CAPE-K
Aerosol Plan

Clouds, Aerosol, & Precipitation Experiment at Kennaook Cape Grim

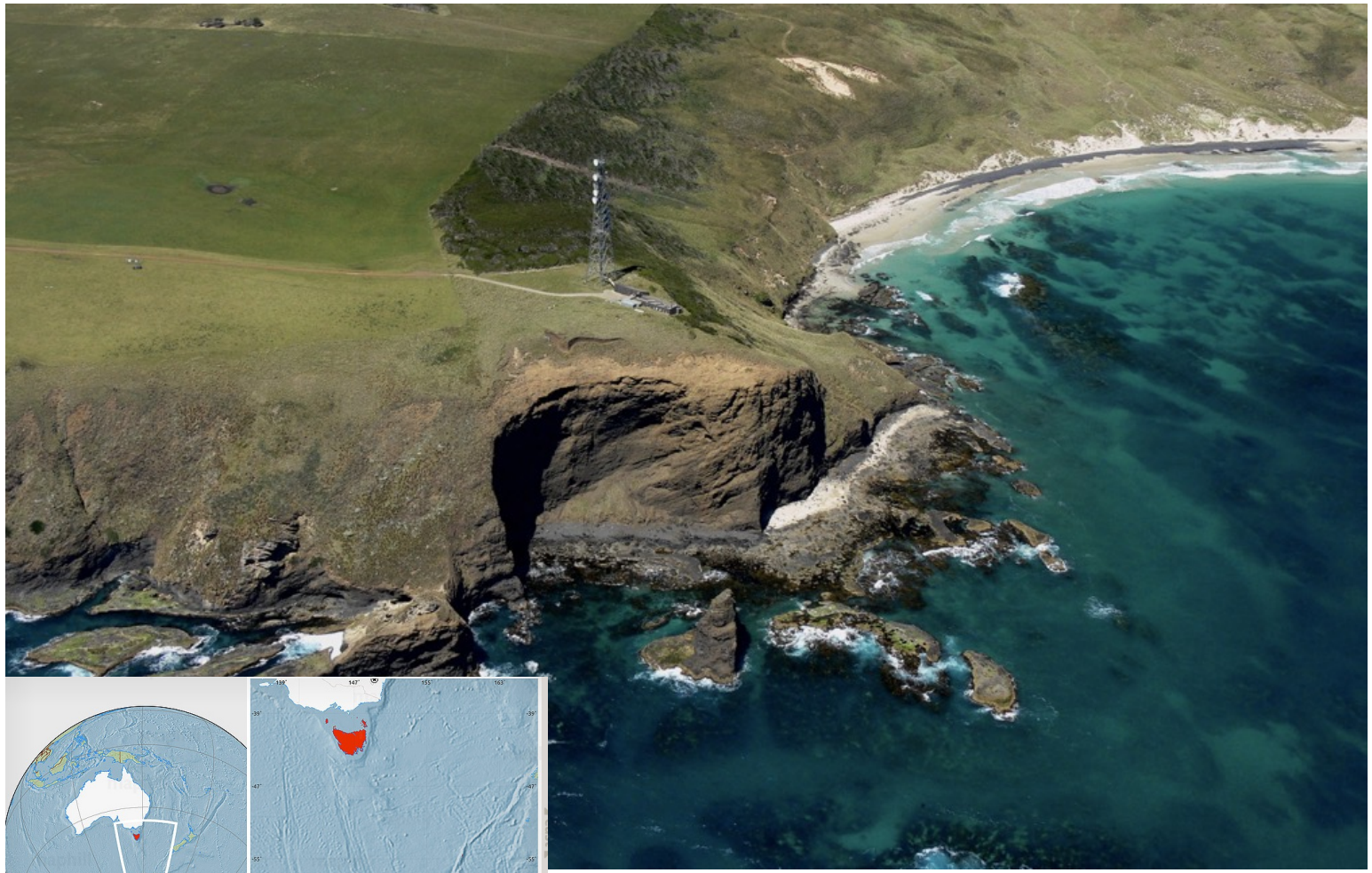
HEATH POWERS

DOE ARM Facility

Los Alamos National Laboratory

CAPE-K Overview

- ***What:*** AMF II field campaign (post-SAIL)
- ***When:*** April 15, 2024 – September 15, 2025 (17-months)
- ***Where:*** Tasmania, Australia at the Kennaook Cape Grim Baseline Air Pollution Station



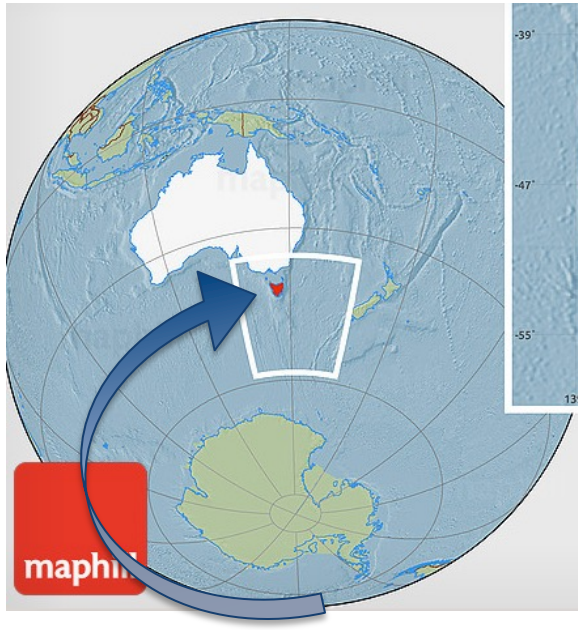
About Kennaook Cape Grim Baseline Air Pollution Station

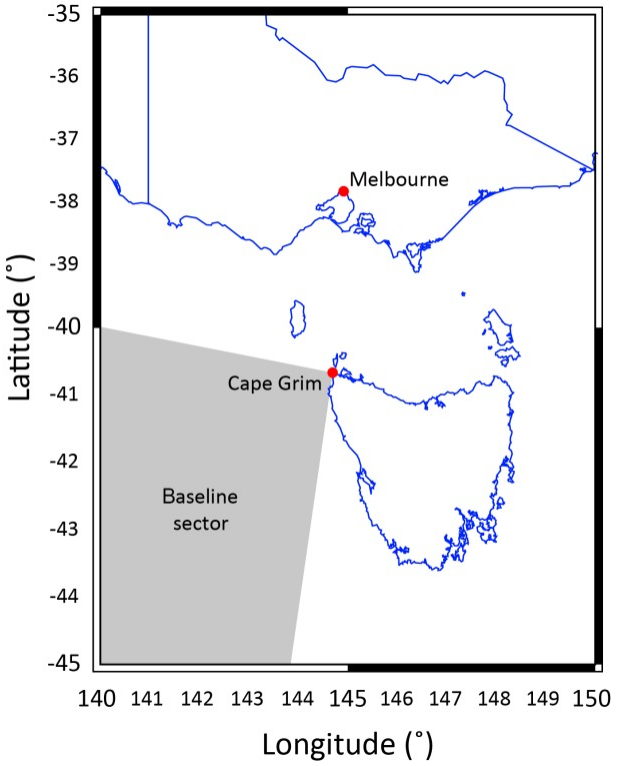
KCGBAPS is a long-term monitoring station located in the Southern Ocean on the NW corner of Tasmania

Cape Grim is supported by:

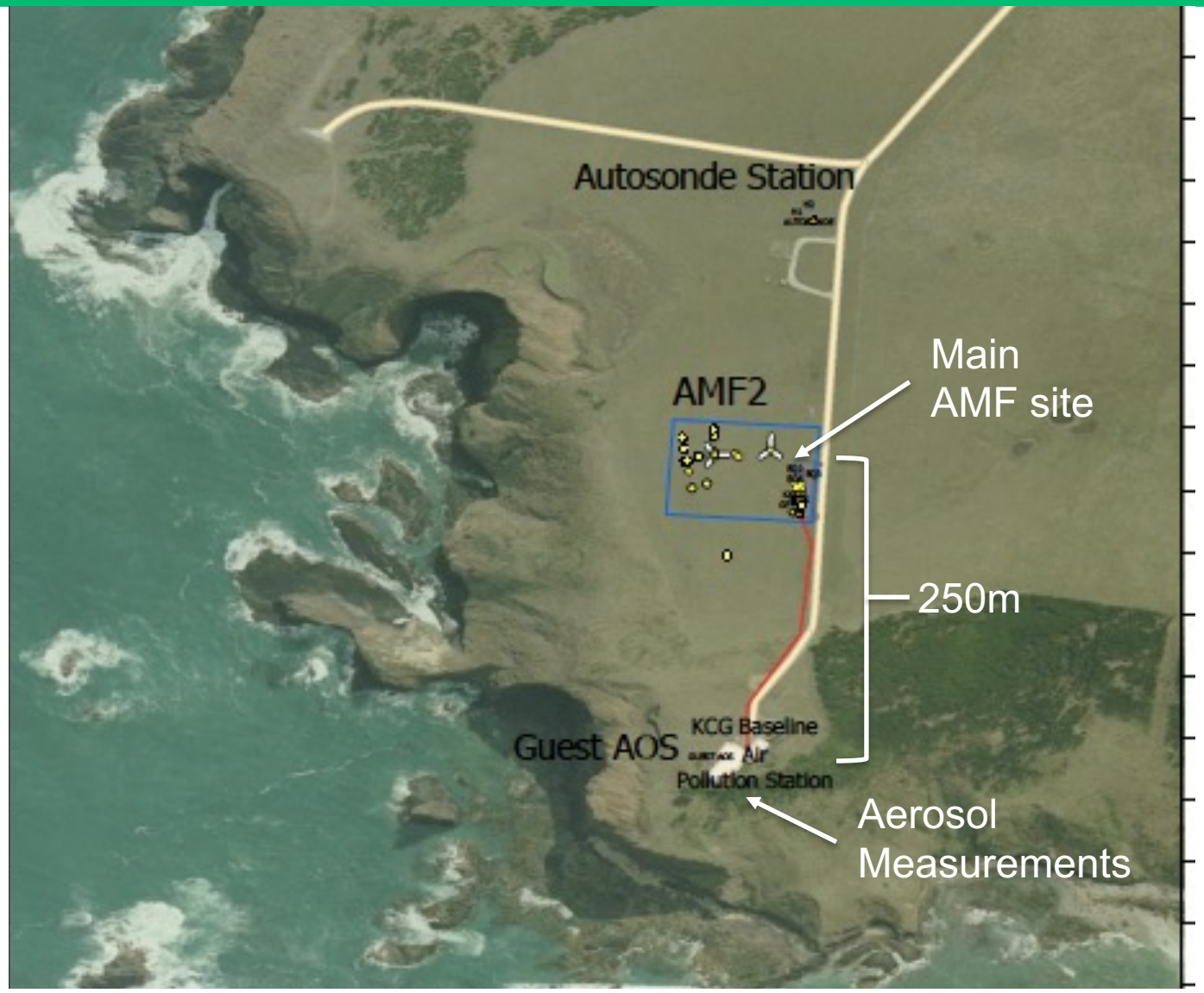
- **CSIRO**: Commonwealth Scientific and Industrial Research Organization
- **BoM:** The Australian Bureau of Meteorology

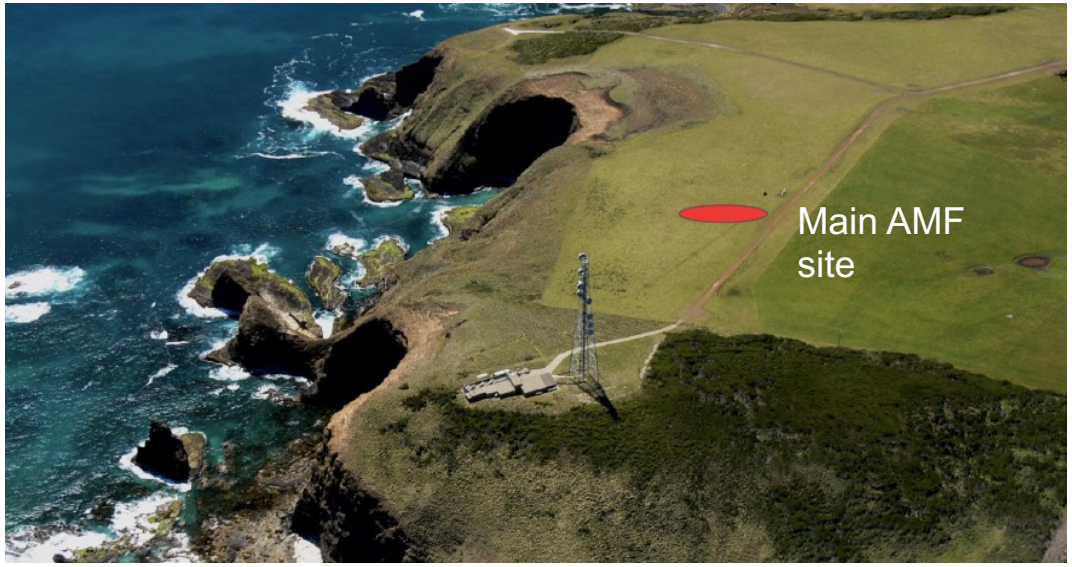
Purpose is to assess background air quality – pristine conditions occur here





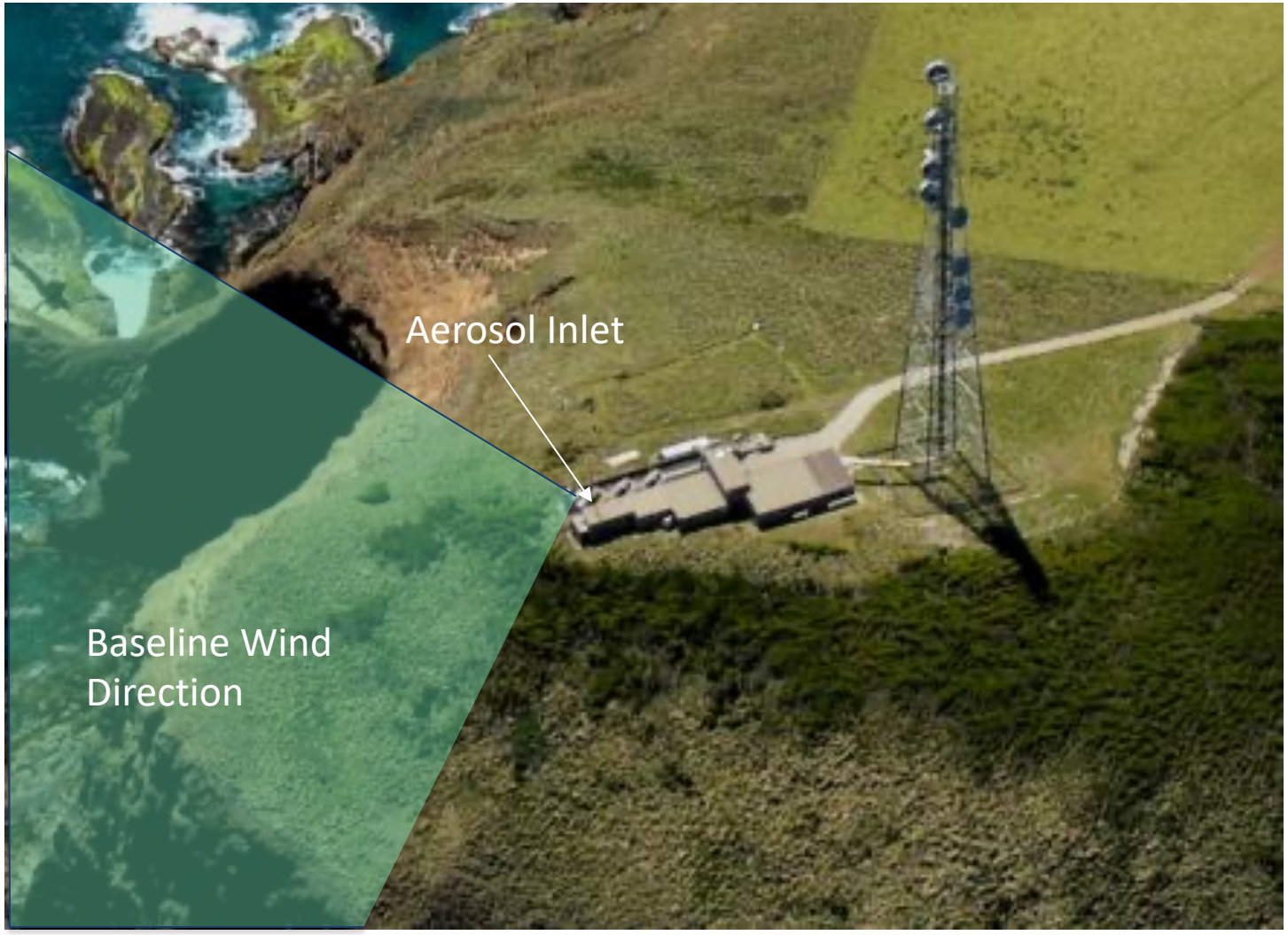
CAPE-K ARM Main Site





- **ARM** will rely on KCG's aerosol measurements (for the most part)
- No ARM AOS for CAPE-K
- **KCG** has comprehensive measurements for aerosol microphysical, optical and chemical properties, plus trace gases: O_3 , GHGs, Ozone-depleting chemicals, Radon, NOx

Sampling at Kennaook Cape Grim



KCG Station Instruments

Instrument	Measurement	Product	Units
CPC: TSI 3010	Particle number > 11 nm	CN, N11	# cm^{-3}
CPC: TSI 3756	Particle number > 2.5 nm (notionally)	UCN, N3	# cm^{-3}
CPC: TSI 3776	Particle number > 3 nm	UCN, N3	# cm^{-3}
CPC: TSI3772	Particle number > 11 nm	CN, N11	# cm^{-3}
MPSS (Tropos SMPS)	Aerosol size distribution	8.7-825 nm	dN/dlogDp # cm-3
DMT CCN counter 1	Cloud Condensation Nuclei > 750nm	CCN, 0.5% super saturation	# cm^{-3}
DMT CCN counter 2	Cloud Condensation Nuclei > 750nm	CCN, 0.5% super saturation	# cm^{-3}
Nephelometer	3 wavelength scattering coefficient (at 635, 525, 450nm)	σ_{sp}	mM^{-1}
Polar integrating nephelometer Aurora 4000	3 wavelength scattering coefficient (at 635, 525, 450nm); from 10° and 90° up to 170°	σ_{sp}	mM^{-1}

Instrument	Measurement	Product	Units
MAAP (Multi-angle Aerosol Absorption Photometer)	Light absorption at 1 wavelength (and black carbon)	σ_{ap} and BC	µg m^{-3}
TAP (Tricolor absorption photometer)	Light absorption at 3wavelengths (467, 528 and 652 nm)	σ_{ap} at three wavelengths	mM^{-1}
Aethalometer® Model AE33	light absorption at 7 wavelengths (370, 470, 520, 590, 660, 880, 950)	σ_{ap} at seven wavelengths	mM^{-1}
Tof-ACSM (time-of-flight Aerosol Chemical Speciation Monitor)	Continuous chemical composition (refractory species) particles less than 1 µm	ACSM	µg m^{-3}
NOx analysers Ecophysics and Thermo			
CO/N2O Piccaro			
Ozone analysers Tecos			
Ecotech High volume sampler 3000 (baseline)	PM10 mass and chemical composition	HVQuartz and HVEmfab	µg m^{-3}
Partisol 2000 (baseline)	PM2.5 mass and chemical composition	LVT	µg m^{-3}

CAPE-K ARM Aerosol Instruments

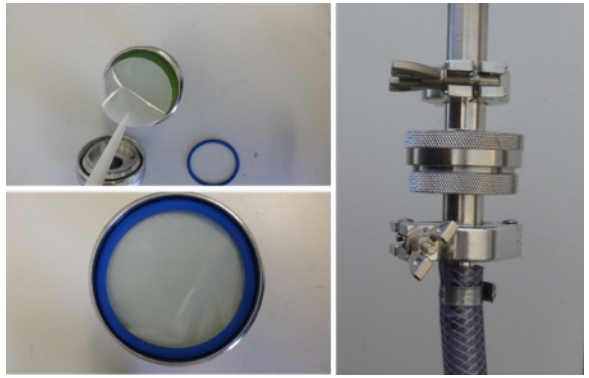
Aerodynamic Particle Sizer (APS)

Larger aerosol diameters .5 – 20 um

Single Particle Soot Photometer (SP2)

Black Carbon

Ultra-high Sensitivity Aerosol Spectrometer (UHSAS)

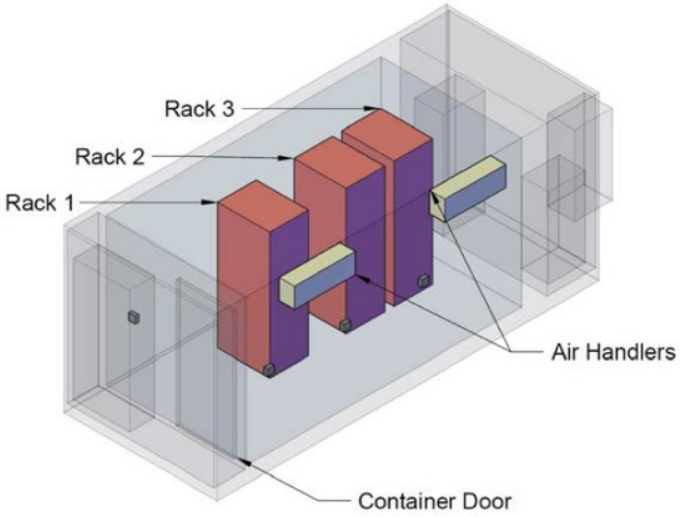


Ice-Nucleating Particle Filter (INP)

Aerosol Observations

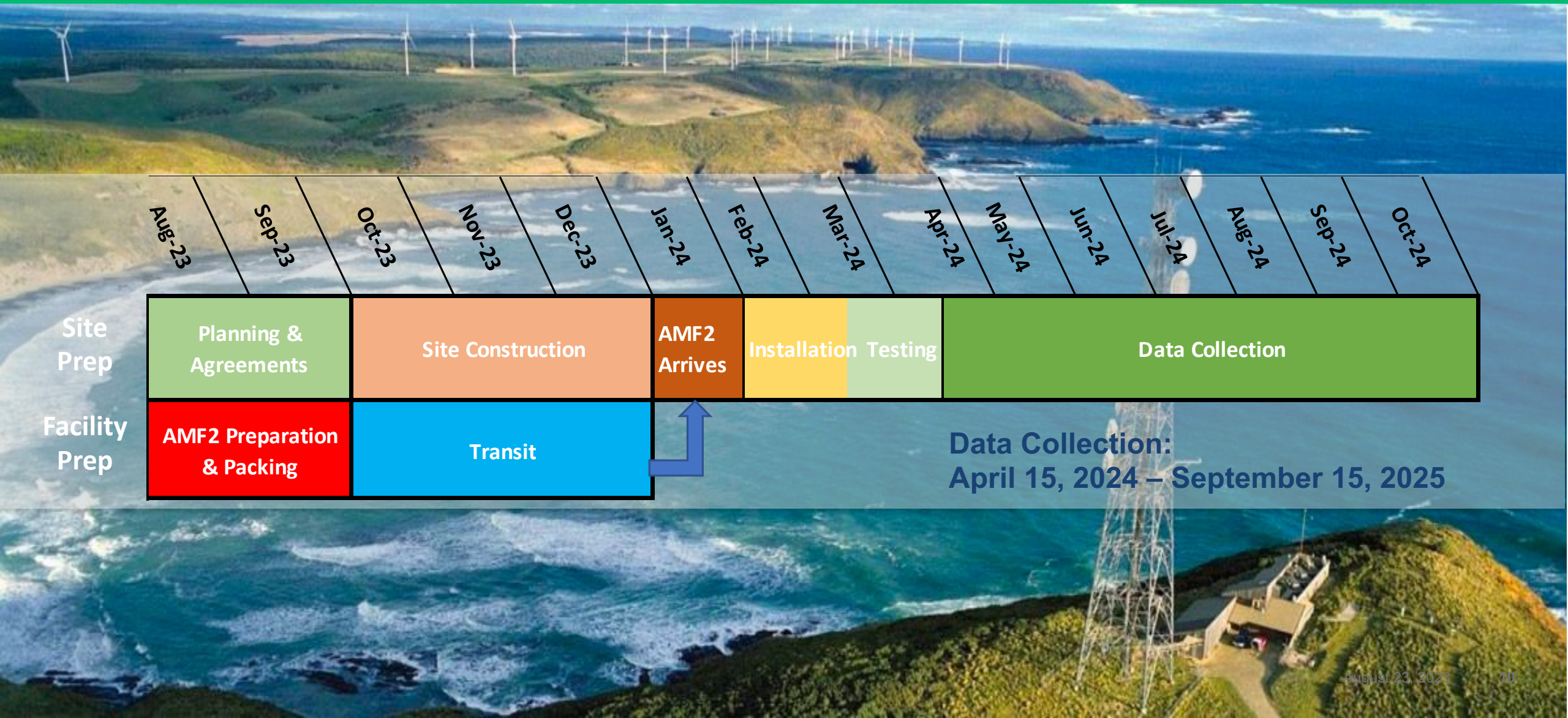
- ARM plans to use KCG's measurements as the primary aerosol observations for CAPE-K
  - Station's data is available (EBAS, WDCA, CSIRO)
  - ARM plans to host station's data in archive
  - Intend to ingest and process KCG data (working details with BoM)
- Value Added Products (VAPs)
  - Planning to produce standard aerosol VAPS: AOP, Merged SMPS-APS, CCN-SMPS Kappa, ACSM-CDCE

CAPE-K ARM Guest AOS shelter



- ARM 'guest' aerosol shelter located beside station
- There is interest in bringing guest instruments (expect this to increase)
- Limited space in station
- Fully functional ARM inlet (drying, climate control, etc)

CAPE-K Schedule



Data Collection:
April 15, 2024 – September 15, 2025

KCG Data Access

Parameter	Description	Link
CN11	Particle number (CN10) hourly averages 2011-2021 TSI3010 NOTE: CN data (2006-2010) submitted to WDCA in NARSTO format	WDCA -unique link (EBAS)
CN3	Particle number (CN3) hourly medians 1977 to 2007 using the Automated Pollack Counter	CSIRO DAP – https://doi.org/10.25919/xd4e-b034
CN3	2007-2021-various TSI instruments	CSIRO Servers
Aerosol scattering	Aerosol forward scattering at 450 nm, 525 nm and 635 nm 2011-2021 using Ecotech 3000 Nephelometer	WDC Aerosols- unique link
Aerosol scattering	Polar Nephelometer 2018-2021	CSIRO servers
Aerosol Absorption	Aerosol Absorption at hourly averages 637 nm 2011-2021 using MAAP and AE33	WDC Aerosols-unique link
BC	Hourly medians BC old aethalometer	Commitment to submit to CSIRO DAP
CCN 0.5%SS	CCN hourly averages 2012-2021	WDC Aerosols -unique link
CCN 1.2%, 0.96%, 0.71%, 0.47% and 0.23% SS	Manual monthly CCN medians 1981 to 2002 using the static thermal diffusion chamber	CSIRO DAP- https://doi.org/10.25919/bzkn-pq93
PM10ish composition	Soluble ion composition weekly baseline samples 1989-2003 using the Gold Top sampler	KCG Archives and CSIRO servers Commitment to submit to CSIRO DAP
PM10 and PM2.5 Composition	2003 onwards	CSIRO servers
Precipitation composition		KCG Archives and CSIRO servers Commitment to submit to DAP in 2023 for use in Minamata Effectiveness Evaluation
Gaseous Elemental Mercury	2011-2022	
Aerosol size distribution	2019-2021	CSIRO Servers
PM1 composition	2020-2021	CSIRO Servers
Mercury wet deposition	2013-2014	GMOS