

Hail: The Next Big Thing

Some experiences last a lifetime. The chance to participate in the VORTEX2 (Verification of the Origins of Rotation in Tornadoes EXperiment), considered the most comprehensive tornado field research project in history, is one of those experiences for Dr. Tanya Brown and Dr. Ian Giammanco, now researchers with the Insurance Institute for Business & Home Safety (IBHS).

Two years after the VORTEX2 project ended, Brown and Giammanco are embarking on another ground-breaking endeavor to go inside hailstorms in an effort to reduce or eliminate hundreds of millions of dollars in property damage reported annually across the United States.

The pair is helping to develop and implement IBHS' first scientific field study examining characteristics of severe hail, including the hardness of hailstones. This is foundational science, because no commonly accepted or relied upon standard currently exists. Using first-hand experience with instrumentation gained during their participation with VORTEX2, the IBHS team has developed a new, unique piece of instrumentation, Giammanco said.

"The instrument will allow for the hardness property of an individual hailstone to be quantified. This field project will collect these first-of-a-kind measurements," he said. "This research will aid the risk modeling community in developing an improved understanding of damaging hailstorms, as well as provide a potential forecast application to understand that a given storm may produce more damaging hail."

For now, IBHS field research efforts are focused on determining the characteristics of hailstones for use in guiding our laboratory production of hailstones for impact testing, notes Brown. Plans also are in place to conduct statistical analyses from large damage datasets collected after land-falling hurricanes. Research capabilities may be expanded to other perils in the future. "The hailstone characteristics pilot field study will take place in May or June of 2012 and will focus on measuring hardness and density characteristics of natural hailstones," explained Brown, who has already been hard at work re-creating realistic hailstorms inside the IBHS Research Center in South Carolina.



Dr. Ian Giammanco (left), IBHS research scientist, and teammate at the time Frank Lombardo (right) secure a probe and begin collecting data during the VORTEX2 tornado and hail research project.

This summer, two IBHS teams will follow behind hailstorms and collect data on fresh hailstones as storms occur. These data are vital to ensuring that the artificial hailstones created in the IBHS facility are highly realistic. Once a more realistic stone is created, better, more accurate impact testing can be completed in the lab to help understand the true vulnerabilities in building systems. "It is hypothesized that harder hailstones will inflict more damage than softer hailstones, and we want to examine how that variable affects the testing of building materials. Our goal is to be able to inflict the same type of damage, see very similar damage patterns, with our artificial hailstones as we observe in the field from Mother Nature's hailstones," Brown said.

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-Dr. Tanya Brown

In addition to the IBHS team, WeatherPredict Consulting, an affiliate of IBHS member RenaissanceRe, will be archiving radar, surface, and upper air data on all of the storms for which the IBHS team collects data on. Brown notes that “this partnership will help IBHS and us determine if certain environmental characteristics lead to harder or softer hailstones, which then will allow us to take a huge step forward in assessing the risk of individual hailstorms.”

The field research teams are using new dual-polarization (known as Dual-Pol) radar technology to help guide their efforts. While the benefits and improvements in tornado forecasting ability gained from VORTEX 2 will take several years to put into practice, Dual-Pol is a new technology continuing to come online this year through the National Weather Service’s (NWS) network of Doppler radars. It will add a vertical component to the existing radar technology, which currently only includes a horizontal pulse. The upgrade to Dual-Pol technology began in February 2011. Interested parties can track the progress of the Dual-Pol upgrade here: <http://www.roc.noaa.gov/WSR88D/dualpol/>.

“Existing radars using single, horizontal polarization struggle to tell the difference between a lot of small hail, and a little large hail, and also struggle to differentiate between types of precipitation,” Brown said, “which is why this new Dual-Pol technology is so exciting – the addition of the vertical pulse will give us a much clearer picture of what is happening with the precipitation inside the storm.”

Looking long-term, Giammanco and Brown said the goal for IBHS hail field research is to couple together hardness and density measurements with environmental characteristic data and risk analysis, and damage surveys and claims studies to create a complete picture of damaging events. “This kind of complete study would allow us to determine what hailstone characteristics lead to different damage states, and allow us the opportunity to further investigate hailstorm damage modes, including the effects of wind-blown hail,” Brown concluded.

IBHS researchers also weigh in on tornado forecasting and the best solutions for protecting lives and property in the latest issue of [Disaster Safety Review](#).



IBHS is a non-profit applied research and communications organization dedicated to reducing property losses due to natural and man-made disasters by building stronger, more resilient communities.

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