Melting Layer Detection Using Dual-Frequency Ratio (DFR) data from DPR

Toshio Iguchi (NICT) and Yuki Kaneko (JAXA), NASA PMM Science Team Meeting, Phoenix, Arizona, 8-12, October 2018

Algorithm for identifying the melting top in stratiform precipitation

- $DFR_m$ vs $Z_m$ (Ku or Ka) plot as a function of range exhibits a loop around the melting layer in stratiform rain.
- $DFR_m = Z_m(Ku) - Z_m(Ka)$
- The loop is made because the peak of $DFR_m$ and that of $Z_m$ appear at different ranges.
- The $DFR_m$ peak appears at a slightly higher altitude than the $Z_m$ peak.
- The algorithm uses only the first derivatives of $DFR_m$ and $Z_m$ as major factors.
- Approximate temperature is used to set the search window.
- A very simple attenuation correction of HB type is used. (Att. correction is necessary only for relatively intense rain cases.)

Examples of melting layer detection

- Precip. Rate at E surface
- BB flag

Summary

- DFR method identifies the existence of a melting layer in a stratiform storm even when the melting layer does not exhibit a clear bright band because of the smearing effect due to slant measurement.
- DFR method increases the detectability of a melting layer substantially, in particular near scan edges.
- Identification of the melting or freezing height in a convective storm is a future issue.

Detectability of a melting layer

Ocean
- Histogram of BB detection (Ocean)
- DFR method
- Standard method

Land
- Histogram of BB detection (Land)
- DFR method
- Standard method

Degradation of BB detectability at off-nadir angles, especially near scan edges due to the smearing effect.