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Using Documentaries for Earth Science Education

With the success of *An Inconvenient Truth*, a movie about former U.S. vice president Al Gore's campaign to educate the public on global climate change, long-form documentaries, particularly those concerning environmental issues, are enjoying a renaissance. These films can be a powerful educational tool because they create teachable moments by heightening students' interest in environmental topics. Successful documentaries engage the audience emotionally and tell a compelling story, with heroes and villains. Often films touch on some scientific concepts and may even contain graphics and animations that are useful in explaining processes. However, they generally do not provide a balanced exposition of the science and technical issues that underlie the environmental problems described. Documentaries may advocate a particular policy position.

Using advocacy documentary films in an educational setting not only demonstrates the social relevance of science but also provides an opportunity to impart critical thinking skills to students. Are the claims made by the film consistent with scientific knowledge? What aspects are technical and what aspects are social? Is the position espoused by the filmmaker the only "correct" position, or does the other side have legitimate reasons for pursuing a different approach?

Researchers involved with the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), have developed a formula for using documentaries to promote education. Their program, called "Let's Talk About Water," focuses on water issues through a format that consists of viewing the documentary with a carefully selected (and prepared) panel and having a question-and-answer (Q&A) session following the film. Several "Let's Talk About Water" events have been successfully presented on multiple college campuses thanks to this easy-to-follow formula, which serves to maximize the effectiveness of Q&A sessions after films.

Setting Up a Documentary Film Event and a Panel of Speakers

CUAHSI developed its approach after attending many events where the Q&A formats after movies generally did not work well. Panelists often gave extended speeches that did not directly address topics raised by the film and failed to connect the dots between events depicted in the film and issues relevant to the audiences' lives.

The "Let's Talk About Water" format addresses these problems with thoughtful preparation and careful execution of the event. There are four important steps to prepare for these events.

First, identify and attract a specific audience. CUAHSI specifically targeted lower division undergraduates to teach them about the importance of water science and attract them to water science careers. For example, a multicampus event in Boston, involving the University of Massachusetts Boston, Northeastern University, and Tufts University rotates annually among the campuses to expose undergraduates to these different campuses and their graduate programs. For the past 4 years, CUAHSI staff have worked with instructors in entry-level Earth science, engineering, and public health courses to offer extra credit to students who attend the "Let's Talk About Water" events. This has helped to attract audiences of about 200 students to each film viewing and subsequent discussion.

Second, "build the buzz." Advertise in student newspapers and local media outlets. Generally, science writers for local newspapers are happy to include the events in their paper's calendars and mention them in columns. To promote "Let's Talk About Water," CUAHSI has used student clubs to develop posters and generate student interest in the event.

The documentary films featured in "Let's Talk About Water" events have included *Flow: For Love of Water* (a film about businesses exploiting water resources through privatization and manipulation of pollution regulation); *After the Flood* (a film set in the future, after levees in the Netherlands have failed, that interweaves this fictional telling of the future with factual presentation of climate change impacts); and *Gasland* (a film about natural gas extraction through hydraulic fracturing). Additionally, CUAHSI has shown dramatic Hollywood films during the week leading up to the event to build an audience: *Chinatown* (inspired by California's notorious water disputes of the early twentieth century) was shown at the University of California, Irvine, and *A Civil Action* (based on a true story about industrial pollution of water supplies in a small Massachusetts town) was shown at Boston's multicampus event. Such films localize the problem and motivate students.

Third, get a headliner to add star power to the panel. If the budget allows, get a big name on the panel. Jan Schlichtmann, the real prosecuting attorney in the case featured in *A Civil Action*, appeared on the Boston panel for a fraction of his usual fee due to his interest in education. His insight was invaluable—his experiences really connected with students. Including heads of local water management agencies and other "real-world" entities adds dimension to the discussion and credibility to discussions of

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Scientific Network to Decipher Crustal Evolution of the Arctic

The tectonic evolution of the regions in and around the Arctic remains highly debated due to a lack of geologic knowledge, the region's geologic complexities, and the logistical difficulties of working at extreme latitudes. For example, the northward continuation of Paleozoic (~545- to 250-million-year-old) mountain belts is predicted yet unrecognized, and the tectonic development of the Canada Basin—which defines the nature of the crust in and around the Arctic—is still debated, partly because few research projects are regional in scope or link the submarine and subaerial environments. This has led some to speculate, for example, that oceanic crust underlies the

entire Amerasian Basin, whereas others indicate a much more limited extent within the Canada Basin.

A contributing factor in the development of such conflicting hypotheses is the traditional segregation of land- and marine-based researchers: Over the past several decades, Arctic campaigns have conducted marine, aerogeophysical, and geological investigations [e.g., *Lawver et al.*, 2010], but few of these have integrated onshore and offshore environments. To address this shortcoming, a new multinational, multidisciplinary science network called the Circum-Arctic

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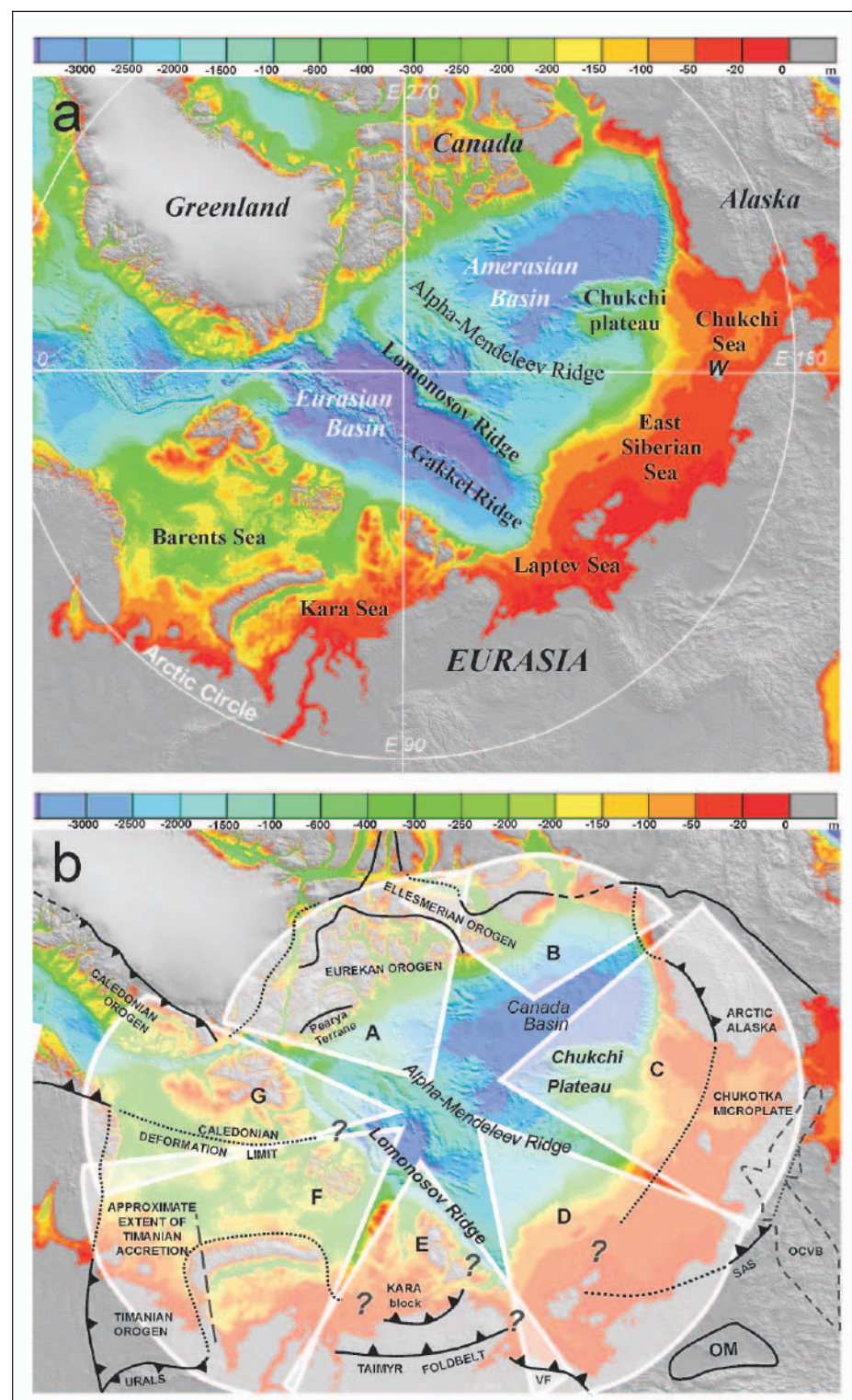


Fig. 1. (a) Geographic features of the modern Arctic Ocean. (b) Circum-Arctic Lithosphere Evolution (CALE) teams. On this Eocene (circa 55 Ma) Arctic reconstruction, the Eurasian Basin and the Fram Strait have not yet opened [after Pease, 2011]. The translucent white regions represent the territories covered by the seven regional teams of CALE. Main tectonic elements of the circum-Arctic region are shown, including orogens and faults (solid where known and dotted where inferred, thrusts if recognized). Also labeled are the Okhotsk-Chukotka volcano-plutonic belt (OCVB), the Omolon Massif (OM), the South Anyui Suture (SAS), and the Verkhoyansk Fold Belt (VF). The figure base is from the International Bathymetric Chart of the Arctic Ocean [Jakobsson et al., 2008].