LOTOS: A Comprehensive Lower -Troposphere Observing System

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EARTH OBSERVING LABORATORY

NCAR

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Lower Troposphere Observing System: A Proposal

LOTOS is:

- Proposed as a configurable and scalable integrated suite of automated ground-based in-situ and remote sensors for weather and climate research

LOTOS is designed to:

- Provide quasi-3-D sensing of the lower troposphere with horizontal distribution of properties at the Earth's surface
- Provide U, T and WV profiles from five nodes
- Provide multiple observations of exchange processes across the land-surface interface and between BL and the free atmosphere

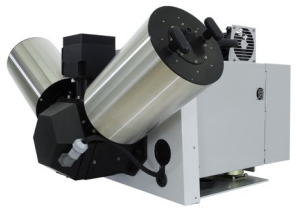
Some likely LOTOS applications:

- Microscale meteorology
- Mesoscale meteorology
- Biogeochemistry
- Hydrology
- Urban meteorology
- Wind energy

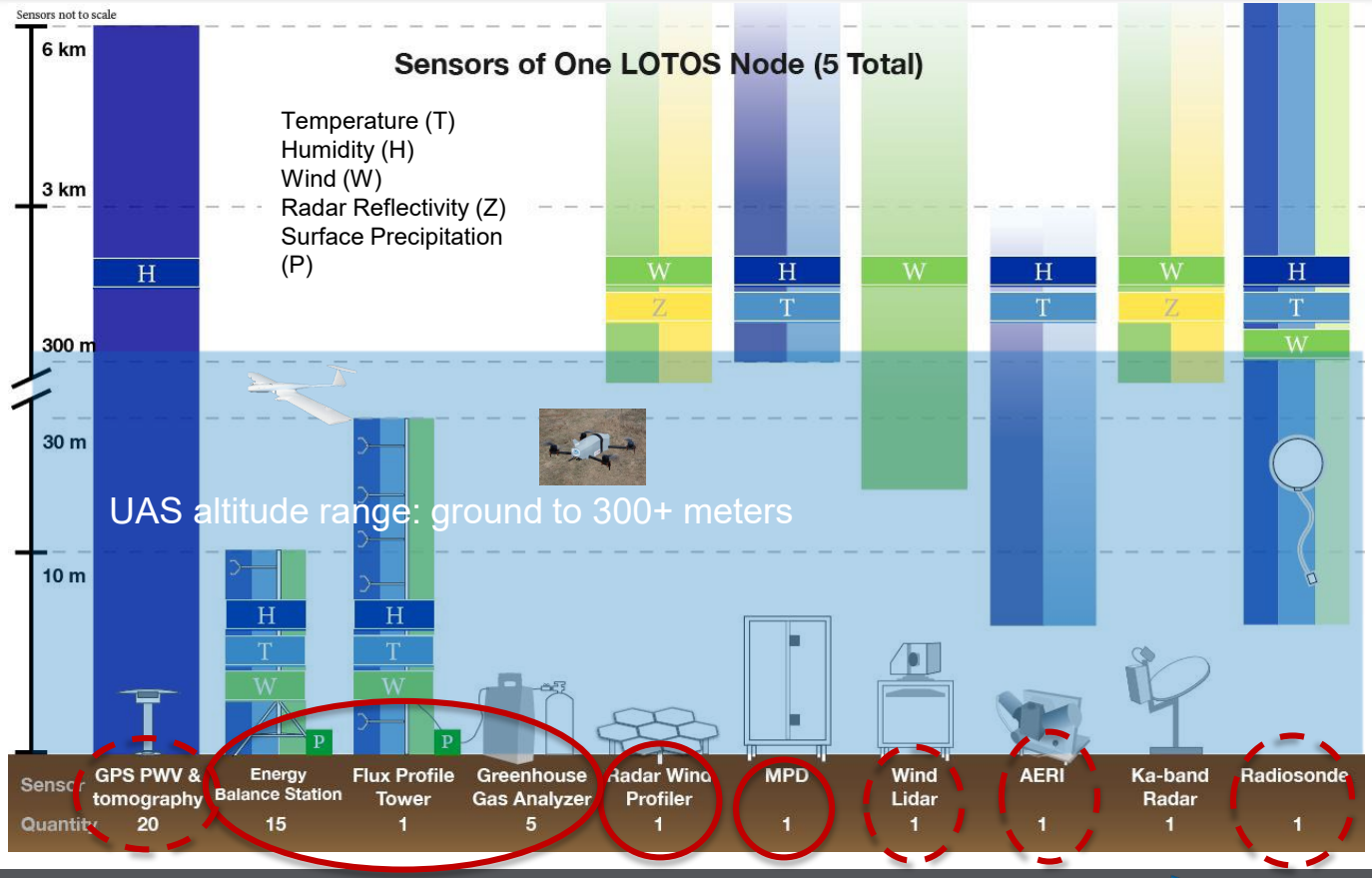






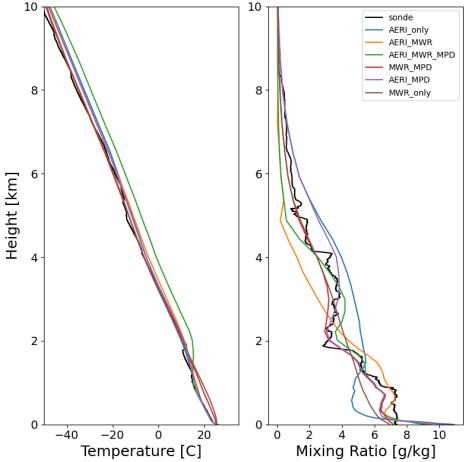
LOTOS Components: Complementary in-situ and remote sensors



EOL's current deployable instruments

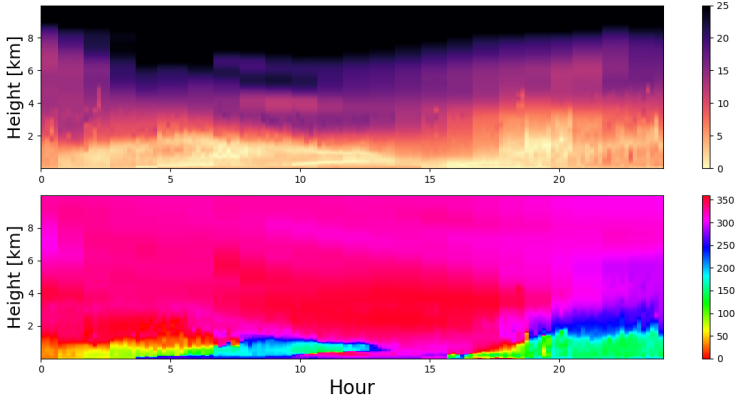
Combining Observations: Optimal Estimation

Thermodynamic Retrieval (TROPoe)
5 August 2021



Optimal results by combining thermodynamic profilers

Wind Retrieval (WINDoe)
5 August 2021



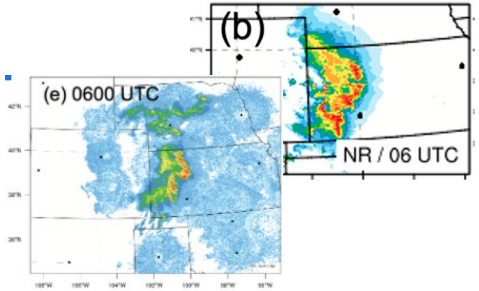
Full wind profile results by combining data from:

- 449 MHz Wind Profiler
- Doppler wind lidar
- 30-m tower data
- Hourly WRF ensemble constraint

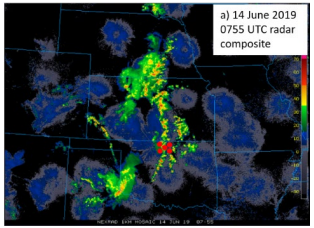
Following Turner and Löhnert (2014, 2021) and Turner and Blumberg (2019)

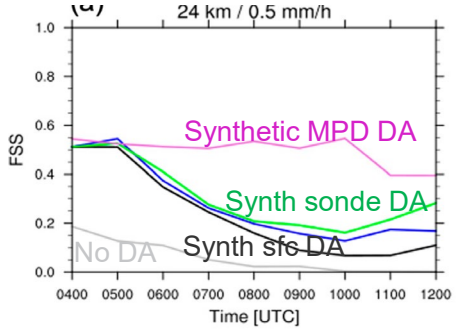
Integrated Observations: Data Assimilation

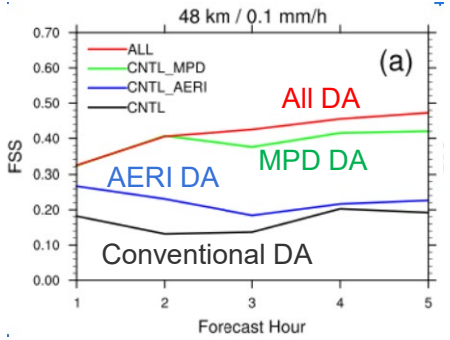
Observing System Simulation Experiment (OSSE) (Kay et al. 2022 MWR)



Observing System Experiment (OSE) (Kay et al. 2023, submitted to MWR)



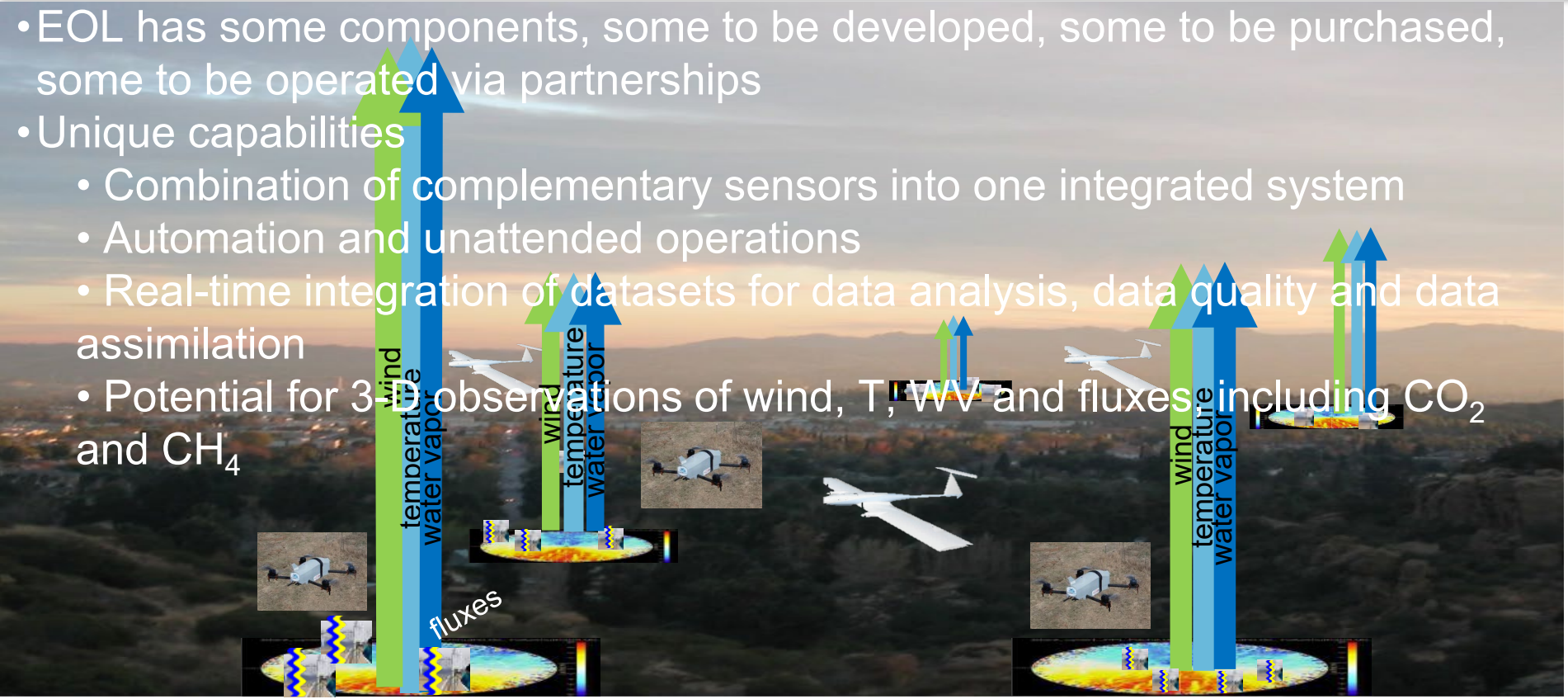




Assimilation of MPD water vapor profiles improves short-term forecasts of convection initiation and precipitation compared to no DA (in the OSSE) and compared to assimilating conventional observations (in the OSE)

LOTOS Vision

- EOL has some components, some to be developed, some to be purchased, some to be operated via partnerships
- Unique capabilities
  - Combination of complementary sensors into one integrated system
  - Automation and unattended operations
  - Real-time integration of datasets for data analysis, data quality and data assimilation
  - Potential for 3-D observations of wind, T, WV and fluxes, including CO_2 and CH_4



Join the LOTOS Team!

We're looking for partnerships with instrument providers, modelers and data integrators.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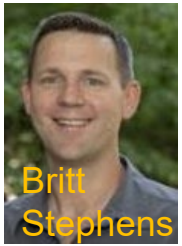
Tammy Weckwerth


Bill Brown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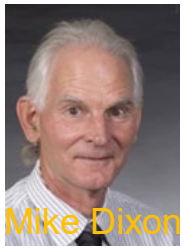
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