

# Tethered Balloon System Baseline Measurements, Instrumentation, and Equipment

## Atmospheric State and Aircraft State

Instrument	Description	Source/Supplier
iMet RSB-1 radiosondes	Pressure, temperature, relative humidity, 3D GPS	interMet (iMet)
iMet XQ2 UAV Sensor	Pressure, temperature, relative humidity, 3D GPS	interMet (iMet)
Sensornet Oryx DTS*	Distributed temperature sensing at 2 m spatial resolution	Sensornet
Silixa XT DTS*	Distributed temperature sensing at 0.5 m spatial resolution	Silixa
40C cup anemometers	Hull-effect calibrated cup anemometers	NRG Systems
3-axis sonic anemometer**	Up to 20 Hz u, v, and $\omega$	Gill
WTAHRS2 IMU**	Up to 200 Hz x, y, z-axis acceleration and angle	WitMotion

\*Sandia guest instruments

\*\*In development

## Cloud Properties

Instrument	Description	Source/Supplier
Supercooled liquid water sondes	Cloud supercooled liquid water content	Anasphere
Video Ice Particle Sampler*	Ice particle maximum dimension, width, area, and aspect ratio from 1 to 5,000 $\mu\text{m}$	Natural Systems Research

## Aerosol Properties

Instrument	Description	Source/Supplier
Condensation Particle Counter (CPC), Model 3007 (2 units)	Total aerosol concentration > 0.01 $\mu\text{m}$	Trust Science Innovation (TSI) Inc.
Printed Optical Particle Spectrometers (POPS, 4 units)	Aerosol size distribution from 140 nm to 3 $\mu\text{m}$	Handix Scientific
Cascade impactors (TBIs: Tethered Balloon Impactors, 3 units)	Atmospheric aerosol samples at four cut-off sizes (0.25, 0.5, 1.0, 2.5 $\mu\text{m}$ )	SKC

## Gas-Phase Measurements

Instrument	Description	Source/Supplier
SNL FROST Sampler/LECO GC-TOFMS*	Identification and concentration of volatile organic compounds	SNL/LECO

## Remote Sensing and Solar Radiation

Instrument	Description	Source/Supplier
Mirage 640P*	Cooled indium antimonide midwave (1.5 to 5 $\mu\text{m}$ ) calibrated thermal camera	ICI

## Equipment

Instrument	Description	Source/Supplier
Winch (3 units)* (*1 of the 3 units)	5 HP motor, 75:1 double-reduction gearbox, and reversible regenerative-driven variable-speed controller with 2.7 km of 2,500 kg minimum break strength plasma tether	SNL-built
Optical fiber spoolers (3 units)* (*1 of the 3 units)	1/8 HP motor, 75:1 gear box, and reversible variable-speed controller with 2.2 km of 50 $\mu\text{m}$ multi-mode fiber and fiber optic rotary joint	SNL-built
79 to 110 m <sup>3</sup> aerostats (6 units)* (*3 of the 6 units)	59 kg net lift in 0 m/s wind speed at sea level and standard air density	Skydoc
35 m <sup>3</sup> helikites (2 units)*	14 kg net lift in 0 m/s wind speed at sea level and standard air density	Allsops
Power and fiber optic embedded tether	550 m of 20 AWG conductor, one single-mode and one multi-mode fiber	Cortland