

benefits of improvements in the use of climate monitoring and prediction products for near real-time use, such as a health early warning system.

Workshop participants also recommended that a suite of pilot application projects should be undertaken to look at the sensitivity of a select number of diseases (likely candidates being malaria, dengue, equine encephalitis and schistosomiasis) to climatic variation. One particularly promising area for research on this topic is to determine the usefulness of El Niño-Southern Oscillation (ENSO) forecasts and expected climatic impacts of ENSO on regional to local scales. Such activities would need to develop not only the appropriate scientific capabilities, but also foster close ties to the regional and local institutional entities needed to disseminate potentially beneficial information resulting from this process. Developing the links between El Niño and health will likely encourage studies on the impacts of global climate and environmental change problems, which have much longer time horizons for action than those associated with seasonal to interannual climatic variations.

It is important to document, through rigorous scientific studies, the connections between specific climatic events, such as prolonged drought or flooding episodes, and disease outbreaks in the Americas. Epidemiological studies are crucial for establishing links and warranting the use of skillful climate predictions of potential human

health impacts. To apply and benefit from emerging ENSO forecast information, the statistical link between resulting disease outbreaks and climate anomalies must be fully established. Pilot applications activities should include a rigorous statistical examination of the historical relationship (both direct and indirect) between climate and infectious disease. Such an analysis will reveal which parameters, or combinations thereof, modify the vulnerability of human populations to ENSO-influenced infectious disease outbreaks.

One of the highest priorities is to better understand the waxing and waning of infectious and chronic (such as asthma) diseases in the context of the seasonal cycle. Departures from these annual cycle changes associated with extreme weather events on daily to seasonal timescales could then be more accurately represented, and the usefulness of long-range predictions on weekly-to-seasonal timescales could be more accurately demonstrated. Specific regions in the Americas where these studies should be undertaken due to their climatic vulnerability to vector-borne diseases are Central America, including Mexico; the Caribbean; Colombia; and Brazil.

Finally, the participants considered some of the more important socioeconomic issues associated with climate and health interactions. Some suggested that health issues are not considered important by governments, industry, agriculture, and the marine commu-

nity, even though those sectors are largely responsible for creating and resolving many of the environmental health problems. All agreed that greater efforts should be devoted to health risk factors and health risk management issues. Such efforts should consider not only traditional notions of disease emergence and spread, but also the long-range implications of development in the context of environmental pollution, demographic changes as they relate to the introduction of nonresistant populations to endemic areas, and other preconditioning factors that could lead, under the right set of climatic conditions, to outbreaks of diseases.

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## FORUM

### Comment on "Climate Control Requires a Dam at the Strait of Gibraltar"

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While we appreciate the editor's desire to publish contributions of general scientific interest, societal relevance, and controversial nature, *Eos* should not sacrifice scientific rigor to achieve this. Publication of "Climate Control Requires a Dam at the Strait of Gibraltar" by R. G. Johnson (*Eos*, July 8, 1997) was irresponsible. The connection between Mediterranean salinity and ice age initiation is only postulated but not substantiated through quantitative reasoning supported by data.

Climate is complex because many competing feedbacks act simultaneously. Even if every single one of the hypothesized mechanisms were correct, there would always be

competing effects, so quantitative analysis is needed to determine the net response. For example, it is hypothesized that a warming of the Labrador Sea would lead to additional land ice formation, but one could argue equally well that the extra ice would simply melt because the surroundings were warmer. Some of the postulated mechanisms are blatantly inconsistent with what is known about fluid mechanics (e.g., the existence of the "fluidic switch," through which, apparently, a tiny current can deflect a large one) or about climate dynamics (if global warming could indeed lead to an ice age, i.e., global cooling, current climate would be unstable).

To publish a demand for a societal response as enormous as building a dam

across the Strait of Gibraltar when the scientific foundation is so tenuous is an affront to the many researchers who work hard to build a quantitative scientific understanding of climate change and how society should deal with it.—Jochem Marotzke and Alistair Adcroft, *Center for Global Change Science, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge*

### Reply

In regard to the role of Mediterranean outflow water increase in initiating the last ice age and the proposal to eliminate the threat of new glaciation by a partial dam at Gibraltar, Marotzke and Adcroft question the wisdom of publishing a hypothesis "not substantiated through quantitative reasoning supported by data." A hypothesis meeting these two requirements would have to be indicated by a well-established numerical model. By these standards, Alfred Wegener's "outlandish" continental drift hypothesis would never have been published, and the fascinating development of the Cretaceous-Tertiary impact hypothesis for