A Quick Overview of the GPROF V4 *a priori* Database Simulations

Introduction

GPM's database from DPR+GMI obs. Observed T_b, Z, & combined retrievals



GPM: GPM Core observations provide database T_b and RR, this transfer standard allows for unified precipitation retrievals.



pmm.nasa.gov/multimedia/images/GPM



Constructing the Profile Database

- Construct database using center 25 pixel MS swath – 1 full year
- Take precipitation profiles from GPM Combined Algorithm as "truth"
- Add necessary geophysical information in non-raining areas
 - Ocean: OE Retrieval, emissivity model
 - Land: Model Reanalysis, retrieved emissivity
- Compute Tb and compare to obs
 - 1D slant path Eddington
- Add/optimize graupel for convective profiles
- Add/optimize cloud ice for improved agreement in high frequency channels



FIG. 4. A schematic of the TMI scan geometry to demonstrate the slant-intersection effect.

Masunaga and Kummerow 2005

Database Emissivity: Ocean

- Remote Sensing Systems (RSS) 2012
 Radiative Transfer
 Model emissivity –
 Meissner and Wentz
 2012
- Function of f, pol, EIA
- Inputs: SST (COMB), wind speed (OE)



Fig. 8. Model functions from Section IV of this paper for the wind-induced ocean surface emissivity at six different frequencies as function of wind speed. The curves are displayed for the reference surface temperature $T_{ref} = 20$ °C and the reference EIA $\theta_{ref} = 55.2^{\circ}$. Dashed lines show the v-pol, and solid lines show the h-pol. The emissivities have been multiplied by a typical surface temperature of 290 K.

Database Emissivity: Land

10.65V GMI Retrieved Emissivity



10.65H GMI Retrieved Emissivity



Land Surface Representation in the Precipitation Retrieval

- Indexing, database stratification for retrieval search
- Define 14 surface classes
 - SSM/I observations 1993-2008 (climatology described in Prigent et al. 2006) clustered into self-similar classes, correlations analyzed using Tool to Estimate Land-Surface Emissivities at Microwave frequencies (TELSEM: Aires et al. 2011)



Land Surface Classes



GPROF ATBD, Nov. 2014

Database: Simulate Tb







18.7H Simulated Tb



Scatter Plots: Low Frequency





Histograms: Low Frequency



10.65 GHz H-pol









Simulated Tb









Scatter Plots: High Frequency





Histograms: High Frequency













Retrieval

- Constellation retrieval scheme is still being validated and tested
- Initial validation results suggest several issues
 - Inability to detect lighter precip at high latitudes
 - Currently being explored cloudsat, etc.
 - Overestimation in convection over land
 - Coastal problems outlines/picture frames
- Ice particle representation + Land surface representation
- Test additional stratification strategies
 - You et al. 2015: land elevation, ice thickness, vertical structure
 - Soil moisture/LAI
 - Emissivity itself
 - empirical model, physical model (Tian et al. 2015), combination, retrieval onthe-fly