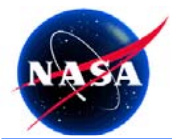


Novel Near-Land Radiometer Wet Path Delay Retrieval Algorithm: Application to the Advanced Microwave Radiometer

Shannon Brown

Jet Propulsion Laboratory

Shannon.T.Brown@jpl.nasa.gov



- **Simple near-land PD algorithm developed and applied to OSTM-AMR data**
 - Easy implementation – uses existing AMR algorithm and no ancillary data required
 - Essentially transforms AMR ocean-only PD algorithm into mixed-pixel all scene algorithm
- **Simulations and comparisons with ECMWF demonstrate new PD retrieval in coastal region significantly improved over IGDR PD**
 - New algorithm error less than 1.5 cm in coastal region globally
- **Plan to make near-land PD product available soon on GDR**

Radiometer Land Contamination

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Land contamination can be divided into three categories

Far sidelobe contamination (> 75 km from coast)

Correctable to acceptable levels (~ 1mm)

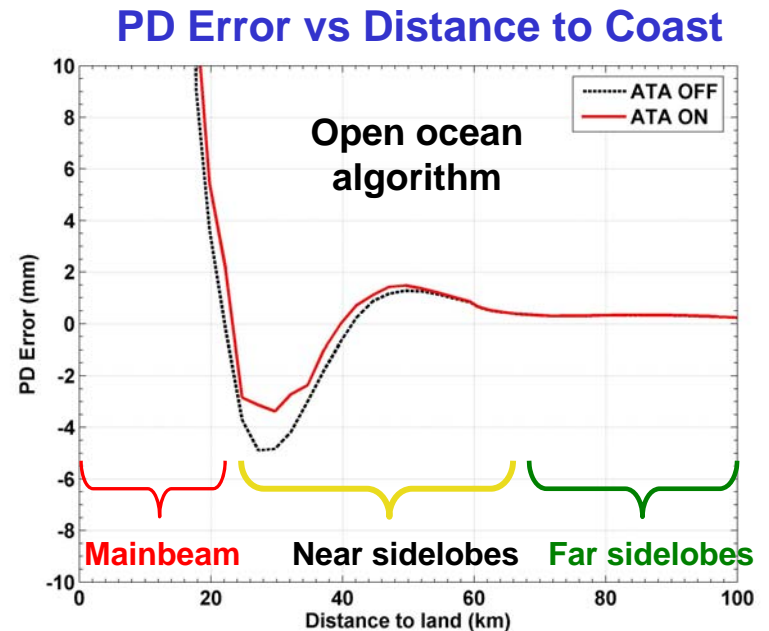
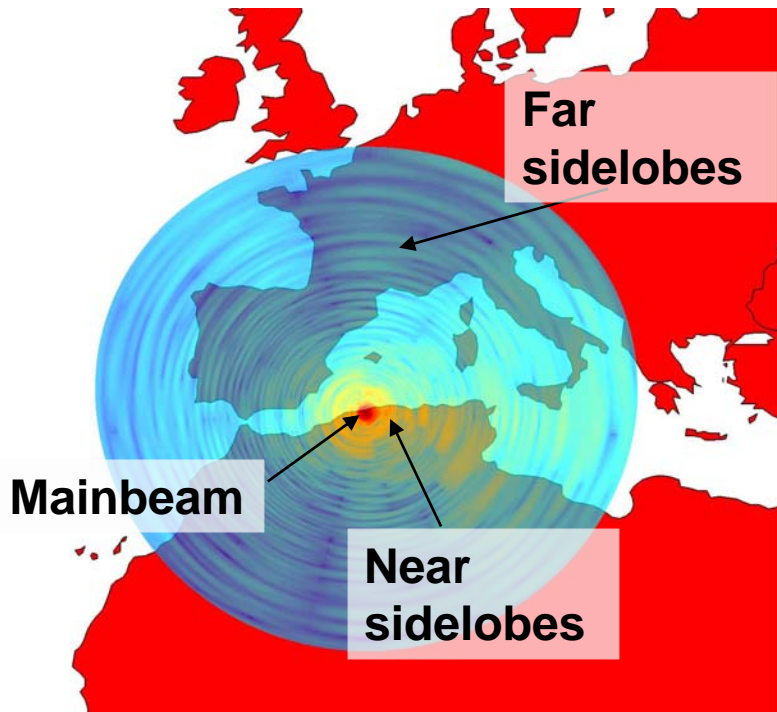
Near sidelobe contamination (30 – 75 km from coast)

More difficult, but correction is possible (~2-4 mm)

Main beam contamination (0 – 30 km from coast)

Very difficult to correct (20-40 mm)

Addressed here

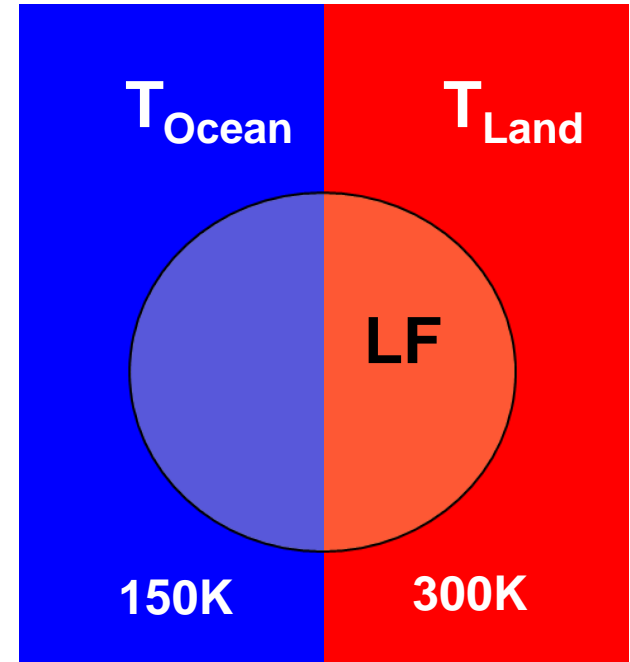


Main Beam Land Contamination

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- Land in main beam biases open ocean T_B
- PD algorithm expects open ocean T_B resulting in large errors near land
- Previous Approach: Decontaminate TBs and apply open ocean PD retrieval algorithm
- T_B correction requires precise knowledge of beam-weighted land fraction and land brightness
 - $< 1\text{cm}$ errors requires 1% absolute knowledge of LF and land brightness knowledge of 2K
 - TB correction tends to decorrelate errors between channels

$$T_{MB} = (1 - LF)T_{Ocean} + LF(T_{Land})$$

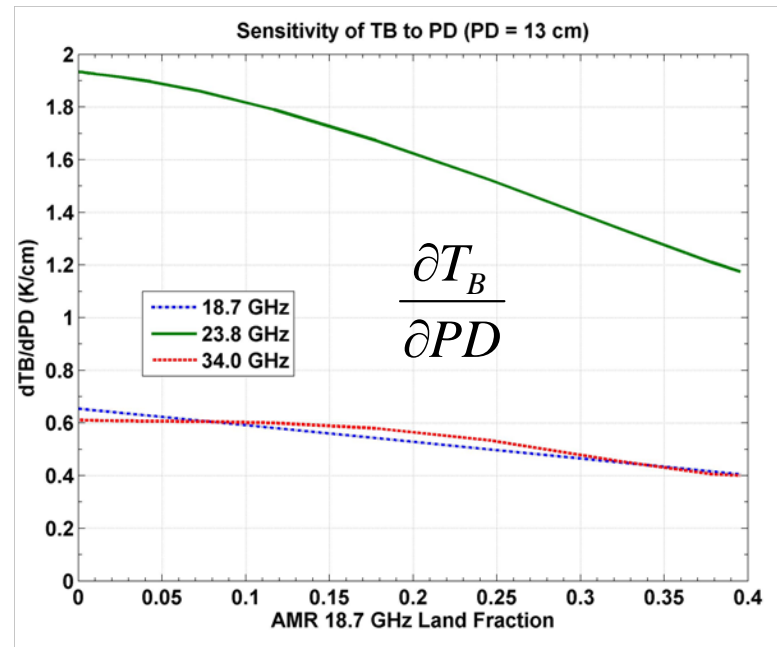
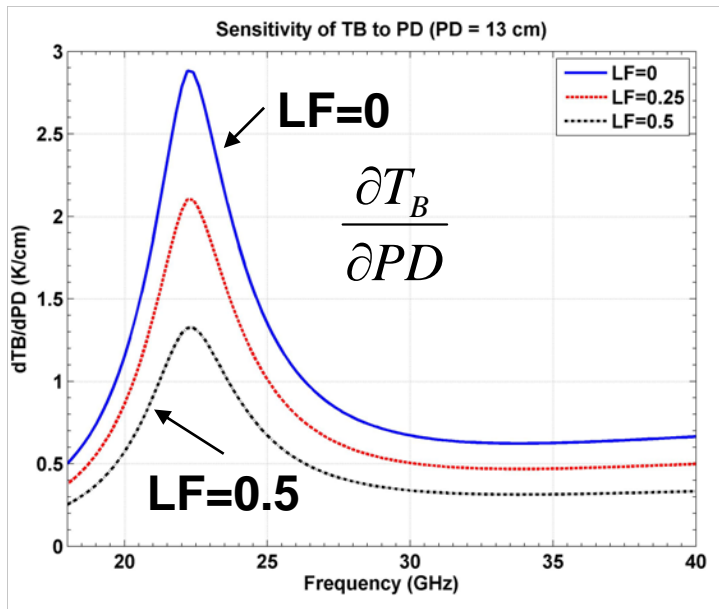


- **Alternative Approach: Develop statistical PD retrieval algorithm valid for mixed pixel scenes**
 - Relies on inherent inter-channel correlation for T_{Land} and LF

New Near-Land PD Algorithm

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- Sensitivity of T_B to PD decreases as land fraction increases
- Train retrieval algorithm as a function of land fraction
 - Merged RaOb profiles, radiometer beam-weighted land fraction map and measured land brightness temperatures to form simulated coastal T_B database
- Uses existing JMR/AMR PD retrieval algorithm with coefficients chosen based land fraction map
 - Simple implementation, fast computation, no ancillary data needed

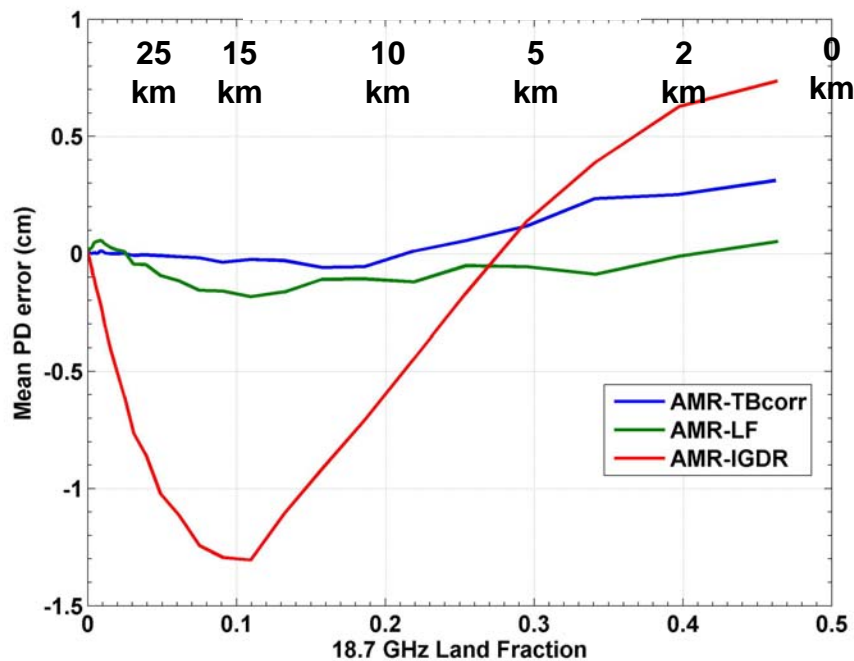


Results from Simulations

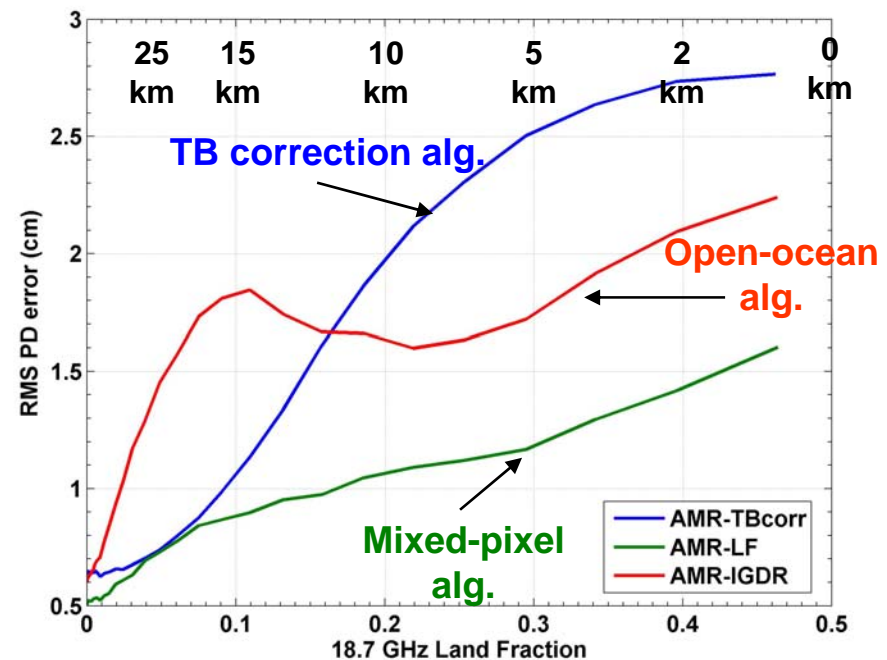
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- Using subset of simulated coastal data, compared open-ocean algorithm, TB-correction type algorithm, and mixed-pixel PD algorithm
 - For correction algorithms, assumed 2K land knowledge error and 10% relative land fraction error
- Both correction algorithms are unbiased near land, but RMS error is significantly lower for mixed-pixel algorithm
 - Mixed pixel algorithm largely insensitive to land fraction error
- RMS error below 1.2 cm to within 5km from coast for new algorithm

Δ PD Mean

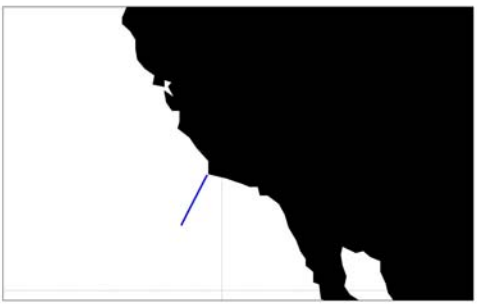
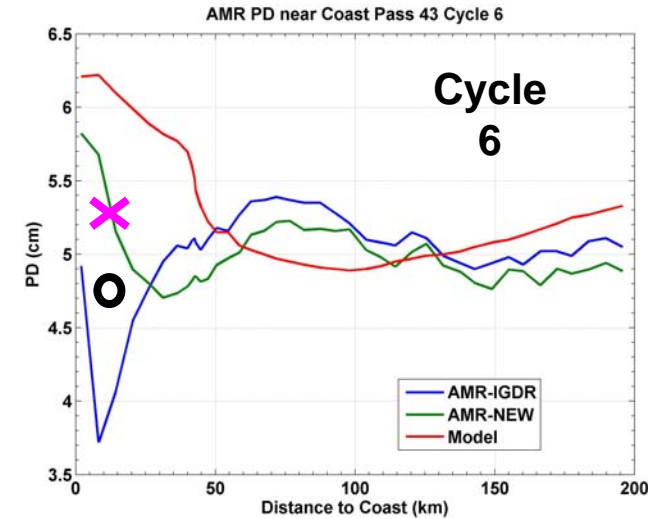
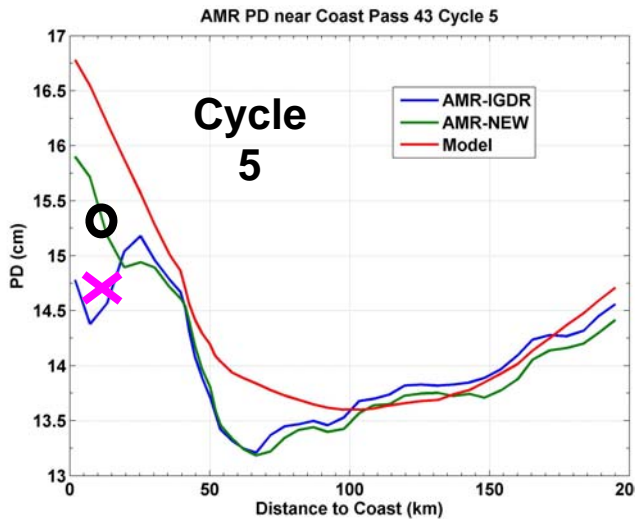
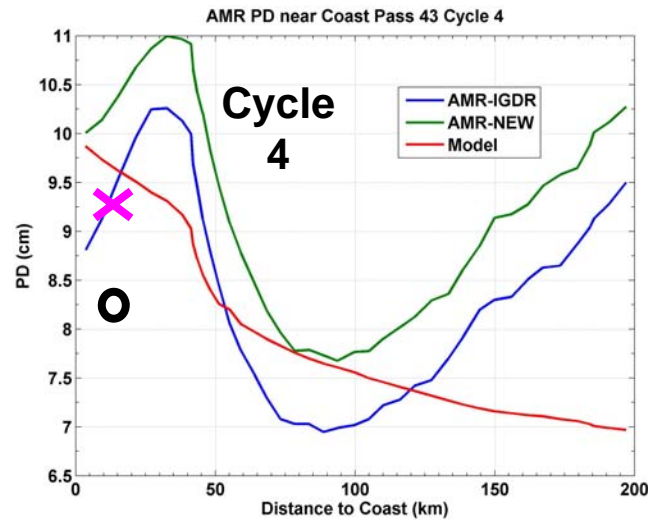
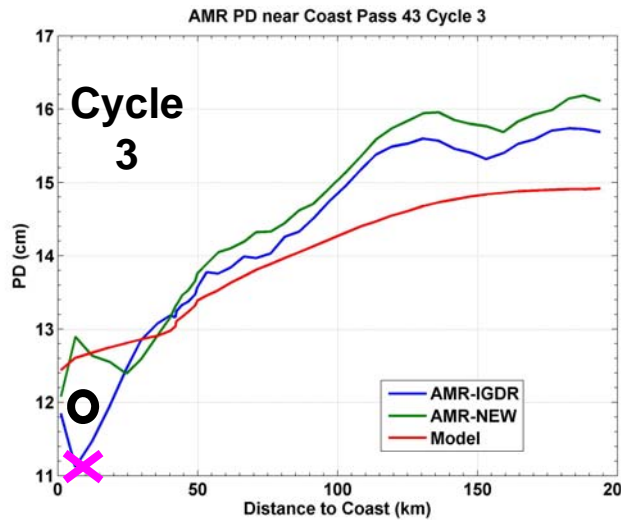


Δ PD RMS

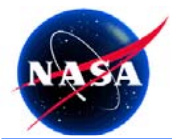


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- Algorithm observed to perform qualitatively better than open-ocean algorithm
- Data shown for pass 43 near Harvest oil platform
- GPS and WVR data from Harvest included
 - Highlights difficulty in algorithm validation



GPS provided by S. Desai and WVR provided by S. Keihm

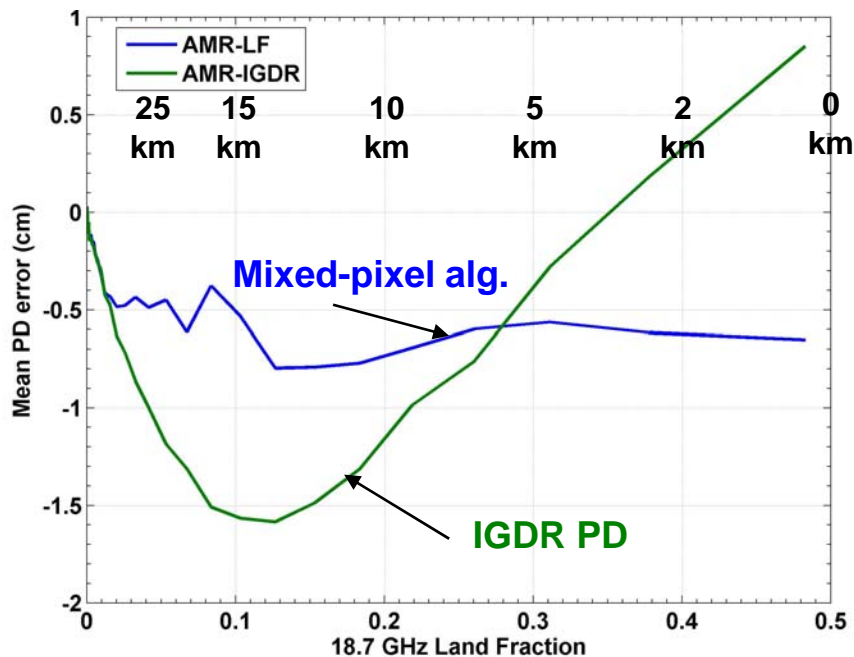


Comparisons between AMR and ECMWF

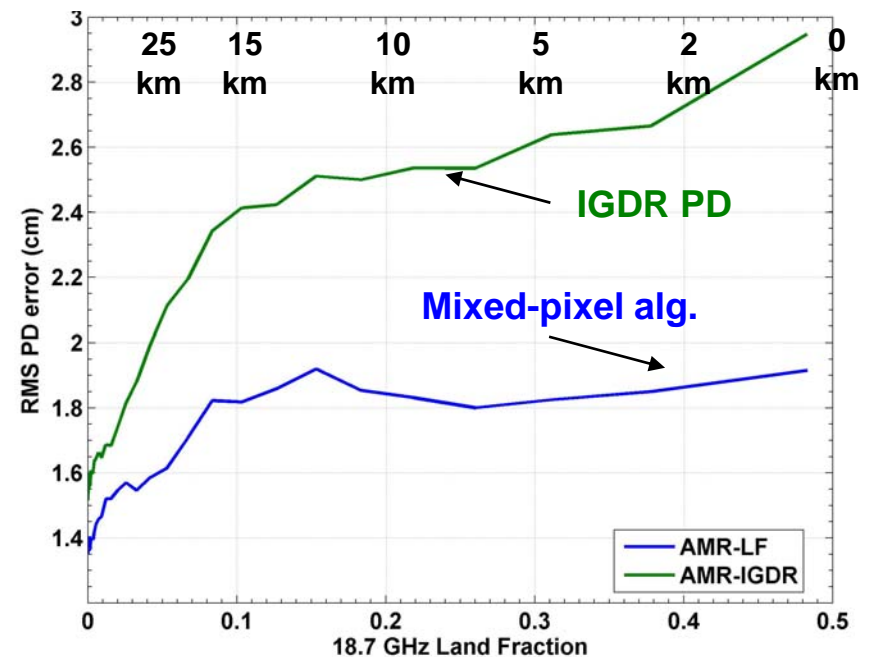
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- Mixed-pixel algorithm applied to AMR data for first 10 cycles
- RMS difference between AMR and ECMWF significantly reduced using new algorithm
- AMR-ECMWF mean nearly invariant with distance to land

Mean AMR-Model PD (cm)



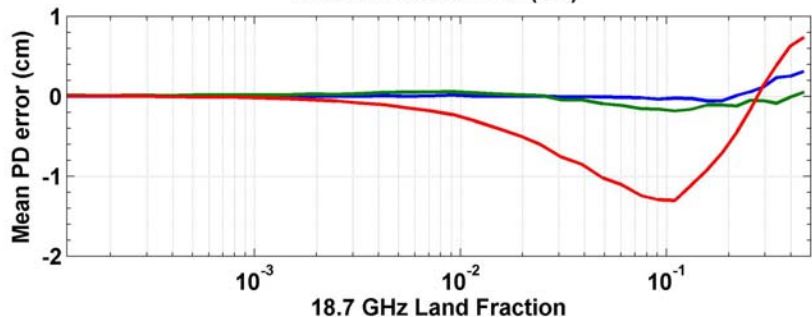
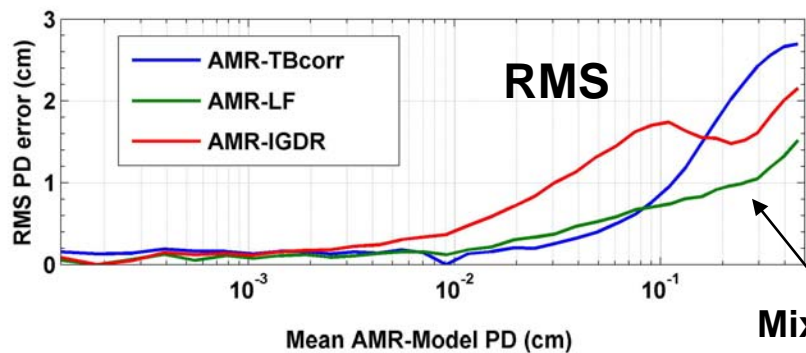
RMS AMR-Model PD (cm)



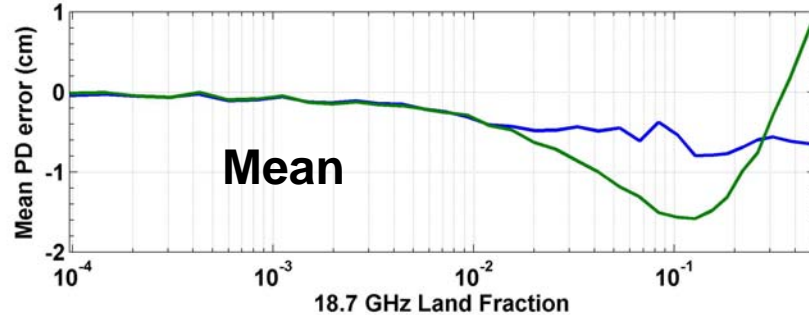
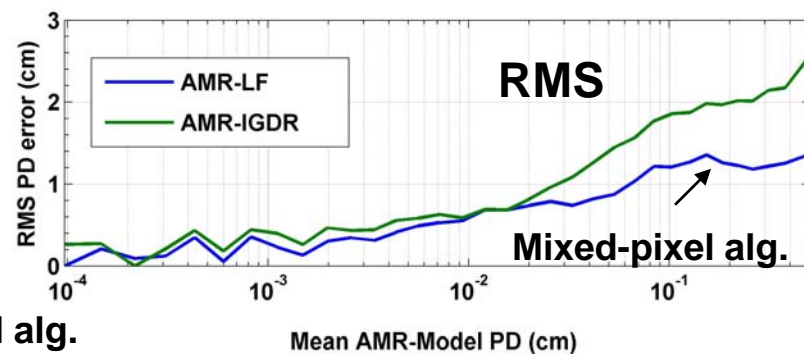
- Excess error near land computed from ECMWF comparisons consistent with simulations
 - ECMWF comparisons also include model error in coastal region
 - Nevertheless, suggests error predicted from simulation accurately depicts error on real data

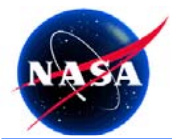
$$\Delta PD_{ALG}(LF) = \sqrt{\Delta PD_{TOT}(LF)^2 - \Delta PD_{TOT}(LF=0)^2}$$

Simulation



AMR-ECMWF





Summary



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- **Simple near-land PD algorithm developed and applied to OSTM-AMR data**
 - **Easy implementation – uses existing AMR algorithm and no ancillary data required**
- **Simulations and comparisons with ECMWF demonstrate new PD retrieval in coastal region significantly improved over IGDR PD**
 - **New algorithm error less than 1.5 cm in coastal region globally**
- **Detailed validation and algorithm improvement on-going**
- **Plan to make near-land PD product available soon on GDR**
- **Next steps are to apply algorithm to JMR and TMR data**