

One Step Closer to Accurately Predicting Earth's Deadly Storms

Meet Adeline, Katrina, Glenda, Dennis, Favio, Krosa and Yuky. These are 7 of 58 hurricanes over a three year period studied by Prof. Yoav Yair and Dr. Mustafa Asfur of the Open University with their colleague Prof. Colin Price of Tel Aviv University. The results of their research, illustrating that hurricane intensification can indeed be accurately plotted, have recently been published in the prestigious Natural Geoscience Magazine and are making waves (thankfully, not hurricane- like) among scientists.

"For one whole day and night it blazed like a furnace, and the lightning broke forth with such violence that each time I wondered if it had carried off my spars and sails; the flashes came with such fury and frightfulness that we all thought the ships would be blasted." written in the 1800's by an American sailor

Hurricanes are the most deadly storms on earth. They bring in their wake loss of life and property destruction at mind-boggling rates. Indeed, the mean annual damage due to hurricanes in mainland USA alone is estimated at nearly \$5 billion.

Katrina was the costliest as well as one of the five deadliest hurricanes in the history of the United States – responsible for the death of nearly 2,000 individuals and over \$100 billion in damage.

With global warming 'heating' up, expectations are that hurricanes will increase in frequency as well as intensity.

"Since 1995, the Atlantic has entered multi-decadal conditions that favor increased hurricane activity. This loads the dice for more hurricanes," according to scientists at NASA.

Hurricanes are characterized by extremely strong winds, lightning, hail and tremendous amounts of rain. For centuries, observers have witnessed the intensity of the lightning factor. But few scientists have actually looked at the close interrelationship between lightning and winds and how this may be used as a prognosticator of a hurricane's intensity.

"Forecasters are quite successful," Prof. Yair explains "in predicting the pathways of hurricanes days in advance, but hurricane intensification is less accurately predicted." That is until, now.

Using the data from 2005-2007, Prof. Yoav Yair and Dr. Mustafa Asfur of the Open University and their colleague Prof. Colin Price of Tel Aviv University, studied the patterns of 58 hurricanes around the globe. They were able to do this with great accuracy thanks to Israel's membership in WLLN – the Worldwide Lightning Location Network – an international network of lightning location sensors operated out of the University of Washington in Seattle. Currently, Israel is one of some 35 country members.

By amassing the extensive data from around the world, the three-man research team performed a number of statistical evaluations, and after monitoring the winds and lightning frequency every 6 hours during the entire lifetime of 58 storms, found that lightning frequency and maximum sustained winds are significantly correlated (mean correlation coefficient of 0.82).

In essence, what they discovered was that the maximum sustained winds

and minimum pressures in hurricanes are preceded by increases in lightning activity approximately one day prior to the winds peaking. In layman's terms: lightning peaks about 24-30 hours in advance of the winds.

These results have helped open other areas of study, which the three researchers are continuing to pursue.

This recent study was a follow up to a paper published two years ago in the journal *Geophysical Research Letters*, where the team tracked hurricane activity in the Atlantic Ocean by going eastward into Central Africa. "Strong thunderstorms in Central Africa," Prof. Yair explains "cause a disturbance in the atmosphere, instigating instability and turbulence that are conducive to collating information on the formation of hurricanes."

Their next study will examine lightning within the hurricane and compare it with satellite images to see how vertically developed the clouds are.

The ultimate goal is to create even more powerful predictive concepts for hurricanes. If countries can better prepare, more lives and property can be saved and damage curbed. With this newest study by Prof. Yair, Dr. Asfur and Prof. Price, great strides are being made in this direction.