

Evaluation of a compact water vapor DIAL in humid climate conditions

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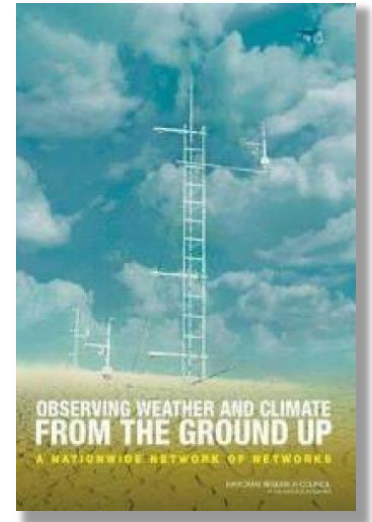
ISTP 2019

21 May, 2019

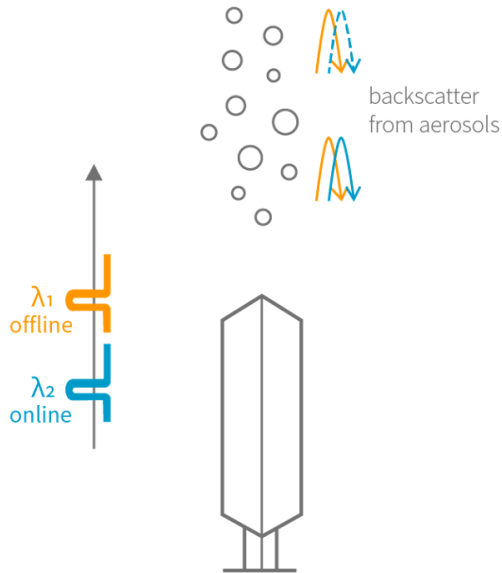
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Need for improved boundary layer profiling

- NMHSs are active in planning **mesoscale operational profiling networks**
- First-priority needs
 - / *National Research Council, USA, report, 2009 (2010, 2012)*
 - Height (and structure) of the PBL
 - Soil moisture and temperature profiles
 - **High-resolution vertical profiles of atmospheric humidity**
 - Air quality concentrations above the atmospheric surface layer



Vaisala water vapor DIAL (differential absorption lidar)

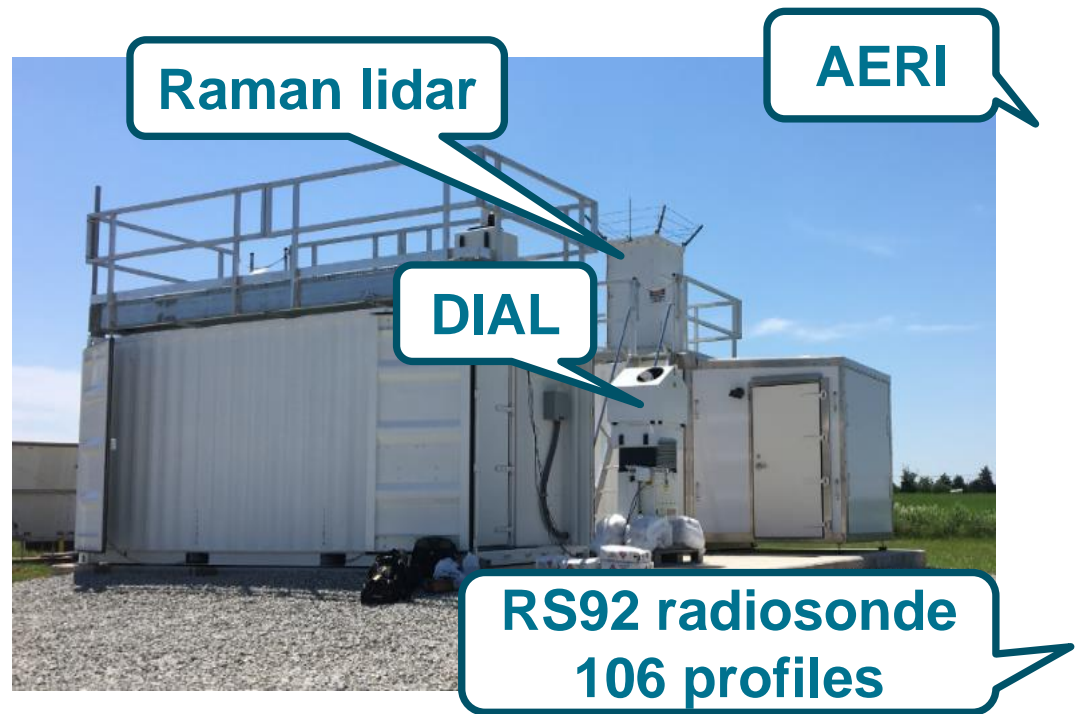


DIAL prototype

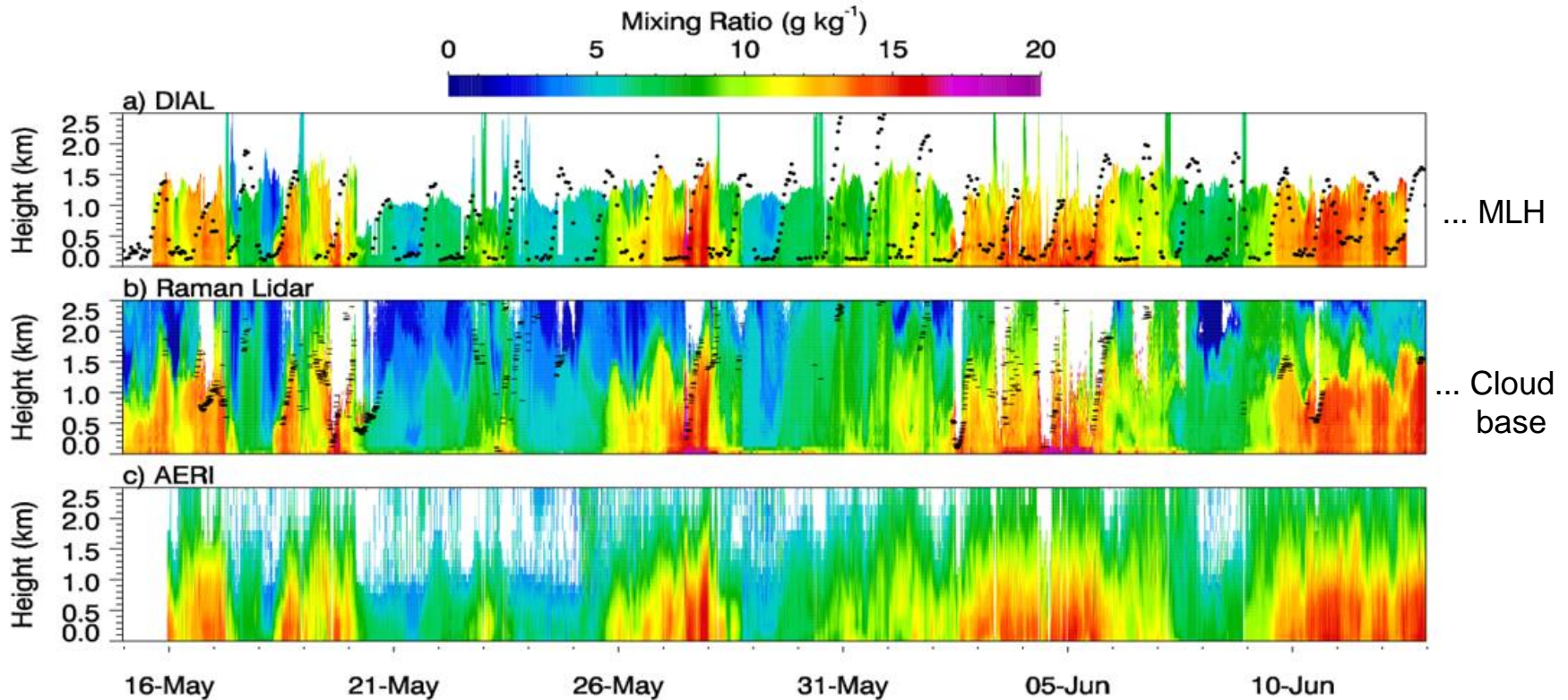
Instrument type	Pulsed laser diode, eye-safety 1M
Wavelength	910 nm range
Maximum range	3 km (nominal)
Averaging time	20 min
Optical units	Coaxial TX/RX, separate units for low/high altitude

Oklahoma, USA (36.4N 97.3W) Atmospheric Radiation Measurement (ARM) Southern Great Plains (SGP) site

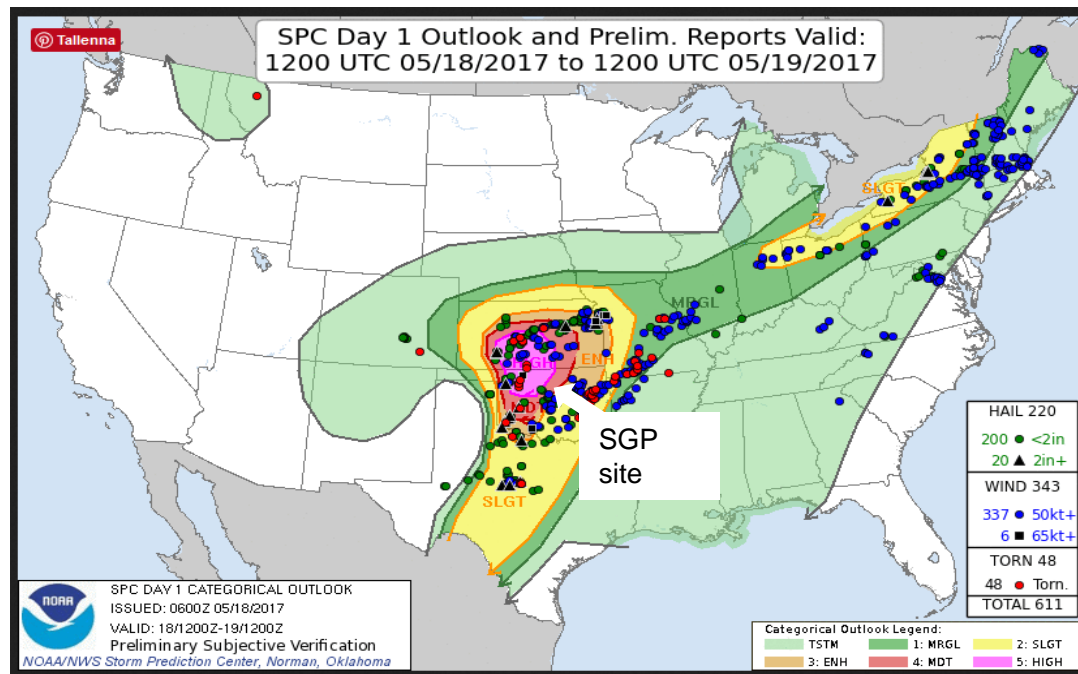
- 15 May to 12 June 2017
- Mid-latitude continental summertime conditions



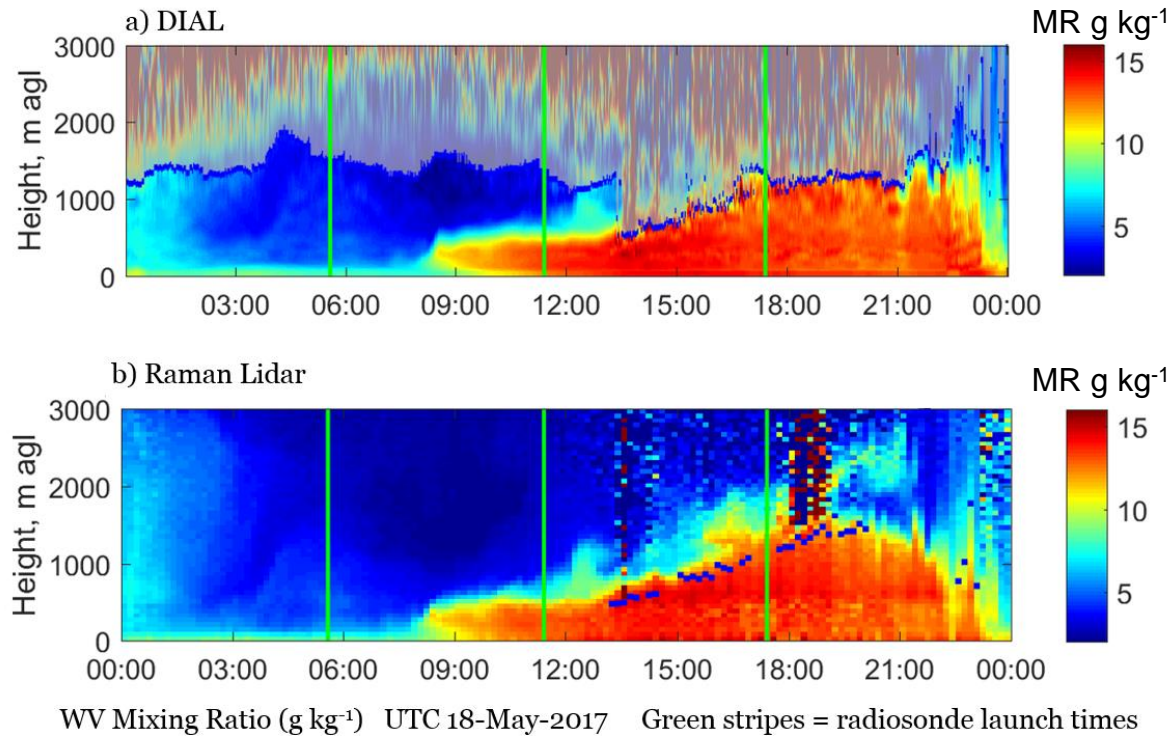
Time-height plots of water vapor mixing ratio



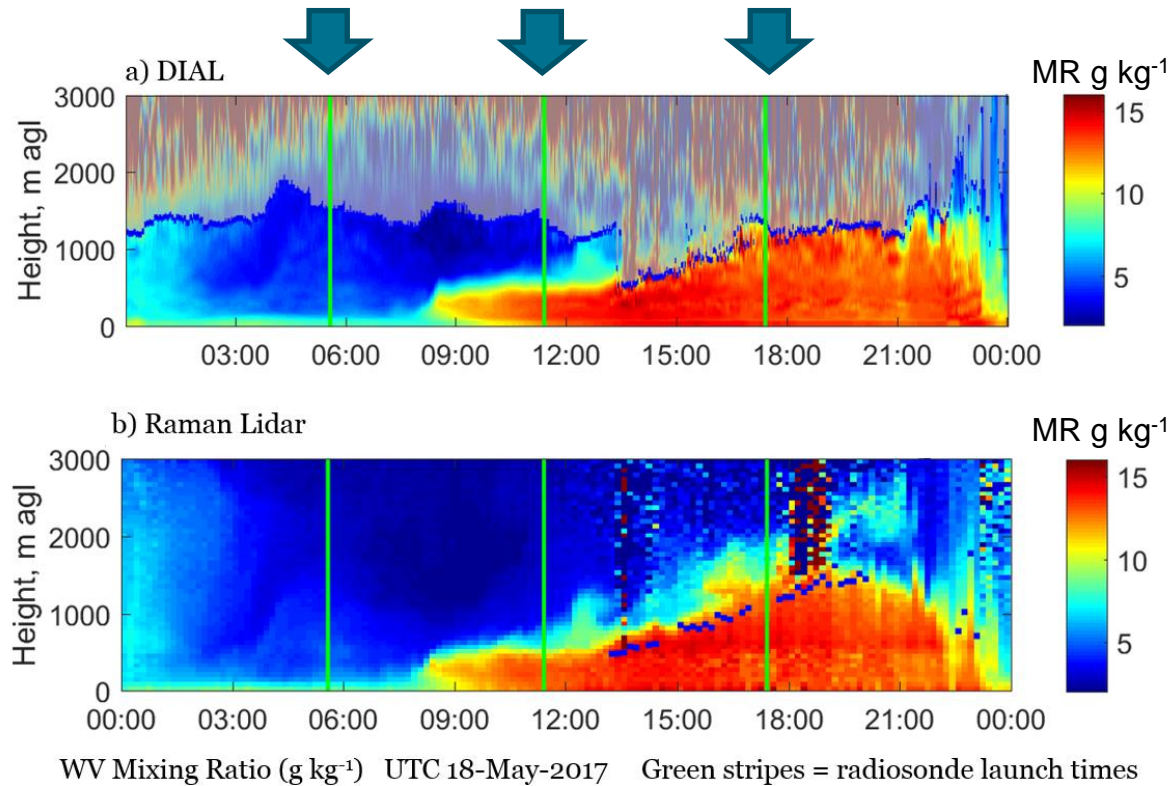
Example, May 18, 2017: Continuous monitoring of a severe weather event



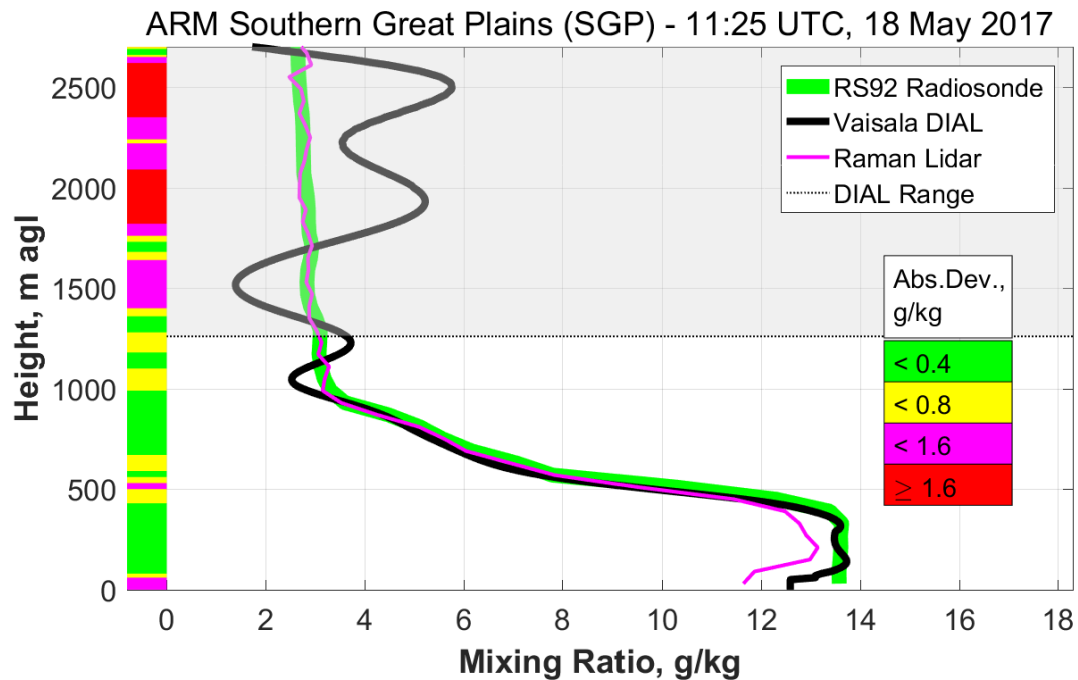
Example, May 18, 2017: Continuous monitoring of a severe weather event



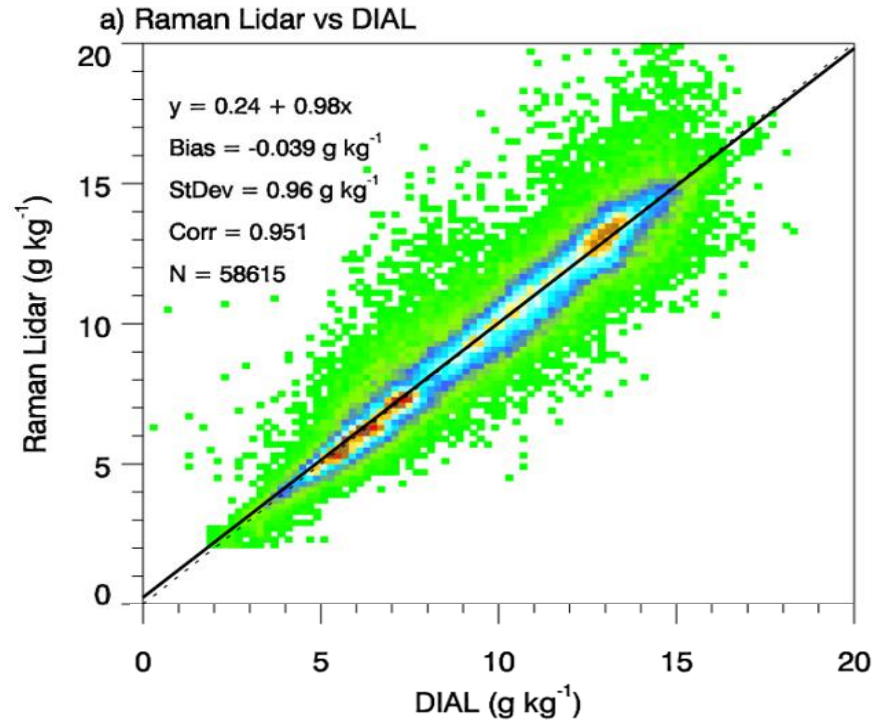
Example, May 18, 2017: Continuous monitoring of a severe weather event



Example, May 18, 2017: Continuous monitoring of a severe weather event

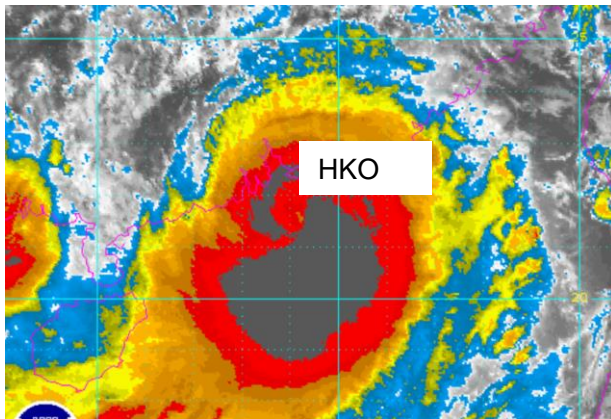


Instrument comparison

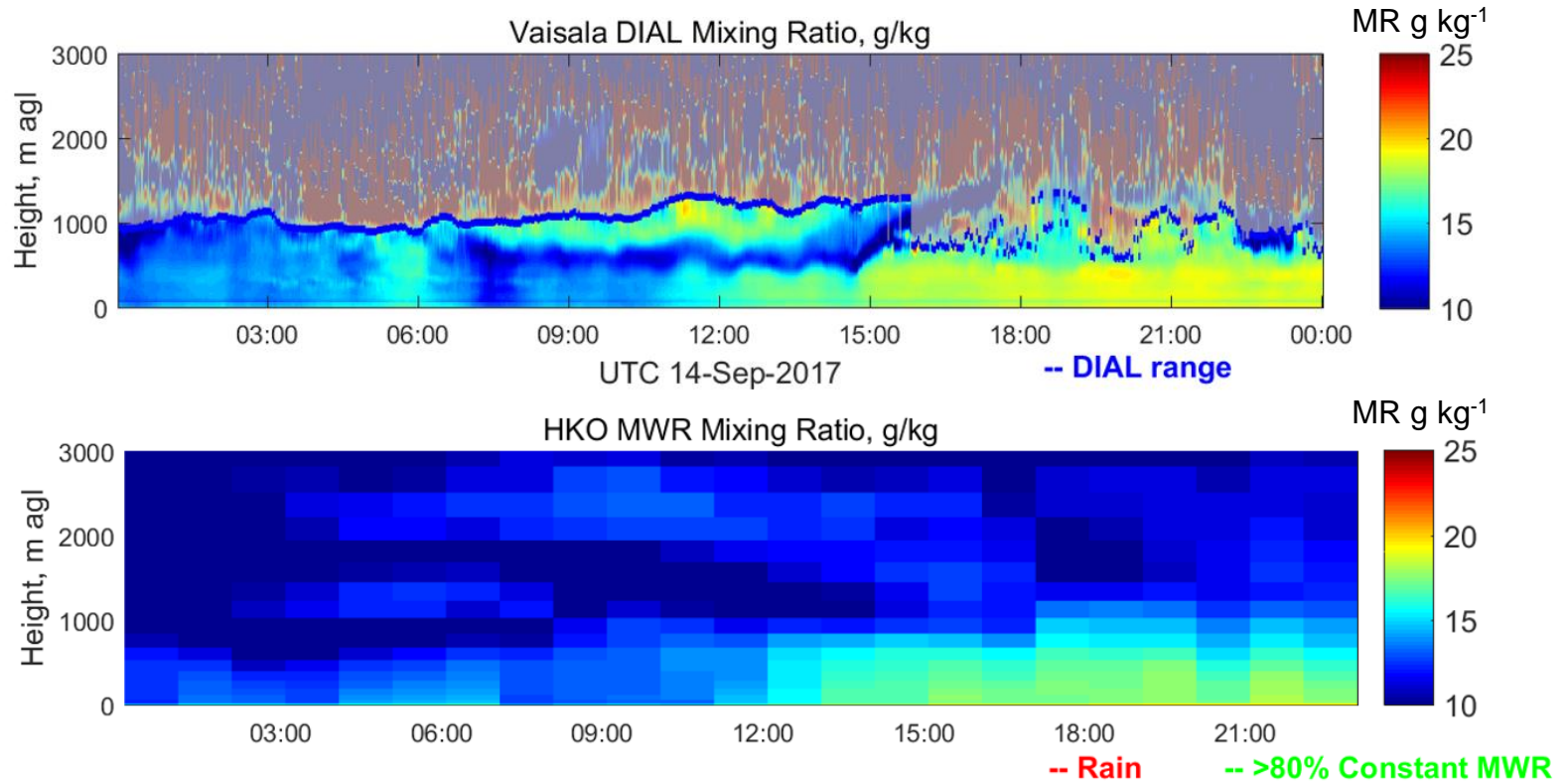


Hong Kong observatory (22.2N 114.1E)

- 22 August to 12 October 2017
- Very high humidity
- Two tropical cyclones

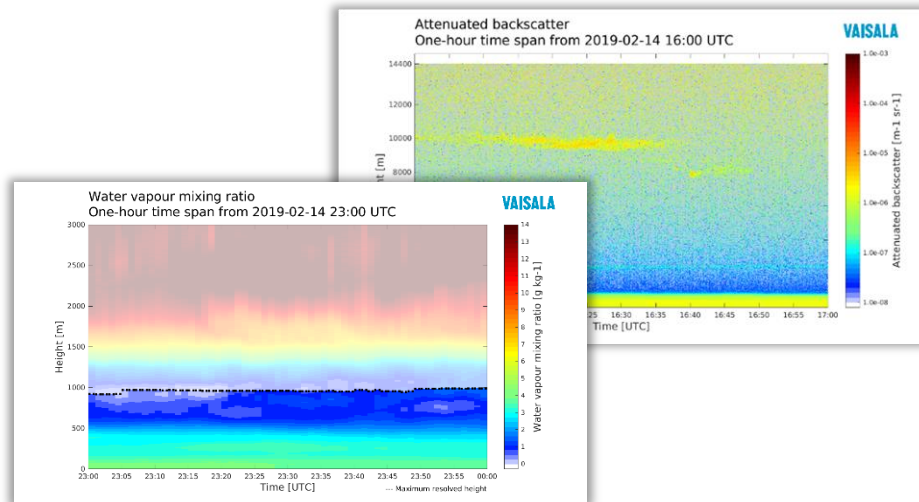


Example, September 14, 2017



Improved prototype design

- Design for manufacture
- Improved state-of-the-art electronics (RX, TX, CPU)
- Increased signal-to-noise ratio
- Data client for output files and graphs



ECDC Iqaluit, Canada

September 2018 -



DWD Lindenberg, Germany

January 2019 -



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