LOWER TROPOSPHERE OBSERVING SYSTEM (LOTOS)

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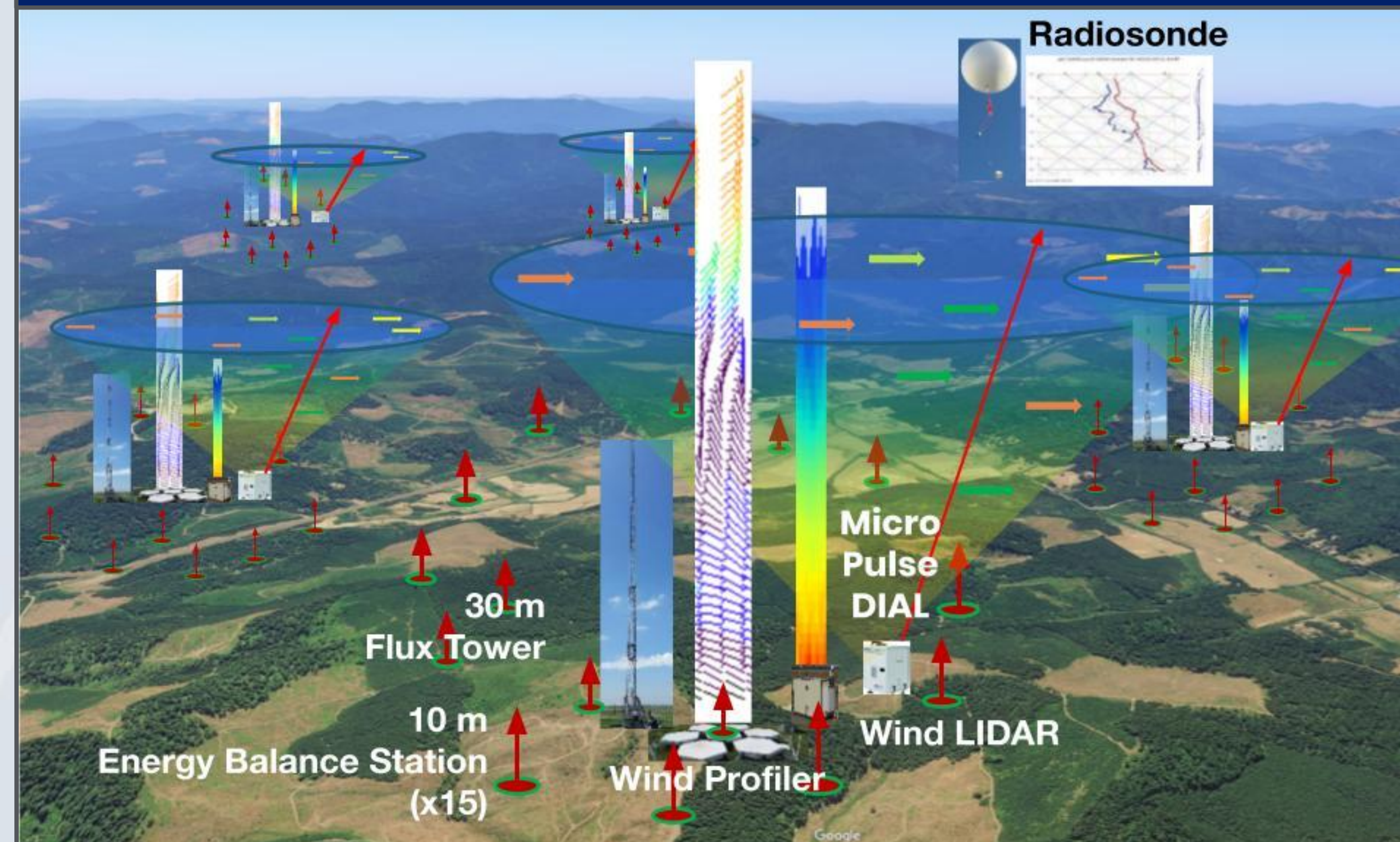
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LOTOS MOTIVATION

- LOTOS is motivated to address outstanding scientific challenges of processes within the atmospheric surface layer, boundary layer, and lower troposphere.
- LOTOS enables quantifying spatial structure and temporal evolution of the lower troposphere needed to advance Earth System science including urban needs (air pollution).
- LOTOS enables quantification of boundary layer processes, surface exchange of biogeochemical and climate-relevant gases from microscale up to regional scale.
- LOTOS allows multiple observations of exchange processes across the land-surface interface and between BL and the free atmosphere.

LOTOS CONCEPT - 5 NODES

Radiosonde

30 m Flux Tower

10 m Energy Balance Station (x15)

Wind Profiler

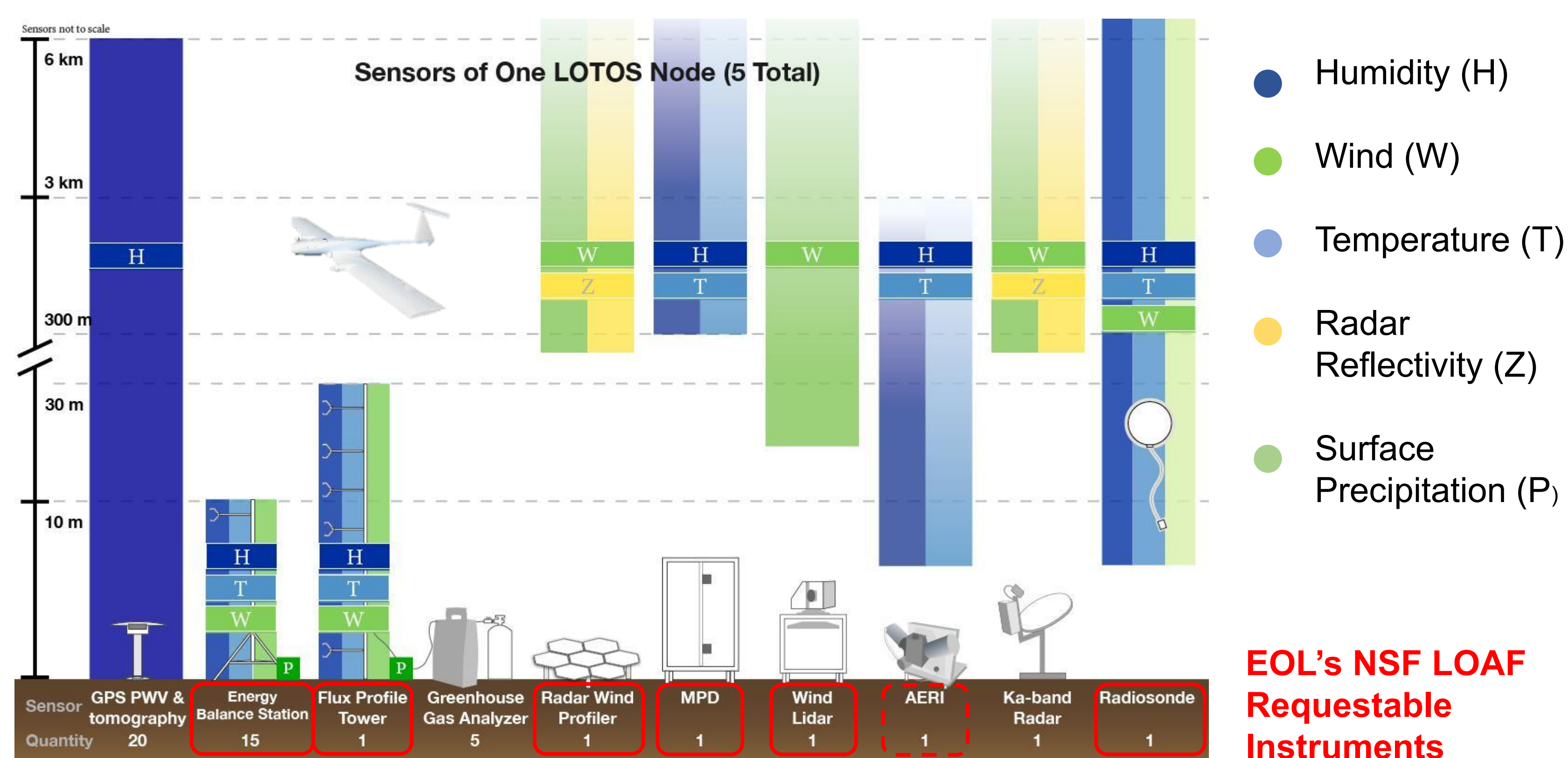Micro Pulse DIAL

Wind LIDAR

LOTOS CAPABILITIES

- A configurable and scalable integrated suite of automated ground-based in-situ and remote sensors.
- 3D sensing of the lower troposphere and horizontal distribution of properties at the Earth's surface.
- A network of 5 nodes consists of vertical wind and thermodynamic profiling of the lower troposphere
- Multiple sensors surrounding each node for surface and subsurface characterization and quantification of exchange processes at the lower boundary.
- Intended to be a requestable NSF Lower Atmospheric Observing Facility (LAOF)

WE ARE LOOKING FOR COLLABORATORS

- Community (University, NSF CIF's) Instrumentation (eg: **SWEX**, **Perdigão**)
- Facilitate community common data formats and tools – LIDARS, Profilers, Mesonets
- Create community value added data products.

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LOTOS VERTICAL MEASUREMENT RANGES

Sensors of One LOTOS Node (5 Total)

- Humidity (H)
- Wind (W)
- Temperature (T)
- Radar Reflectivity (Z)
- Surface Precipitation (P)

EOL's NSF LOAF Requestable Instruments

Sensor	GPS PWV & tomography	Energy Balance Station	Flux Profile Tower	Greenhouse Gas Analyzer	Radar Wind Profiler	MPD	Wind Lidar	AERI	Ka-band Radar	Radiosonde
Quantity	20	15	1	5	1	1	1	1	1	1

COMBINING MEASUREMENTS INTO A UNIFIED PRODUCT

WINDoe with Ensemble Constraint
Based on TROPoe
(Dave Turner, Josh Gebauer, et al)

5 Aug 2021 wind retrieval at NCAR Marshall field site
Combining data from:
- Wind Profiler 449 MHz
- Doppler wind LIDAR
- 30 meter Tower data
- Hourly WRF ensemble constraint

Technique shows promise in comparisons with soundings

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Wind Speed

Wind Direction