

Update on MWRRET.v2

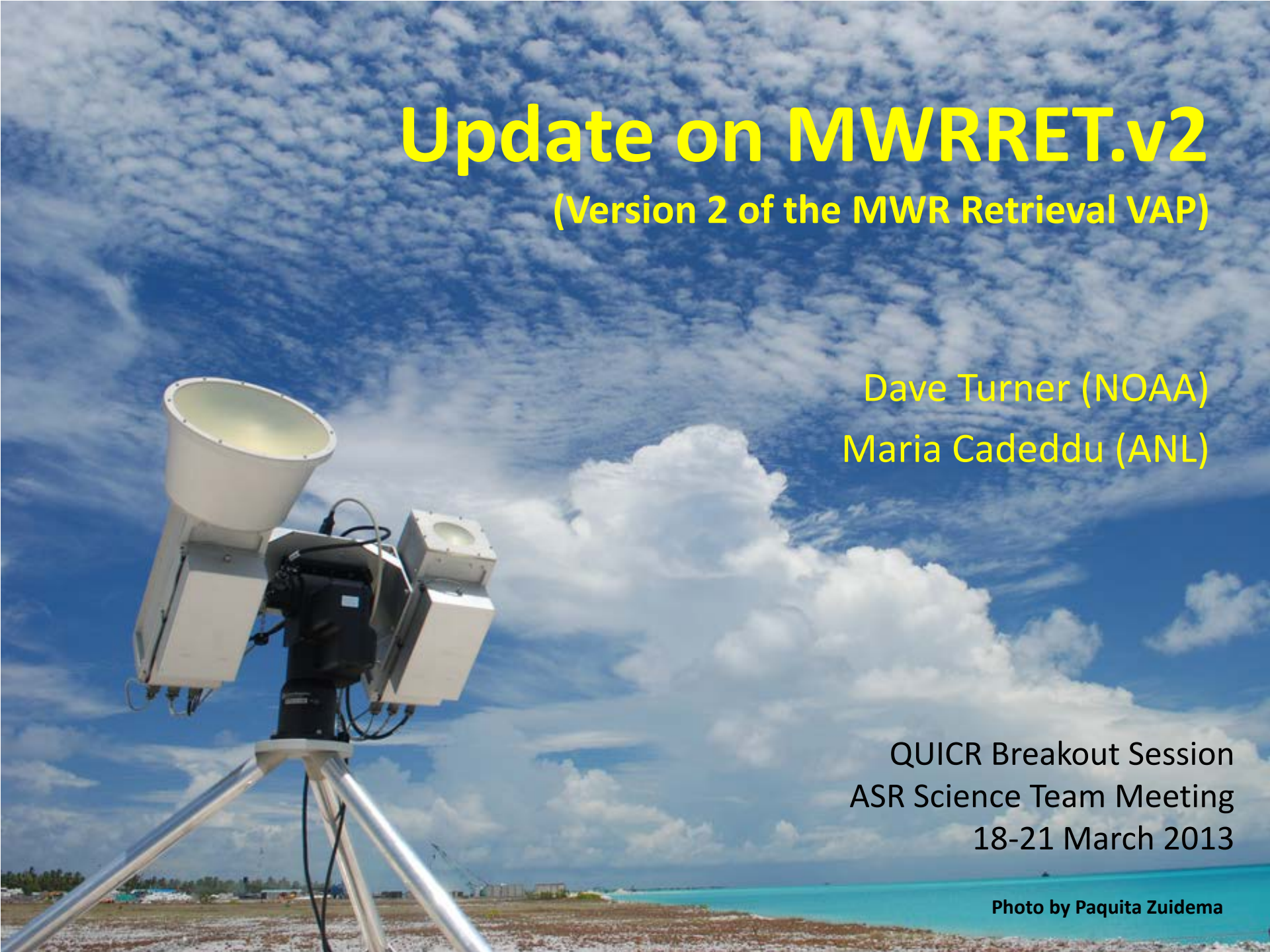
(Version 2 of the MWR Retrieval VAP)

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Photo by Paquita Zuidema



MWRRET Background (1)

- Original “LOS” statistical retrievals had significant biases, especially in LWP
- Many studies had demonstrated the need for accurate LWP for radiation, cloud-aerosol interactions, etc (especially for smaller LWP values)
- MWRRET developed to perform physical retrievals to get the best possible estimates of PWV and LWP from the MWRs
 - Original algorithm designed for orig 2-ch MWRs (23.8 & 31.4 GHz)
 - Forward model is MonoRTM v3.0 (~2005)
 - Used variable T_b offsets to remove bias in LWP during clear skies
 - Uses optimal estimation, so sample-specific uncertainties are produced
 - Implemented for all ARM MWRs, data in archive, running operationally
 - Turner et al., TGRS 2007
- 90 GHz observations have 3x sensitivity to LWP

MWRRET Background (2)

- Ordered many new MWR-3ch radiometers (23.8/31/89 GHz)
- Have several other higher frequency radiometers around also
 - 90/150 GHz systems (at SGP and AMF-1)
 - 170-183 GHz system at NSA
- Updated algorithm able to use any combination of frequencies to retrieve PWV and LWP; e.g.:
 - New MWR-3ch radiometers
 - GVR and GVRP at Barrow
 - Combine channels from multiple radiometers (e.g., MWR-2ch and MWR-HF at Azores)
- Updated forward model – MonoRTM v4.2 (Nov 2011)
 - Significant changes to H₂O continuum, H₂O line parameters (i.e., spectral widths), and N₂ continuum
- Updated algorithm can remove static T_b offsets

Cadeddu, Liljegren, and Turner, AMT, submitted

MWRRET v2 Status

**No T_b bias offsets applied
to these datasets!**

- Evaluation datasets processed for:
 - SGP MWR-3ch (23.8, 31.4, 89 GHz) Nov-Dec
2011
 - AMF/Gan MWR-3ch (23.8, 31.4, 89 GHz) Nov 2011
 - AMF/Azores MWR-2ch + MWR-HF (23.8, 31.4, 90 GHz) Jan-Dec 2010
 - Summit HATPRO + MWR-HF (23.8, 31.4, 90, 150 GHz) Jul 2010-Oct 2012
- Currently being implemented as VAP (by Riihimaki et al)
- Concerns / future
 - Need method to account for time-varying biases in some channel(s) ?
 - How to identify the channel(s) that need to have a bias correction?
 - Need automated way to determine clear skies from only the T_b data
 - Identification of precipitation induced biases
 - Ability to retrieve LWP and PWV during precipitation
 - The modeled temperature dependence of the liquid water absorption needs to be improved

Supercooled Liquid Water Absorption

- Strong temperature dependence of liquid water abs in μ wave
- Using data from 3 locations: FKB, SMT, UFS
- Analyzed frequencies: 31, 52, 90, 150, 225 GHz
- No single abs model fits the obs well at all frequencies
- Seems that our current model (Liebe91) is among the worst

