Particulate Raindrop Analysis for More Accurate Storm Forecasts

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Global warming represents one of the most apparent threats to humanity by increasing the destructive force of natural phenomenons such as hurricanes dramatically. Due to its almost inevitable progression, methods for accurate storm forecasting are in urgent demand. The objective of this project was to come up with a measuring technique for storms allowing for a superior spatial resolution and a short-term prediction of the storm's further progression. An entirely self-developed measuring instrument consisting of a membrane which oscillates upon the impact of water droplets to enable a determination of their individual sizes was built for this purpose. Calibrating the measurement device involved novel techniques from interdisciplinary fields such as digital signal processing, advanced analog electronics, fluid dynamics, software programming and digital image processing. The ability of the demonstrated calibration method to autonomously generate calibration curves yielded results with uncertainties of about 2.2 millionth of a liter per droplet after about 2000 artificial raindrops were created for calibration purposes. After the integration of this measuring principle into a wirelessly interconnected, self-sufficient prototype, 15 of those have been distributed in a radius of about 40 kilometers. The aggregation of data in a self-developed cloud processing system allows me to precisely determine the further progression of a storm about half an hour in advance, which means that the aim of the project has been accomplished completely. For this reason, an expansion of the project to a global scale holds a decisive potential for the benefit of humanity.

Awards Won:

Intel ISEF Best of Category Award of $5,000

First Award of $3,000

American Meteorological Society: Second Award of $1,000