



# *Measuring Humidity? It's Plane and Simple!*

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Detailed measurements of humidity in the lower atmosphere are currently difficult and expensive to obtain. For this reason, there is interest in the development of low-cost, high-volume opportunistic technologies to acquire measurements of tropospheric humidity. We demonstrate the use of interferometry to measure the atmospheric refraction of the Automatic Dependent Surveillance-Broadcast (ADS-B) radio transmission routinely broadcast by commercial aircraft. Atmospheric refraction is strongly influenced by changes in humidity, and refractivity observations have proved to be an effective source of humidity information for numerical weather prediction models. A prototype ADS-B interferometer has been developed that can simultaneously perform angle-of-arrival (AoA) interferometry and decode ADS-B signals. Combining the measured AoA of the ADS-B signal with the known position of the aircraft (information contained within the ADS-B signal) allows the bending of the signal due to refraction to be determined. Combining the measured bending of numerous ADS-B signals allows for information concerning the refractivity structure to be extracted. The results from an experiment using a prototype ADS-B interferometer are shown and initial refractivity profiles were retrieved using a ray tracing forward operator and its adjoint. A huge amount of future work is required to fully realise the potential of this novel source of atmospheric observations, however initial results encourage further exploration into the potential to further mitigate sources of observational noise and potential assimilation experiments. This work has been funded by the University of Exeter, the UK Met Office and the Harry Otten Foundation.

**Thursday, 26 June 2025, 2:00PM**

**Refreshments 1:45PM**

**Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm**

NCAR-Foothills Laboratory, 3450 Mitchell Lane  
FL2-1022, Large Seminar

**Seminar will also be live webcast**

**<https://sundog.ucar.edu/public/page/MMM>**

Participants may ask questions during the seminar via Slido.