Atmospheric flow in complex terrain has received increased attention in recent years because of its numerous applications, including air pollution, contaminant dispersion, aviation, and wind energy harvesting. Many of these applications demand improved observations and accuracy of predictions spanning multitude of scales, from mesoscale to microscale.

To support observational needs of the mountain meteorology research community and, more broadly, the Earth System science needs for enhanced thermodynamic profiling and land-atmosphere exchange process measurements, a new integrated sensor network is being developed. The LOwer Tropospheric Observing System (LOTOS) sensor network is designed to allow simultaneous and coordinated sampling both vertically, through the atmospheric planetary boundary layer, and horizontally, across the surrounding landscape, focusing on the land-atmosphere interface. The core of LOTOS will be a portable integrated network of up to five nodes, each consisting of a profiling suite of instruments surrounded by up to fifteen flux measuring towers. LOTOS is designed to operate in unattended mode to provide remotely sensed profiles of winds, temperature, moisture, clouds and aerosols; in situ measurements of turbulence and surface fluxes; near-surface profiles of meteorological parameters and greenhouse gases and automated radiosonde launches.

LOTOS will provide an integrated set of measurements needed to address outstanding scientific challenges related to processes within the atmospheric surface layer, boundary layer, and lower troposphere, and enable novel quantification of surface exchange of biogeochemical and climate-relevant gases from microscale up to regional scale. This presentation will describe the background, motivation, plan and timeline for the LOTOS’ proposed development.