"Coordination, research needed in weather science"

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At the onset of another hurricane season, Gavin Schmidt's Quick Study piece on "The Physics of Climate Modeling" (Physics Today, January 2007, page 72) could not be more timely nor on a topic of greater importance. It follows one by Kerry Emanuel in the August 2006 issue (page 74), on thermal aspects of greenhouse gases contributing to hurricane genesis. And in the November 2006 item "Science Board Recommends Major Hurricane Research Program" (page 30), Jim Dawson directed attention both to the devastation wreaked by Hurricane Katrina and to a National Science Board panel convened to investigate the root causes of severe, damaging storms and ways to ameliorate their effects. We're among the concerned scientists and engineers who have written letters in support of the NSB effort, and we now provide additional information on the topic.

First, we underscore the broader need for research funding by pointing out that the topic of weather damage encompasses more than hurricanes developing from severe storms over water. This point is relevant because Dawson's November article stated, "Politicians from the Dakotas and Montana 'don't think [research on hurricanes] is their problem.' " Tornadoes spawned by severe storms over land are very much an increasing threat to people, infrastructure, and property in the US interior. Tolls associated with these devastating killers are staggering. On average, 800 tornadoes occur annually nationwide. The Environmental Protection Agency states that tornadoes annually cause approximately $1.1 billion in damages and around 80 fatalities. On 3 May 1999, for example, a series of tornadoes ripped through Oklahoma City and its environs, leaving 48 people dead and causing more than $1 billion in damage. The hurricane insurance losses for 2005 were $57 billion, the highest ever before the Hurricane Katrina costs, which are still being counted. And on 5 May 2007, a single tornado with winds up to 205 miles per hour struck and essentially destroyed the town of Greensburg, Kansas. Thus, whether over land or sea, there are more

than enough concerns for personnel, infrastructure, and finances to warrant investing in research on severe storms.

Second, now appears to be an optimum time for bringing together the previously estranged communities of weather modification practitioners, who are mostly supported by insurance industries, and research academics, who have very limited funds. A considerable amount of data on practical weather modifications has accumulated, and significant advances have occurred in fundamental model descriptions of severe weather–based instabilities; for example, two of us (Armstrong and Glenn) have re-examined the role of electrification forces in contributing to tornado formation.[1] With coordinated efforts, a new, stronger community can be formed to advance the art and science of weather modification.

In another case, Juergen Michele, Vladimir Pudov**,** and one of us (Alamaro) have been discussing a concept inspired by a 1970s Soviet weather-modification program in the Baltics.[2] In that program, an array of jet engines was employed to form a vertical jet of air flow that, it was hoped, would be sufficient to cause cloud formation. Even in a stable atmosphere, 9 out of 15 tests led to cloud formation. Alamaro and coworkers presented the hypothesis that the method may be used for such weather modification applications as frost prevention, fog dispersion, and, most ambitiously, hurricane modification. In the latter case, a designed array of multiple jets would be used to create atmospheric perturbations that might turn a hurricane back to sea.

References

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2. M. Alamaro, J. Michele, V. Pudov, *J. Weather Modif.* **38**, 82 (2006).

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Ronald Armstrong

(rona@eng.umd.edu)

University of Maryland, College Park

J. Greg Glenn

(joseph.glenn@eglin.af.mil)

Eglin Air Force Base, Florida

Moshe Alamaro

(alamaro@mit.edu)

Massachusetts Institute of Technology

Cambridge