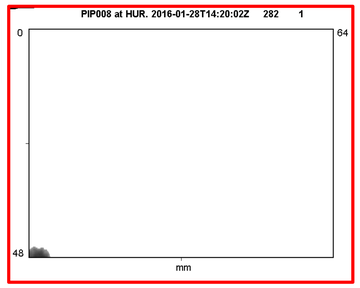
the Precipitation Imaging Package (PIP)

Hurricane Ridge
Olympex



Video: Click On\Off

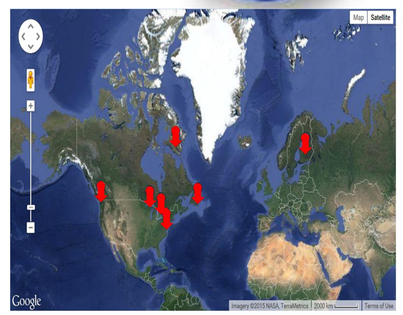
PIP Observations For Precipitation Studies

Larry Bliven and Walt Petersen

Dual-frequency radar-algorithm development for GPM applications in cold region is high-priority.

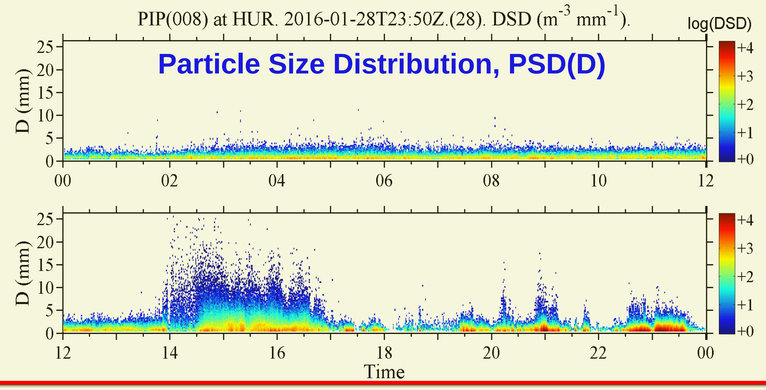
At GSFC, we developed **PIP** to enable worldwide studies of precipitation.
PIP consists of a high-speed video camera that images falling precipitation, and apps to display particles, and quantify particle sizes and fall-speeds.

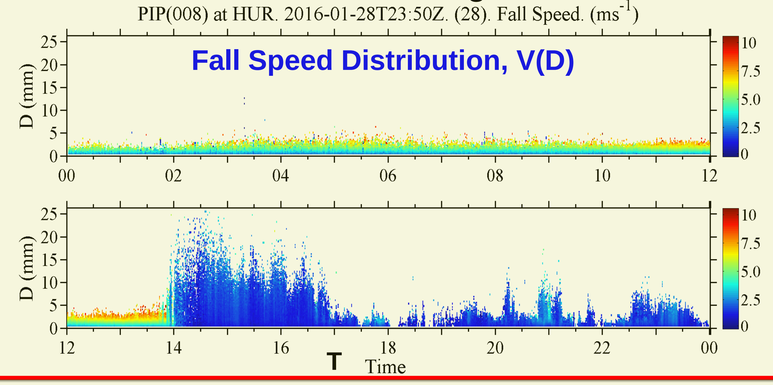
To monitor diverse storms, PIPs are installed across the US and Canada, and in Finland and Antarctica.

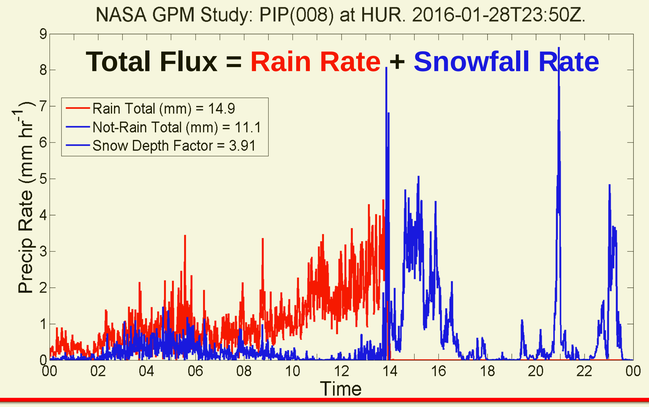


PIPs at GPM-PMM Sites

Reliable Monitoring







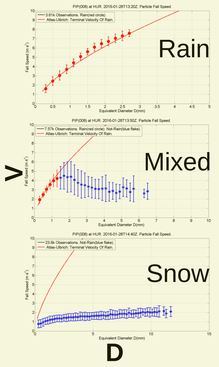
Equivalent Snowfall Computations

$$R_S = \int_{D(min)}^{D(max)} Density(D) * V(D) * PSD(D) * N(D)^3 \, dD$$

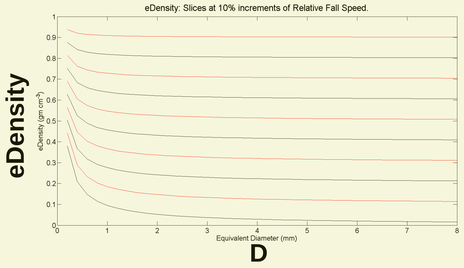
Equivalent Snowfall Rate: R_S

PSD & V are measured by PIP,
however no instrument can measure Density.

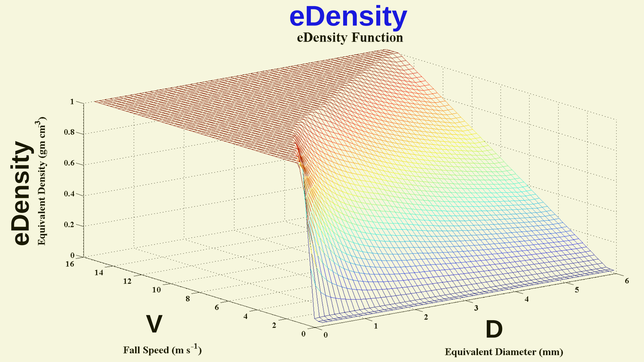
We introduced the empirical Equivalent Density model,
eDensity(D, Relative Fall Velocity).



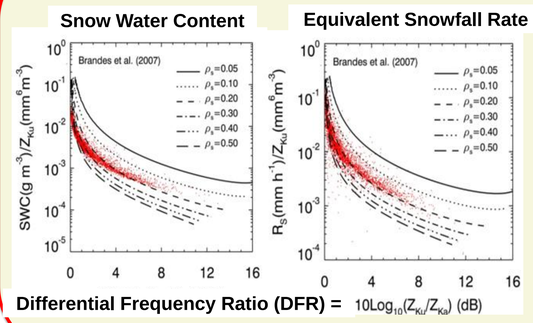
Slices at 10%V_{Rel} Steps



eDensity



Satellite Algorithms



Retrieval of Snow Properties by using Ku- and Ka-band Dual-Frequency Radar
Liang Liao, Robert Meneghini, Ali Tokay and Larry Bliven

VOLUME 55 JOURNAL OF APPLIED METEOROLOGY AND CLIMATOLOGY SEPTEMBER 2016

The focus of this study is on the estimation of snow microphysical properties and the associated bulk parameters such as snow water content and water equivalent snowfall rate using Ku- and Ka-band dual-frequency radar data.

'To aid in the development of the Ku- and Ka-band dual-wavelength radar technique and to further evaluate its performance, self-consistency tests are conducted using measurements of snow PSD and fall velocity acquired from the Precipitation Imaging Package (PIP).'

This study uses a $\rho(D_{max})$ relationship. ρ (D, V) is feasible with PIP data and enables refined analysis of precipitation processes.

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GLOBAL PRECIPITATION MEASUREMENT