

# Recommendations for Instrumentation to Remain at Oliktok Point, AK to Support Future Arctic Aerial Campaigns

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As the AMF3 is relocated, ARM may consider maintaining some assets and capabilities at Oliktok Point, AK to support Arctic aerial field campaigns and use of the DOE R-2204 and W-220 controlled airspaces. Candidate instruments that would support UAS flights (and manned flights) utilizing the airspaces include those below.

*Note\*, Sandia National Labs owns a sounding station and ceilometer that may be available for use at Oliktok Point. To maintain the instrument systems, proper shelter with power and data/communication systems that can be activated for campaigns will be required.*

## **For identification of potentially dangerous conditions aloft:**

### **SONDE: Balloon-Borne Sounding System\***

Sondes are launched at scheduled intervals and provide in situ measurements (vertical profiles) of atmospheric moisture, pressure, temperature, turbulence, shortwave downwelling and upwelling irradiance, and wind speed and direction.

### **MAWS: Automatic Weather Station**

Measurements include atmospheric moisture, pressure, temperature and horizontal wind. The data are collected in one-minute averages of 10-second samples, and collected daily.

## **For surface-based data collection of cloud properties:**

### **KAZR: Ka ARM Zenith Radar**

Ka-band ARM zenith radar (KAZR) probes the extent and composition of clouds at millimeter wavelengths. The KAZR is a zenith-pointing Doppler radar. The main purpose is to determine the first three Doppler moments (reflectivity, vertical velocity, and spectral width) at a resolution of ~30 meters from ground to ~20 km altitude.

### **MWR (Radiometrics): Microwave Radiometer**

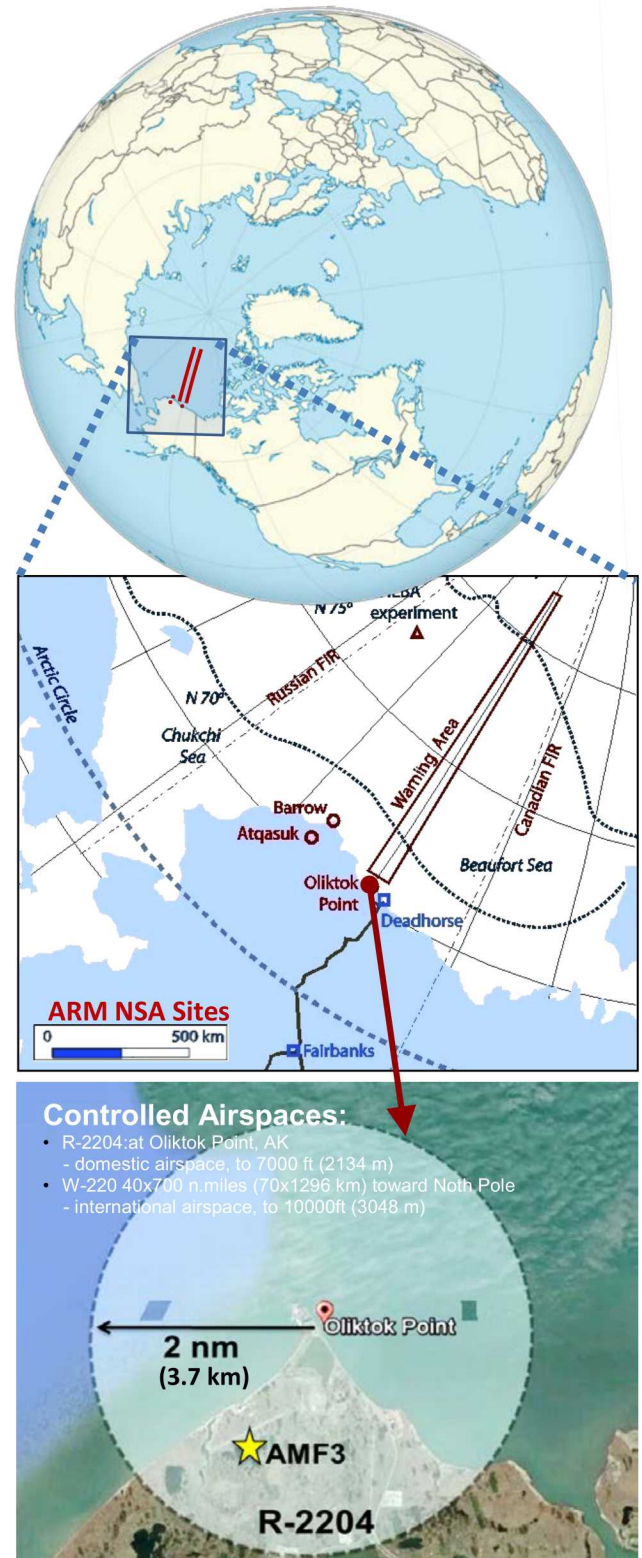
The Microwave Radiometer (MWR) provides time-series measurements of column-integrated amounts of water vapor and liquid water. Integrated water vapor and liquid water path are derived from radiance measurements with a statistical retrieval algorithm that uses monthly derived and location-dependent linear regression coefficients.

### **MPL: Micropulse Lidar**

The Micropulse Lidar (MPL) is a remote-sensing system, primarily to determine the altitude of clouds; however, it is also used for detection of atmospheric aerosols. Post-processing of the lidar return characterizes the extent and properties of aerosols or other particles.

### **CEIL: Ceilometer\***

The ceilometer (CEIL) is a remote-sensing near-infrared instrument that measures cloud height, vertical visibility, and potential backscatter signals by aerosols. It detects up to three cloud layers through a vertical range of 7700 m.



### **For surface-based data of winds:**

#### **DL: Doppler Lidar**

The Doppler Lidar (DL) is an active remote-sensing instrument that provides measurements of the line-of-sight component of air velocity (i.e., radial velocity) and attenuated aerosol backscatter. The DL operates in the near-infrared and is sensitive to backscatter from atmospheric aerosol, which are assumed to be ideal tracers of atmospheric wind fields. DLs have full upper-hemispheric scanning capability, enabling 3D mapping of turbulent flows in the atmospheric boundary layer.

#### **MET: Surface Meteorological Instrumentation**

ARM Surface Meteorology Systems (MET) use mainly conventional in situ sensors to obtain 1-minute statistics of surface wind speed, wind direction, air temperature, relative humidity, barometric pressure, and rain-rate.

### **For surface-based aerosol data:**

#### **UHSAS: Ultra-High Sensitivity Aerosol Spectrometer**

The Ultra-High-Sensitivity Aerosol Spectrometer (UHSAS) is an optical-scattering, laser-based aerosol particle spectrometer for sizing particles in the 60 to 1000 nanometer (nm) range; able to count particles in up to 100 user-specified sizing bins.

#### **SMPS: scanning mobility particle sizer**

The scanning mobility particle sizer (SMPS) is a veteran and well-characterized particle sizer that measures particle size using the differential mobility technique after applying an electrical charge to aerosol particles. The method is independent of the refractive index. The SMPS measures particles from  $\sim 0.01\mu\text{m}$  to  $\sim 1\mu\text{m}$ .

#### **POPS: Printed Optical Particle Spectrometer**

The POPS is a miniaturized optical particle counter that measures particle based on a refractive index for sizes ranging from  $\sim 0.12\mu\text{m}$  to  $\sim 8\mu\text{m}$ , and could be mounted to a tower to collect data on aerosol ambient measurements.

### **For surface-based radiation data:**

#### **SEBS: Surface Energy Balance System**

The Surface Energy Balance System (SEBS) consists of upwelling and downwelling solar and infrared radiometers within one net radiometer, a wetness sensor, and soil measurements of temperature, moisture, and soil heat flow.

#### **MFRSR: Multifilter Rotating Shadowband Radiometer**

The visible Multifilter Rotating Shadowband Radiometer (MFRSR) is a passive instrument that measures global and diffuse components of solar irradiance at six narrowband channels and one open, or broadband, channel. Direct irradiance is calculated using diffuse and global measurements.

Other capabilities and equipment currently at the site should also be considered for use include power systems (could be seasonally rented systems as needed), communication and data collection systems, heating systems, storage spaces, weather-protected prep areas, all-season rough-terrain vehicles, maintenance tools/hardware and space, and other cold/snow/ice equipment.