Hydrometeor Types From Dual-Pol Radar, Compared to GMI Brightness Temperatures

**Approach**

- Use “Virtual Network” (VN) of ground-based dual-polarization radars from GPM-GP (mostly Central and Eastern USA), together with GMI brightness temperatures
- Database is constructed using a minimum threshold for raining pixels, so inherently devoid of non-raining precipitation
- Hydrometeor ID (HID): hail, high-density graupel, low-density graupel, aggregates, liquid rain, etc. derived from dual-pol radar data
- Construct joint histograms and probability-of-occurrence for different hydrometeor types as a function of brightness temperature in different channels
- To facilitate use of low-frequency channels over land, construct polarization corrected temperatures (PCT). (More on that later)

**Example – 26 May 2015, west of Ft. Worth**

![Left: Radar Reflectivity](image1)
![Right: Hydrometeor Identification (HID)](image2)

**Probability of Dominant Hydrometeor Type, as a Function of Brightness Temperature**

Given a certain brightness temperature from GMI, what is the probability the vertical column includes:

- Hail (black)?
- If not hail, then High Density Graupel (purple)?
- If none of those, then Low Density Graupel (blue)?
- If none of those, then other hydrometeors (red)?

Given a combination of brightness temperatures from the 37 and 89 GHz channels, what is the probability the column includes:

- Hail (top)
- Hail or High Density Graupel (middle)
- Hail, High Density Graupel, or Low Density Graupel (bottom)

Other channel combinations and other hydrometeor types also being examined

**Polarization Corrected Temperatures (PCT)**

In order to use low frequency (10, 19 GHz) more effectively over land, we are developing Polarization-Corrected Temperature (PCT) formulae for those frequencies.

Empirical coefficients are derived to maximize the contrast between land and water surfaces.

This removes much of the precipitation signal, except for accentuating the strongest convective cores having high concentrations of large ice (graupel and hail). This might be useful for looking at strong storms over land.

Using 10 or 19 GHz PCT together with vertically-polarized channel might be useful for looking at a broader range of precipitation, without having problems associated with land-water boundaries.

We are just now finalizing our assessment of PCT coefficients, with a manuscript forthcoming. Subsequent work will incorporate 10 and 19 GHz PCT into the analysis of hydrometeor types.