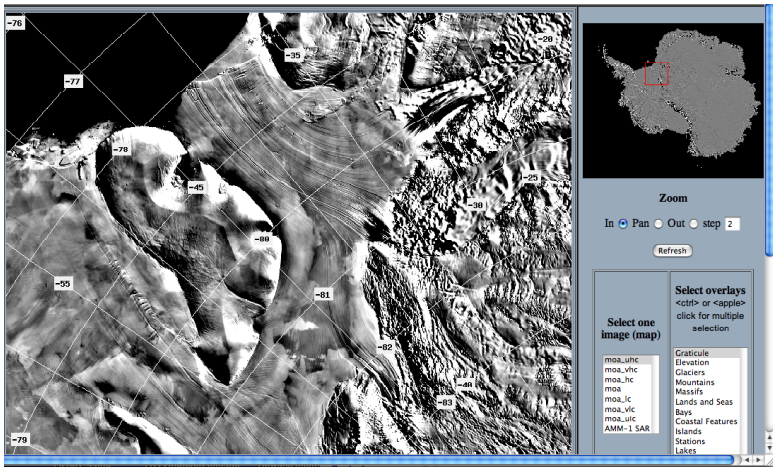
Students learn about satellite data and polar processes by exploring the 'Mosaic of Antarctica'

The Antarctic environment is a remote and fascinating world of glaciers, mountains, subglacial lakes and ice sheets that capture the imagination of people of all ages. Satellite data provide a tool for students to personally explore this continent, identify landscape features and processes, and look 'beneath the glacier'. Students become excited when they can successfully identify a subglacial lake or an ice stream from satellite imagery and often desire to look further into the dataset, and for some into the science behind the data. The Mosaic of Antarctica (MOA), a seamless digital map created from visible and radar satellite imagery, is a visually rich data set offering a mixture of identified and identifiable ice features and processes. MOA is an excellent vehicle for engaging student learning. http://planet.sr.unh.edu/MOA/

How should teachers unleash students on this dataset? Consider a topic that students can learn about through this experience. Emerging research suggests that there are more than 200 subglacial lakes in Antarctica, and that these lakes may be key components in regulating the flow of ice streams that move ice from the center of the continent to the oceans. Identifying where the subglacial lakes are found in Antarctica is the first step in understanding the role of these lakes in ice sheet movement.

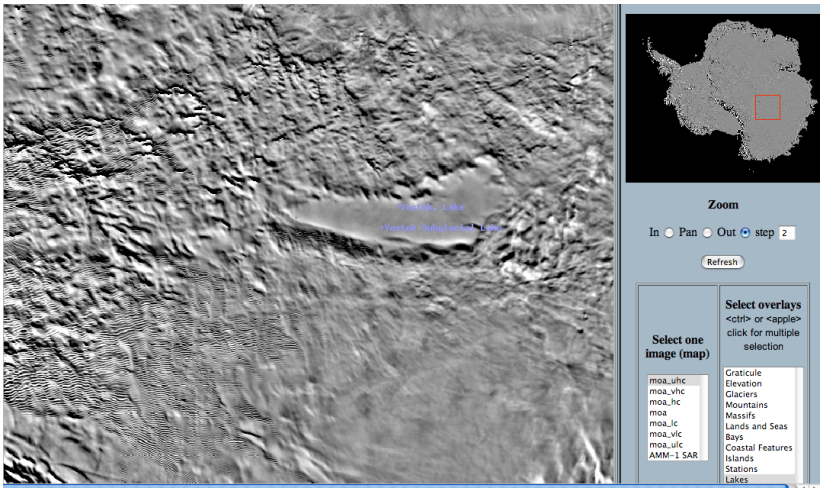


There are several ways to expose students to this new topic. The traditional way would involve providing the information to the students in a lecture. This format would require that they dutifully jot down this information in their notes and log it away as information they learned in class, and are able to retrieve at test time. An alternative teaching style allows students to explore the data directly. The teacher offers a guided introduction to the Mosaic of Antarctic, and then provides time and incentive to more fully explore the data by posing several targeted "research" questions. Students who have independently explored the MOA data set will be personally engaged with the topic. Their own 'uncovering' of a subglacial lake in the mosaic is like exploring the Antarctic themselves. Through their first hand exploration of the data they will *see* the data, *understand* it and will more likely *remember* the information at test time!

A carefully scaffolded exploration can be very successful and still allow for autonomous use of the data. A quick orientation on how to use the data tool is essential for the students to feel successful, and not overwhelmed when they begin to the use mosaic on their own. The

features are more easily identifiable using the highest definition imagery (moa_uhc). The "graticule" feature adds latitude and longitude information to the data, which provides a way to point students to interesting features within the data.

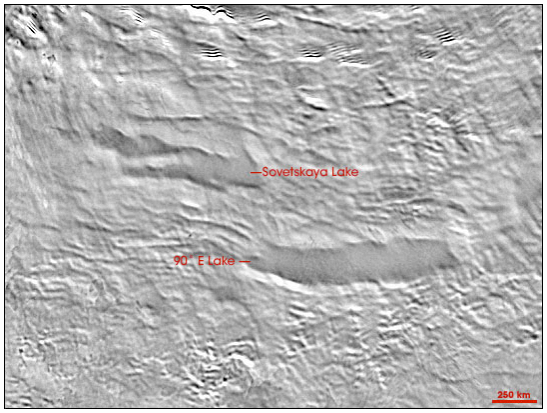
Working as a group, the teacher can point out large, easily identifiable features such as an ice streams, walking students through the process with immediate success. Ice streams that move over water appear as smooth flattened surfaces in the imagery (fig.1), a concept that students will need for locating subglacial lakes in the data.



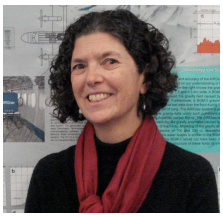
From identifying an ice stream, students can readily move to locating Lake Vostok, the largest subglacial lake in Antarctica. First identified in 1996, the 350 meter deep lake lies beneath 4000 meters of ice, and is the size of Lake Ontario. Lake Vostok is easily identifiable in the MOA imagery (Fig. 2), with its kidney bean shape, and typical subglacial lake features of a smooth surface over water, and a trough/ridge on its boundaries as ice reconnects to bedrock. Students can browse the data and search for the lake on their own. After time for individual exploration, the MOA overlay of lakes can be selected, pointing Lake Vostok and others out on the satellite image, offering immediate feedback to the students' own exploration.

Since the MOA was compiled, two more subglacial lakes have been discovered in the same area of Antarctica. Refocusing students to the same area of mosaic set them loose with their newly acquired sleuthing skills to look for these newly located subglacial lakes. As these lakes are not yet identified in the satellite mosaic the students will need to rely on their own scientific investigative skills to complete this task.

The key to successful use of this product for both the teacher and the students is to support the students in a group introduction to the data, followed by a narrow scope in the research questions posed. A targeted focus engages the students through the freedom to be 'detectives' and uncover their own answers through launching them into open-ended inquiry in the dataset.



Further resource:
http://earthobservatory.nasa.gov/Study/MOA/
http://www.ldeo.columbia.edu/edu/polareducation/
(curriculum activity developed using MOA)



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