Evaluation of AIRS and AIRS+AMSU Data for Characterizing the Dynamics and Evolution of Well-mixed layers in West Africa

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Motivation

- Complex monsoon climate system
- Aerosol-cloud interaction
- Coarse radiosonde network
- AIRS (Regional coverage, less vertical resolution) – More later
- **GOAL: Determine how much of the vertical structure of the SAL is resolved by AIRS/AMSU and the impact of dust on retrievals over West Africa (error and uncertainty).**
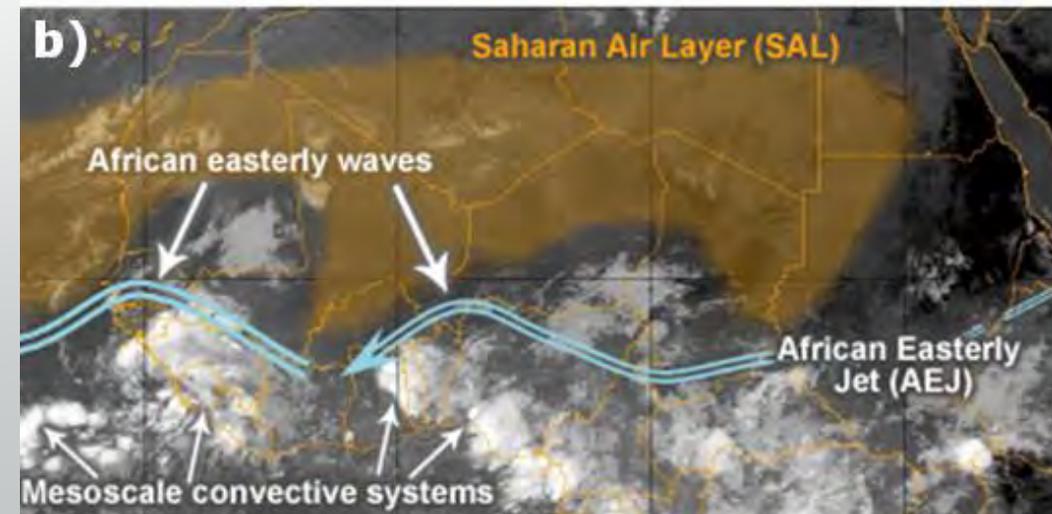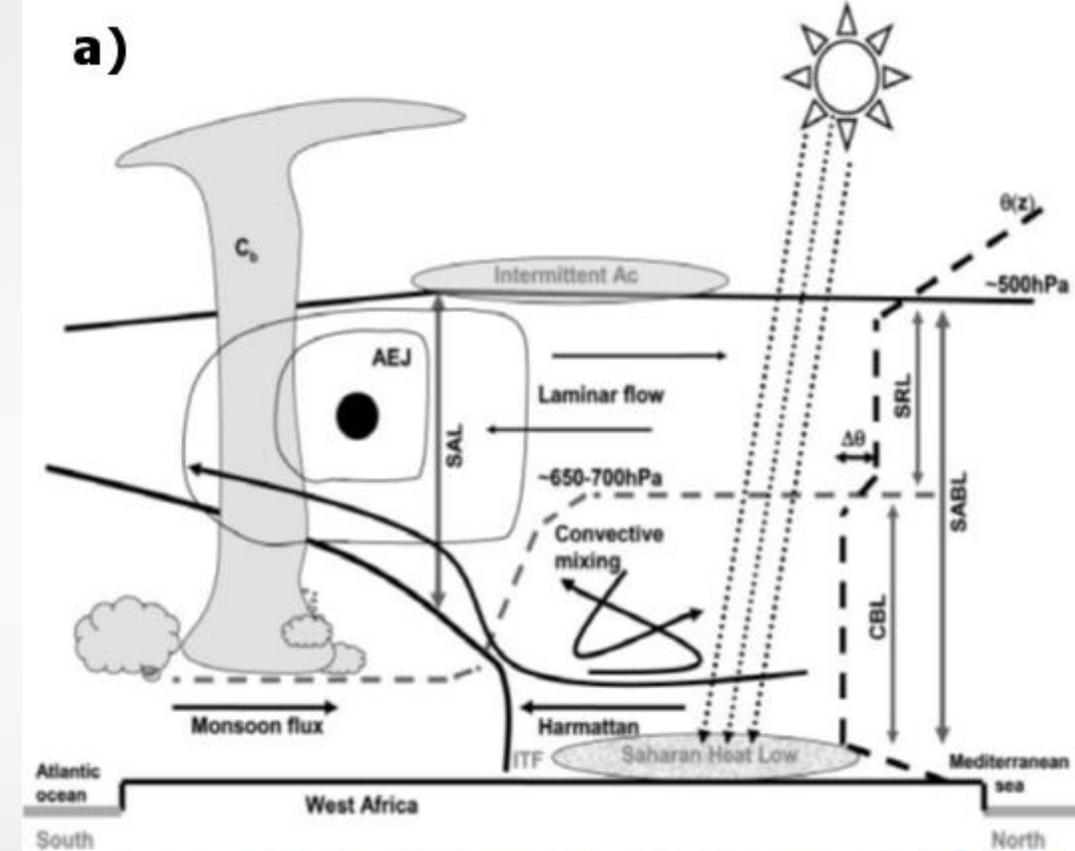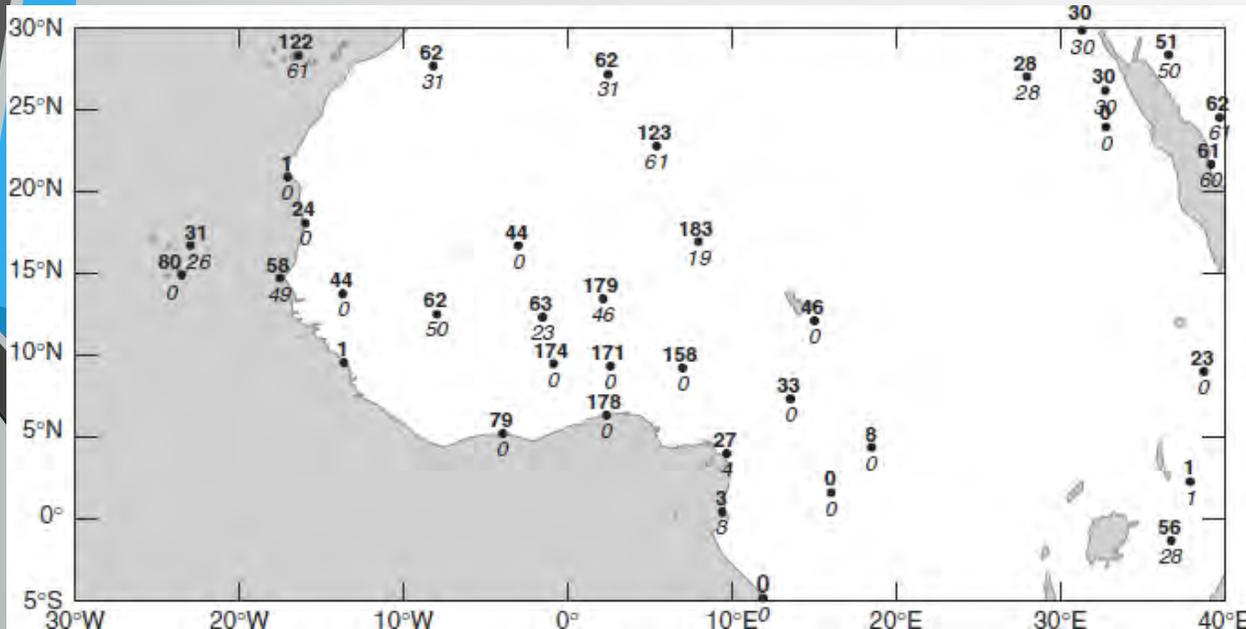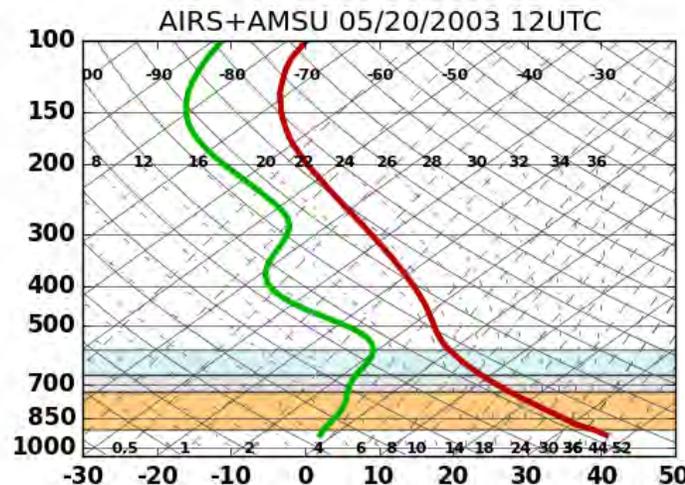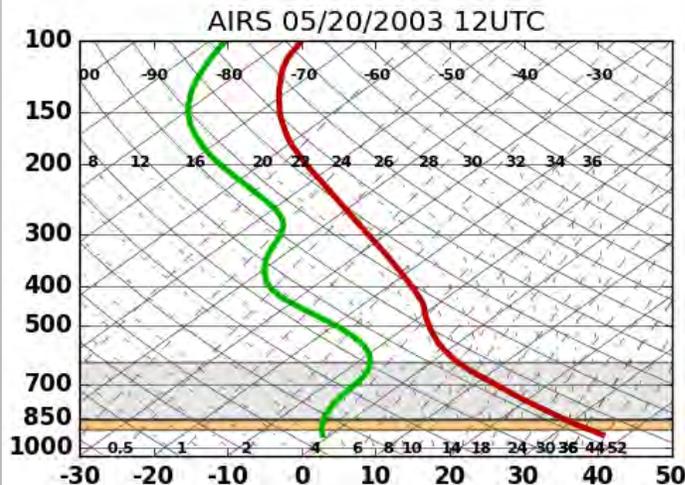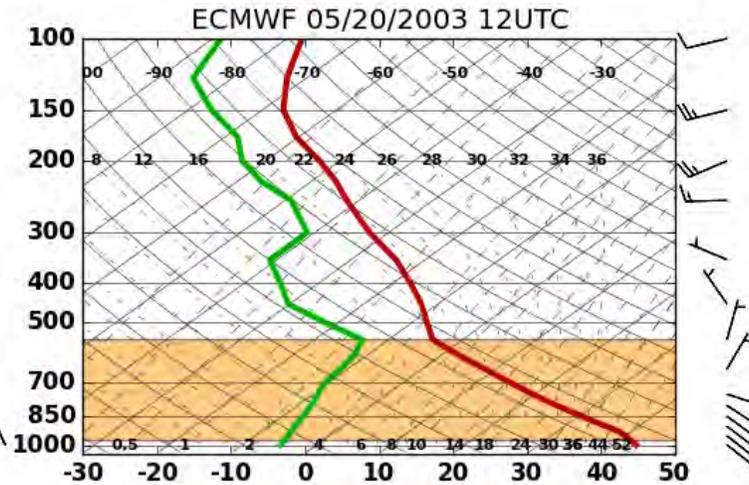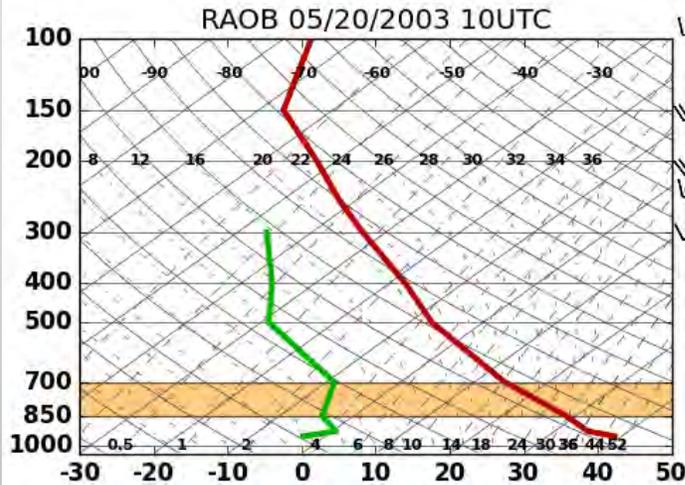
West African Geography
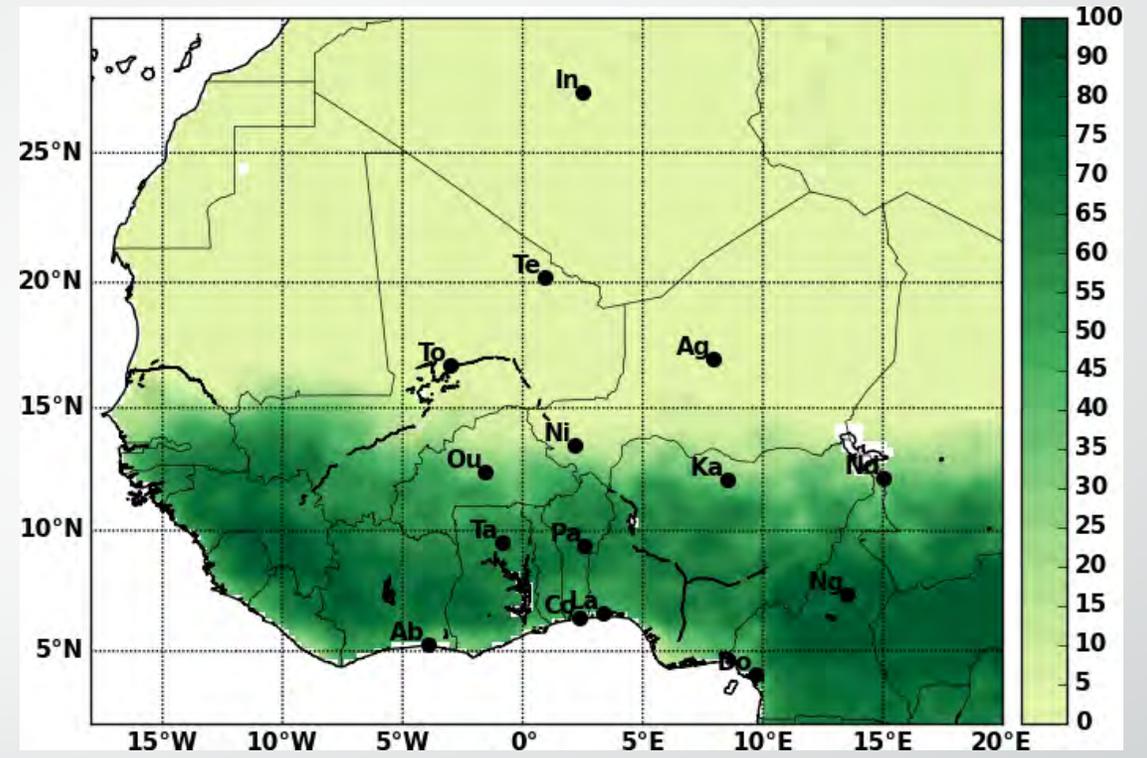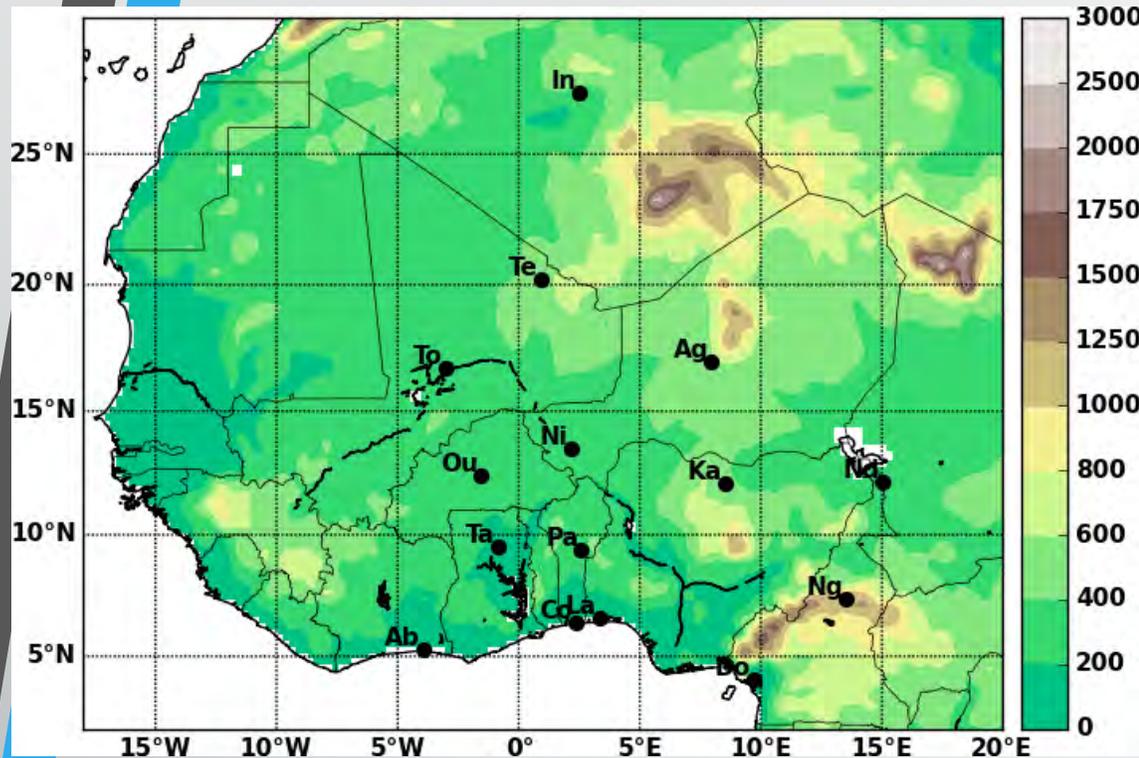
- Diverse topography

- Strong thermal gradients

- African Easterly Waves

- Applied sounding network (shown)

AIRS and well-mixed layer detection

Agadez 61024 Lat: 16.97N Lon: 7.98E Time: 2003/05/20 12UTC

- Data sources
  - NCDC radiosondes
  - ECMWF reanalysis
  - AIRS (L2, Version 6.0)
  - AIRS/AMSU (L2, version 6.0)
- Algorithm
  - Detects well-mixed layers
    - Temperature and moisture lapse rates
    - Key: nearly constant mixing ratio
    - Quality control (layers, top height)
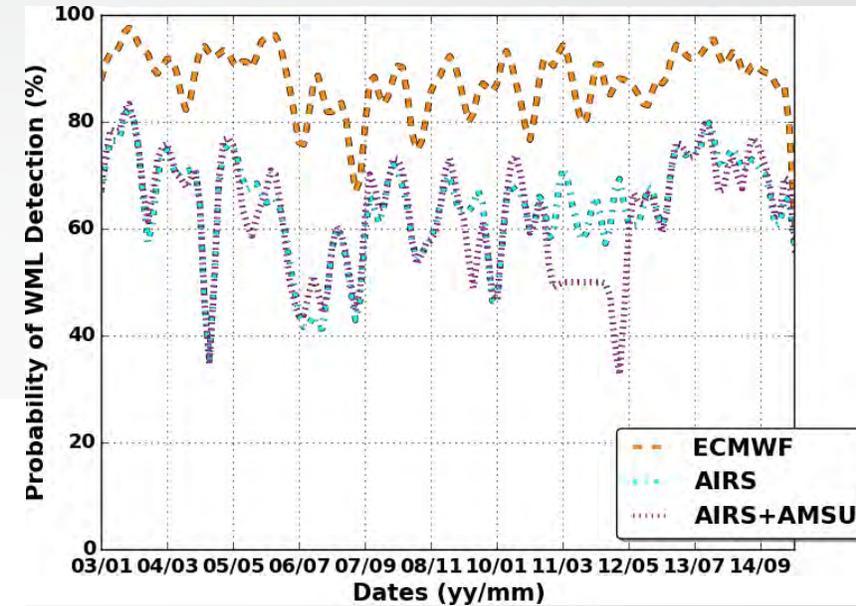- Given smallness of layers used AIRS support products

Overall (12 years) Dust Independent

- AIRS underbias (~0.7)
  - More underbiased than ECMWF
- AIRS hit rate (~60%)
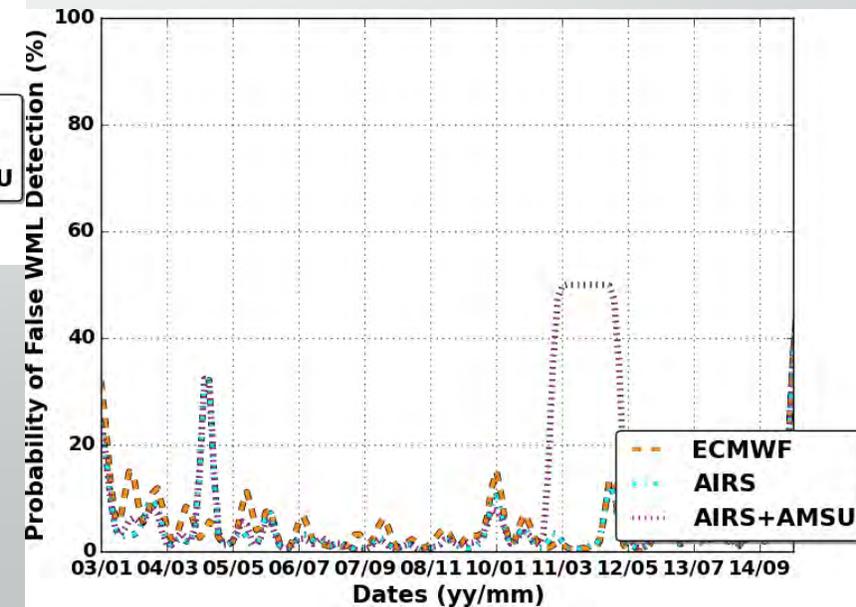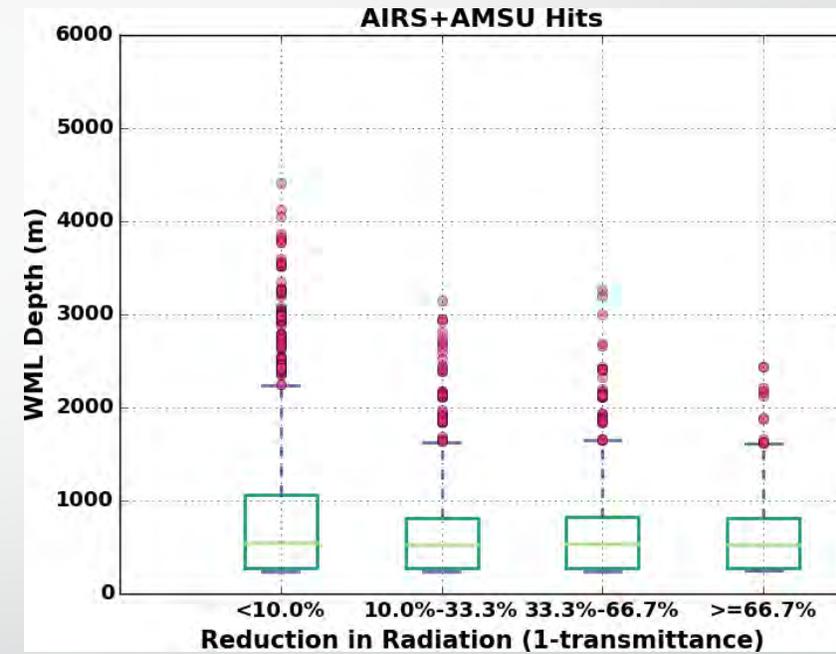- AIRS false alarm (<7%)
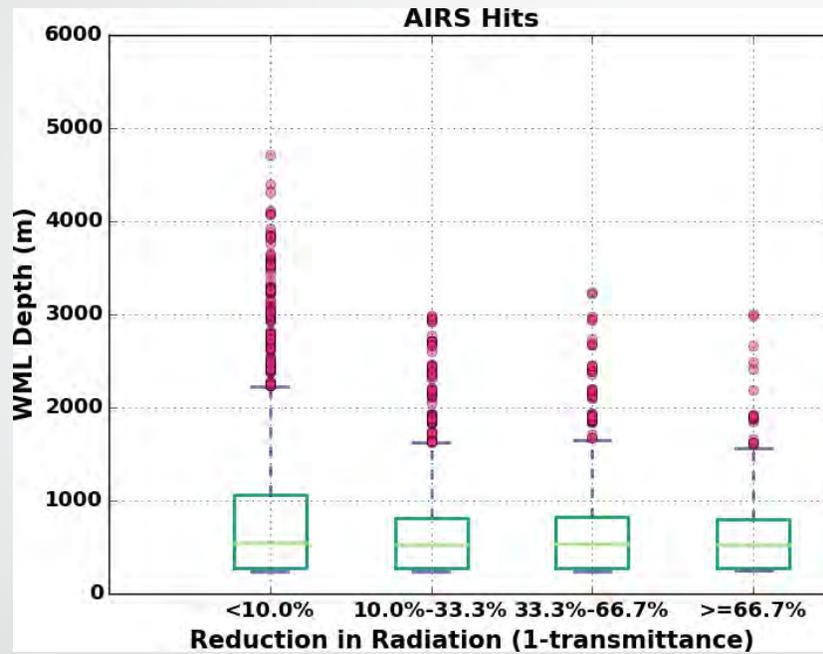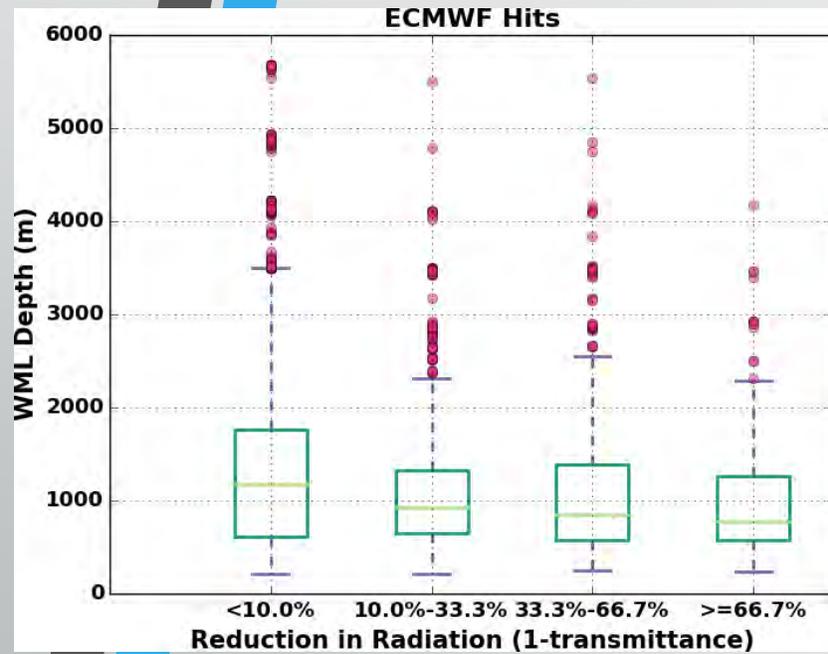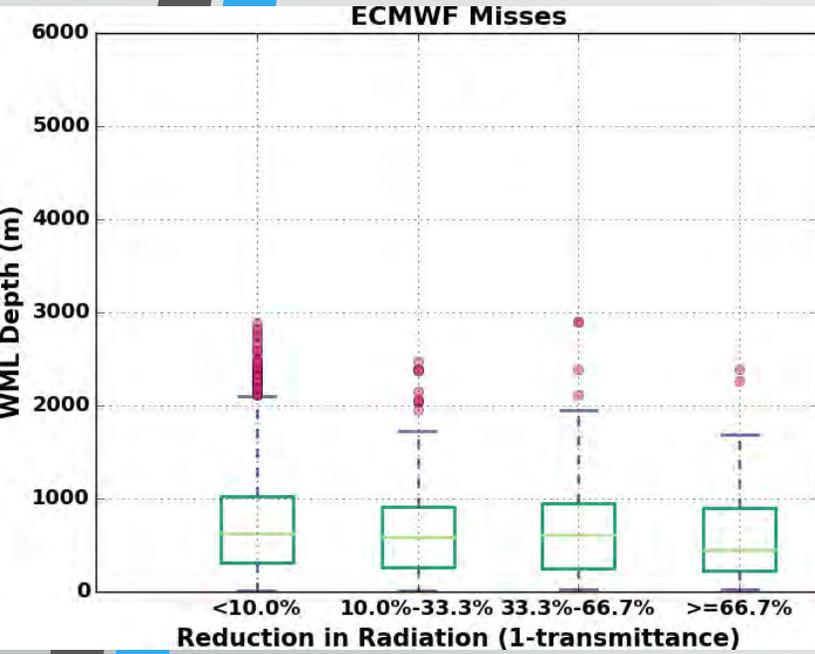- Many missing RAOB's
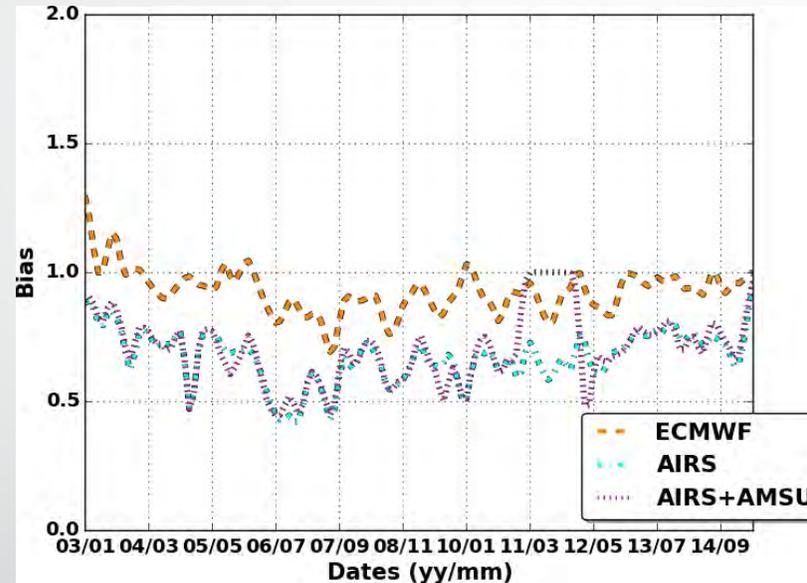
Hits

Bias

False Alarm
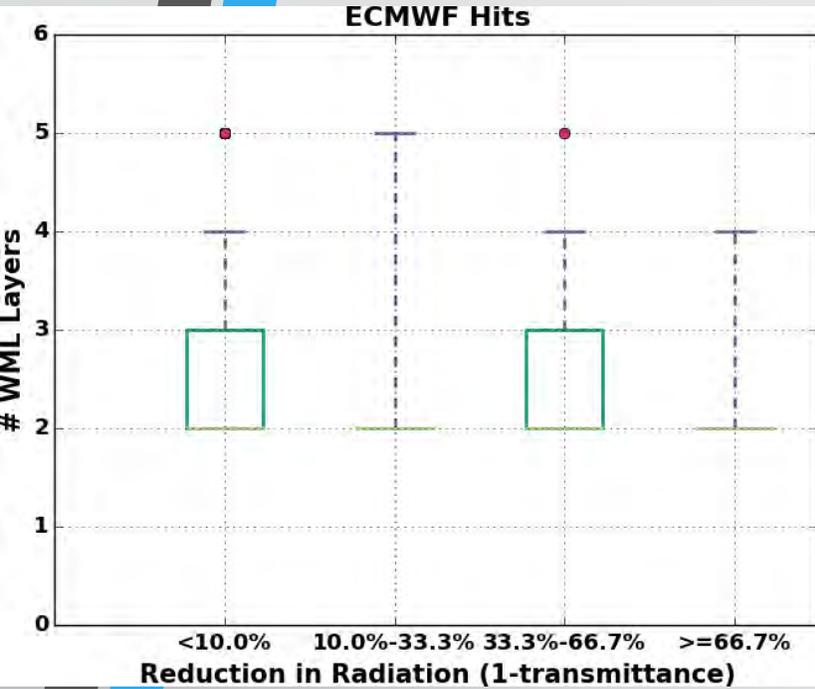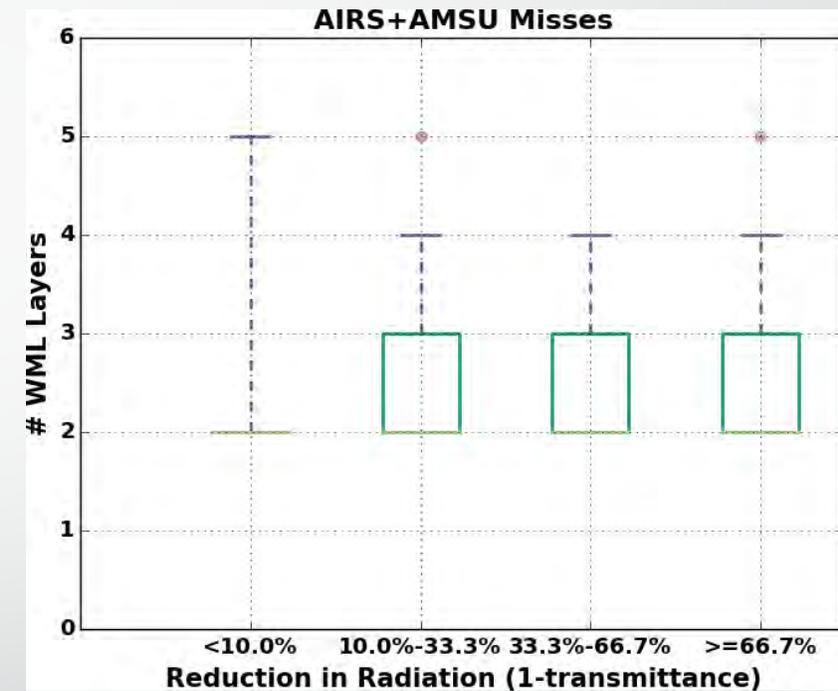
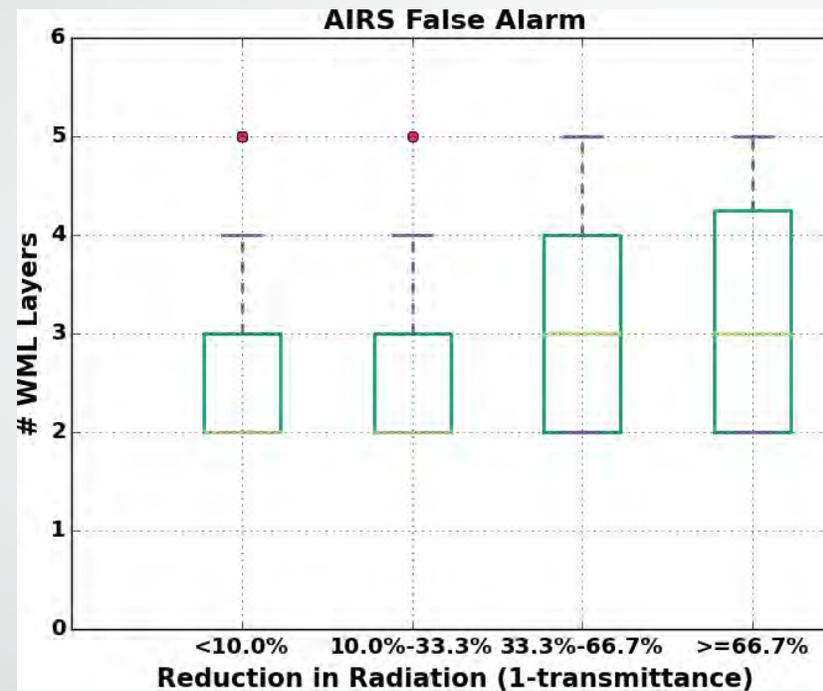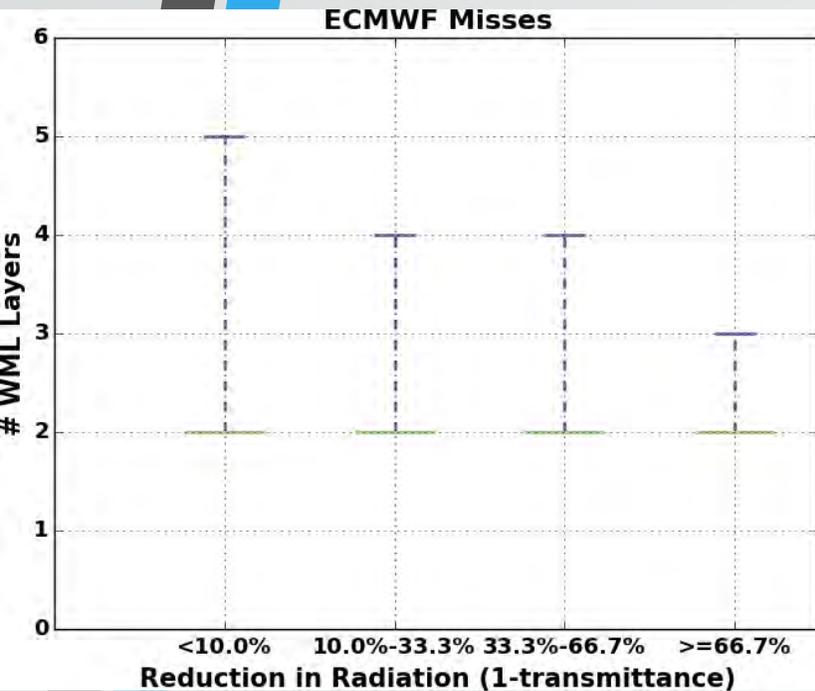# Depth and Dust (Hits)

Depth and Dust (Misses)
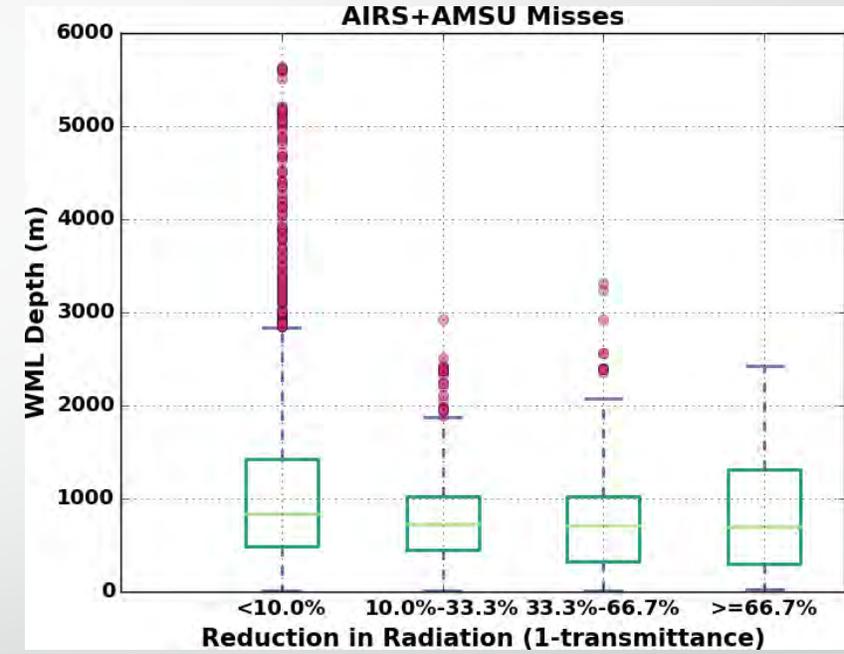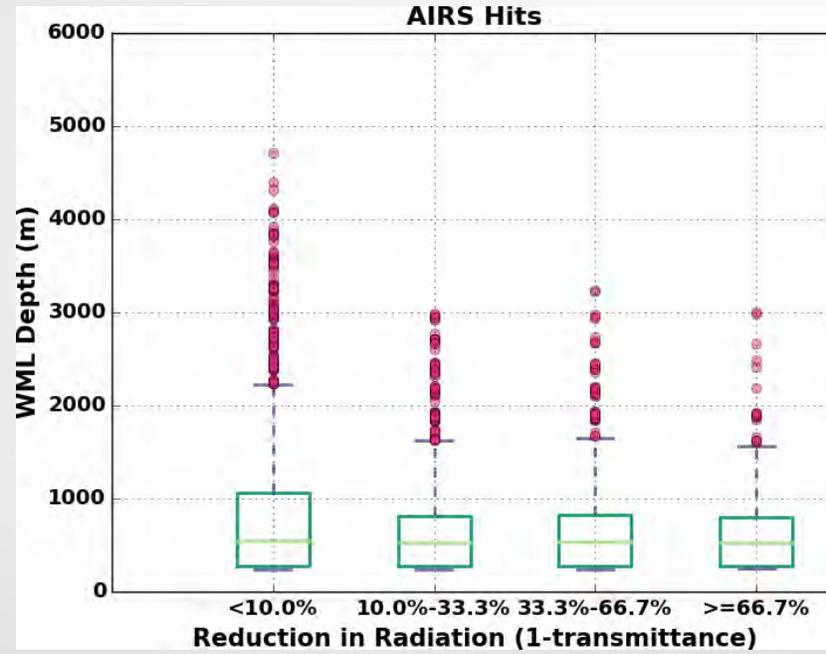
Levels and Dust (Hits)
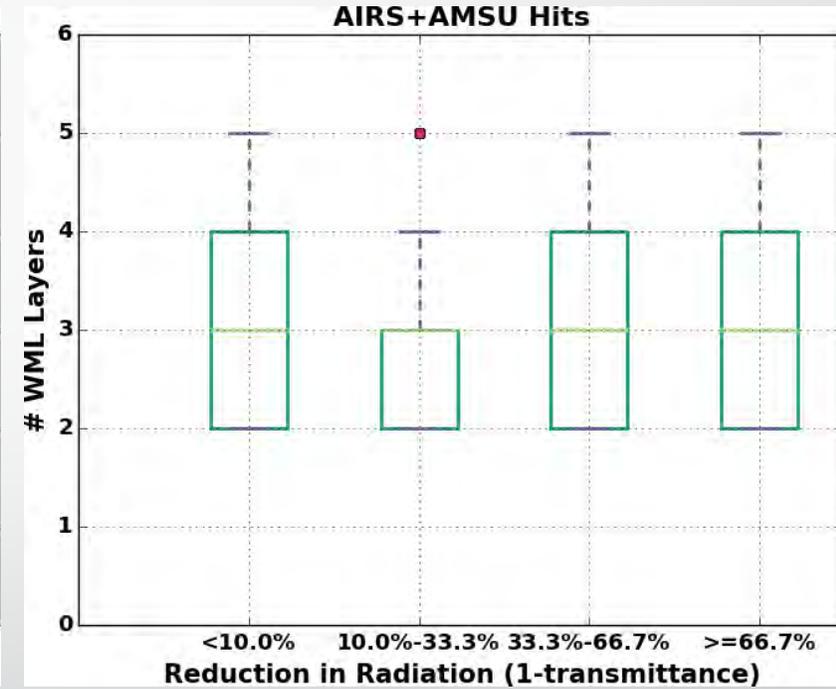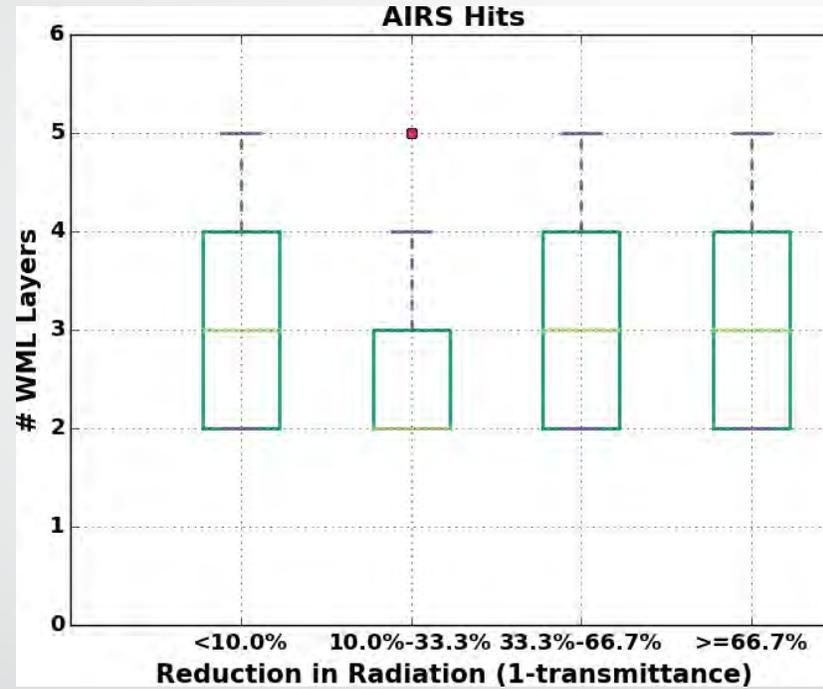
Levels and Dust (Misses)

Summary

- AIRS and AIRS/AMSU can detect WML

  - Underbiased

  - Decent detection rate

- AIRS detection threshold around 300 m thickness

  - Most AIRS misses below 1000 m thickness

  - Dustier air thinner layers, tend to be more numerous