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Technology development for raindrop and hail size distribution measurement

Distrometers are instruments designed to measure raindrop size distributions and significantly contribute to the understanding of cloud physics, hydrology, radar meteorology, and numerous other applications which require detailed knowledge of rainfall characteristics. A rather rare (and currently unavailable) extension in a sensor that can measure the size of falling hail. Kennedy Space Center (KSC) is very interested in this instrumentation because of the need to know if sizable hail has fallen around the launch pads. If hail size is too small to avoid costly inspection to spacecraft and launch delays.

Distrometers are generally considered exotic instruments and most of the existing types are very expensive, with starting prices around \$18K. We propose to develop technologies for a new generation of improved distrometers. These will be inexpensive, portable, low-maintenance and when needed, autonomous. We plan to achieve these goals by extensive use of digital signal processing algorithms. Specifically, we plan to replace most analog hardware with software; use less expensive and durable sensors and applying digital signal processing compensation techniques to achieve high precision and utilize high performance low cost digital technology.

This research will contribute significantly to NASA's Global Precipitation Mission to develop scientific understanding of the Earth system and to solve fundamental problems involving global water cycle processes where geophysical interactions occur on a continuum of spatial and temporal scales ranging from local and regional to global scales and from short-term weather to long-term climate.