

Multi-Angle Snowflake Camera

WEATHER MONITORING

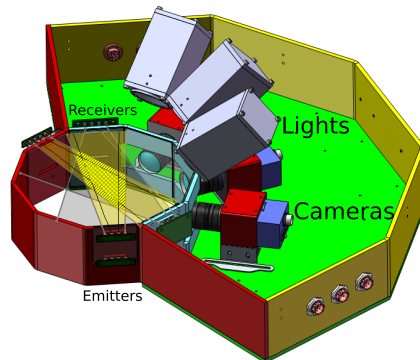
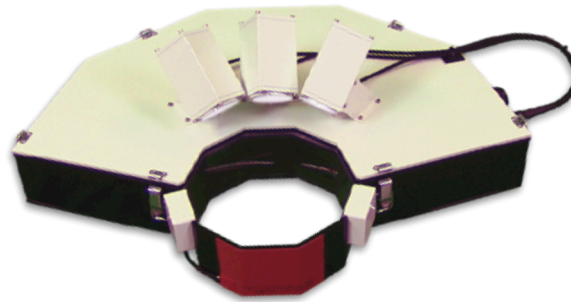
Automated remote measurement of precipitation type for meteorological monitoring and transportation safety

PRECIPITATION STUDIES

Fallspeed measurement and detailed imagery of hydrometeor surface structure for investigations into the relationships between weather conditions and hydrometeor aggregation and riming

MICROWAVE SCATTERING CALCULATIONS

Multiple angle views of individual hydrometeors for constraint of calculations of how hydrometeors scatter microwave radiation



- High-resolution photographs of falling hydrometeors
- On-the-fly calculation of hydrometeor fallspeed
- Views of each hydrometeor from three different angles
- Unattended operation under winter weather conditions

The Multi-Angle Snowflake Camera (MASC) takes 10 to 30 micron resolution photographs of hydrometeors from three angles while simultaneously measuring their fallspeed. The cameras are triggered by a vertically stacked bank of sensitive infrared motion sensors designed to filter out slow variations in ambient light. The triggering is auto-calibrated, and sensitive to snowflake sizes ranging from 100 micrometers to 3 cm (30,000 micrometers). Fallspeed is derived from successive triggers along the fall path. Photographs are obtained at a speed of up to 1/40,000th of a second and the hydrometeors are illuminated by three 40 W LEDs rated at 2700 lumens each.

The instrument is robust to cold and weather and runs unattended. Calibration is limited to occasional camera alignment and lens focusing using a calibration tool that attaches to the instrument. Software is included for image and fallspeed acquisition and display on PC platforms and for creating a live internet feed from the installation site. The executables include lossless (png) image compression to facilitate with data management. Tens of thousands of images might be obtained in a single day. Scientific analysis scripts are available for detailed post-processing.

HIGH SPEED DATA ACQUISITION

High speed data cables transfer three 5 Megapixel images up to two times per second. Images are stored using lossless png compression along with timestamp, fallspeed and instrument status data

REAL-TIME DISPLAY

Software automatically uploads images to a website for real-time monitoring of hydrometeor form

DATA ANALYSIS

Raw data is fully and easily accessible to the user. Scientific analysis software is provided freely on request.

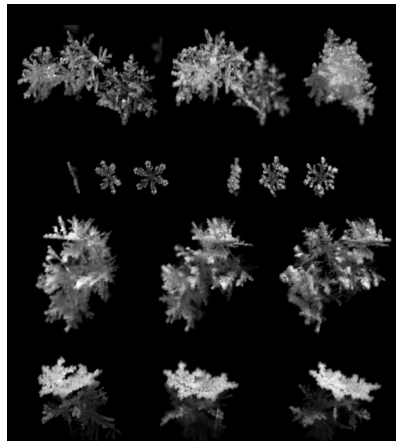
MODULAR IMAGING

Image resolution and depth of field are adjustable by swapping lenses. Adjustable camera mounts and easy-to-use calibration tools are included.

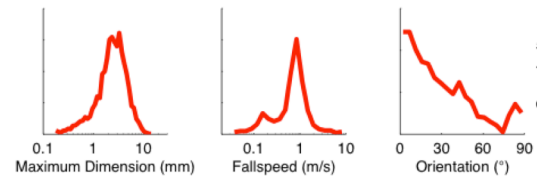
ANTI-RIMING

Heating prevents build-up of rime under extreme weather conditions.

Measurement products



Left: Triplet views separated by 36 degrees of individual frozen hydrometeors. These show mixtures of vapor diffusion, aggregation and riming processes that lead to complex three-dimensional forms



Above: Probability distributions of hydrometeor size, fallspeed, and orientation. Data represents a single day's measurements from April, 2011 obtained in the Utah Wasatch Front mountain range.

For detailed information, see: Garrett, T. J., Fallgatter, C., Shkurko, K., and Howlett, D.: Fall speed measurement and high-resolution multi-angle photography of hydrometeors in free fall, *Atmos. Meas. Tech.*, 5, 2625-2633, doi:10.5194/amt-5-2625-2012, 2012.

Technical data

Subject to change

- MASC Power: Max 25 W at 115-240VAC, AC power plug*
Anti-Riming Power: 138W to 550W at 115-240VAC, AC power plug
- Weight and Size: 10 kg; 43.5 cm x 58 cm x 21.5 cm
- Cameras: Three high-speed 5 Megapixel, 2/3" sensor, industrial cameras, each with C-mount 12.5 mm lenses (swappable).
- Lights: Three 40 W LEDs rated at 2700 lumens each
- Data acquisition: High-speed Firewire 800 cables to a PC.
Single executable for operation within a Windows 7 environment

*Does not include data acquisition system

SERVICES AVAILABLE

- [Technical Support](#)
- [Installation and Setup](#)
- [Maintenance](#)
- [Upgrades](#)
- [Warranty](#)