AMF1 CLAP-MBL 2009-2010

So why the Azores?

CLOUDS, AEROSOLS and PRECIPITATION

The Clouds, Aerosol, and Precipitation in the Marine Boundary Layer (CLAP-MBL) Project identified the Azores as having the right mix of conditions to study how clouds, aerosols and precipitation interact.

While we acknowledge their coupling with each other we are far from understanding the detailed processes sufficient to serve as a reliable foundation for developing climate model parameterizations that will adequately predict aerosol indirect effects and the low cloud response to climate perturbations.

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ARM AMF1

PRELIMINARY FINDINGS: CLAP-MBL

- Enormous variability in boundary cloud structure with at least six different modes (slides that follow illustrate these modes using cloud radar data from AMF at Graciosa).
- Modes are not differentiated by thermodynamic or wind structure alone, whereupon cloud microphysical structure is implicated as being an important determinant.
- Drizzle appears to be a critical process in the maintenance of the clouds found in the vicinity of Graciosa.
- Radiative effect of the clouds in the region is, preliminarily, found to be consistent with past calculations.
- Supplemental installation at Pico has revealed that the air at that location is exceptionally aerosol-free at times, bordering air with cleanliness bordering that observed at Mauna Loa, Hawaii.

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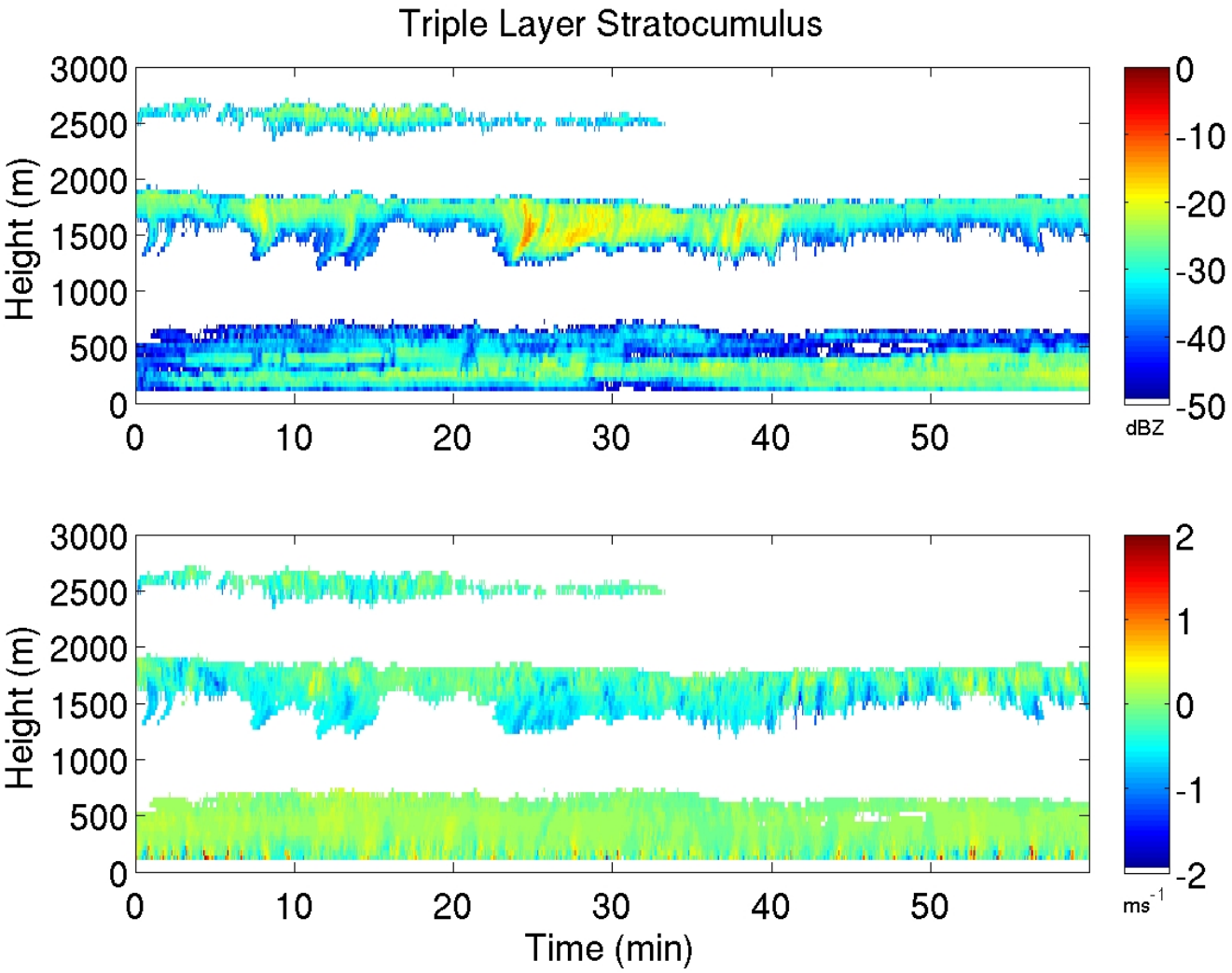
PRELIMINARY FINDINGS



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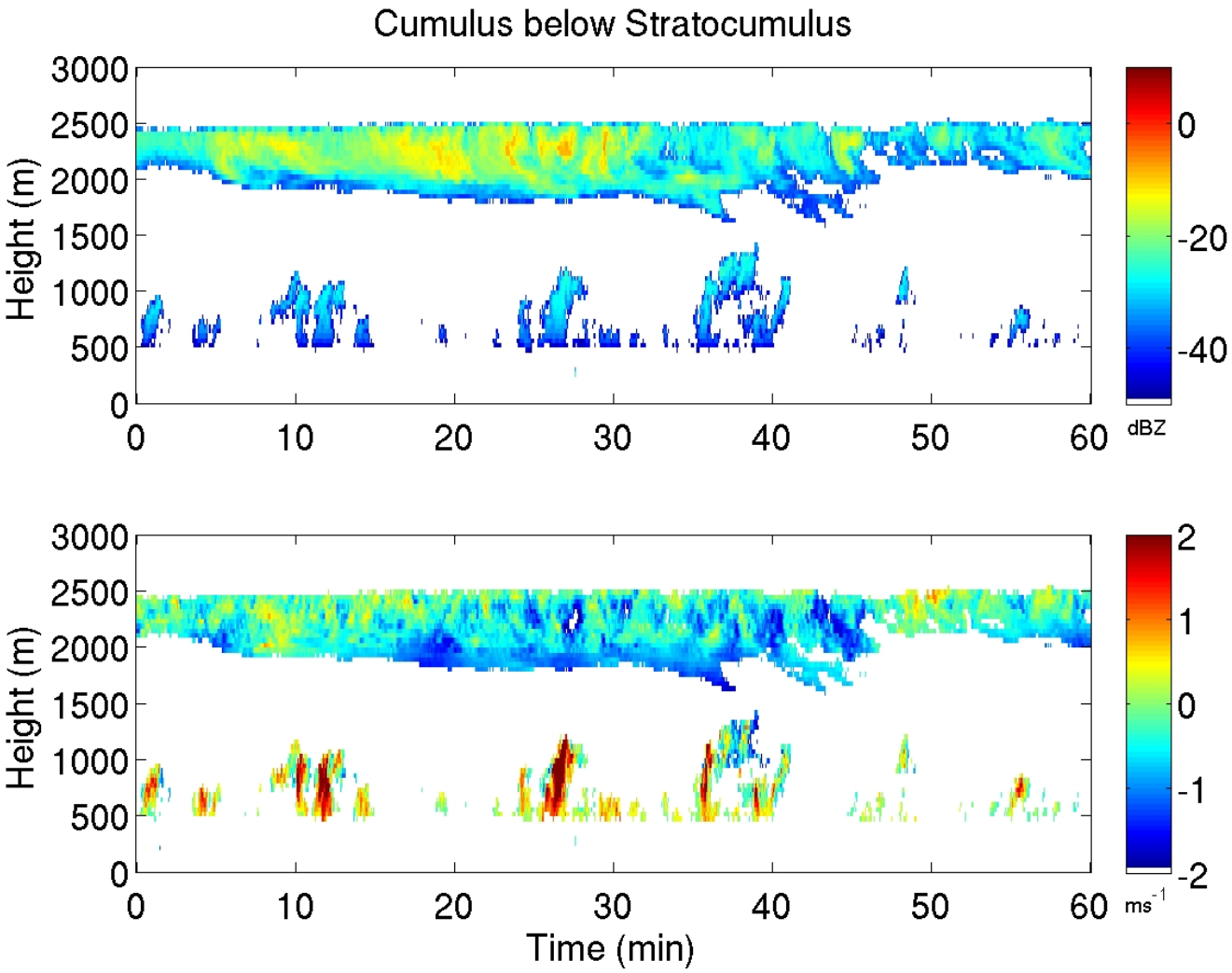
PRELIMINARY FINDINGS



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ARM Eastern North Atlantic (ENA)

The extensive coverage of low clouds over the subtropical eastern oceans greatly impacts the current climate.

The response of low clouds to changes in atmospheric greenhouse gases and aerosols is a major source of uncertainty that thwarts accurate prediction of future climate change.

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AMF1 to ARM Azores

- Successful Operations and collaborative partnership with Azorean organizations, institutions and public
- First true climatology of marine cloud structure over the north central Atlantic.
- Solid preliminary findings and valuable data sets.
- Significant interest from the global research community to continue research – identified as the proffered next permanent site location in the
- Available funding (against all odds)

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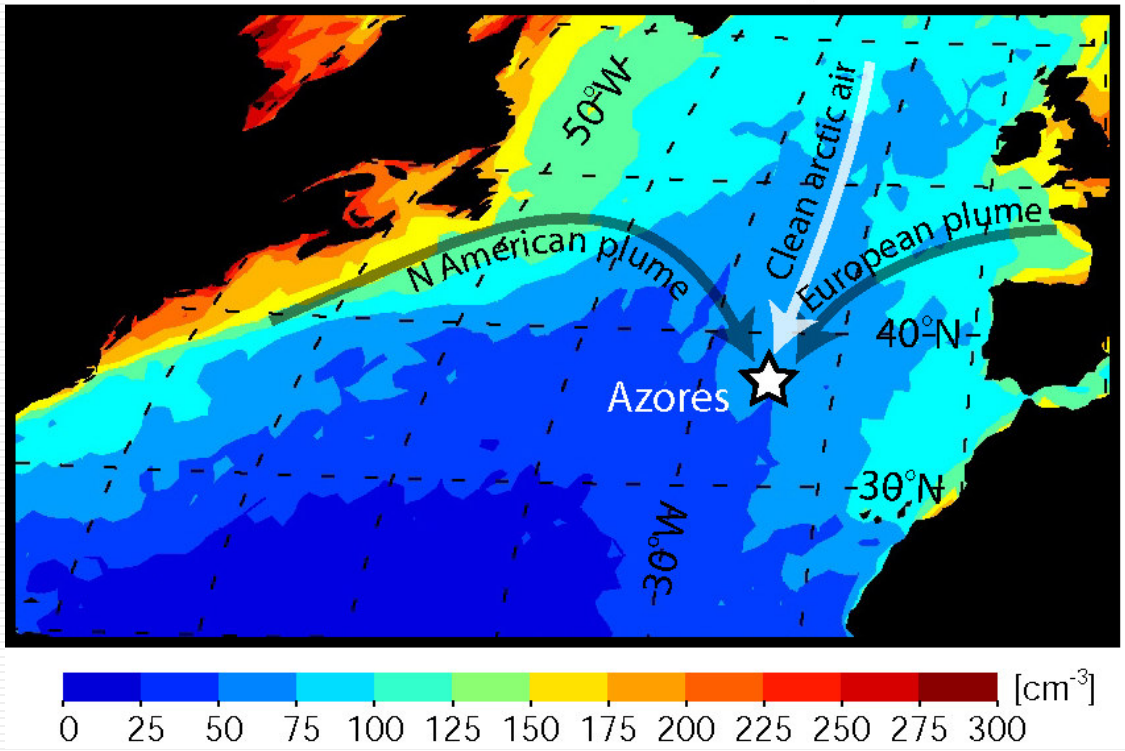
MODIS annual mean cloud droplet concentration for overcast warm clouds over the North Atlantic.



The Azores typically experiences relatively clean conditions with northerly flow, but with periodic episodes of continentally influenced polluted air masses.

The location is therefore ideal for capturing a wide range of aerosol conditions.

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Why Graciosa Island in particular?

- Is small (4×8 km) and low enough (<400 m) that the clouds are not expected to be strongly influenced by its presence

- Is ideally suited to study the transitions from overcast stratus/stratocumulus to broken trade cumulus. (The predominant cloud type is stratocumulus, which is present 36% of the time and trade cumulus occur 30% of the time)

- As a northern island is not affected by aerosols generated from the southern islands when monitoring northerly air flows.

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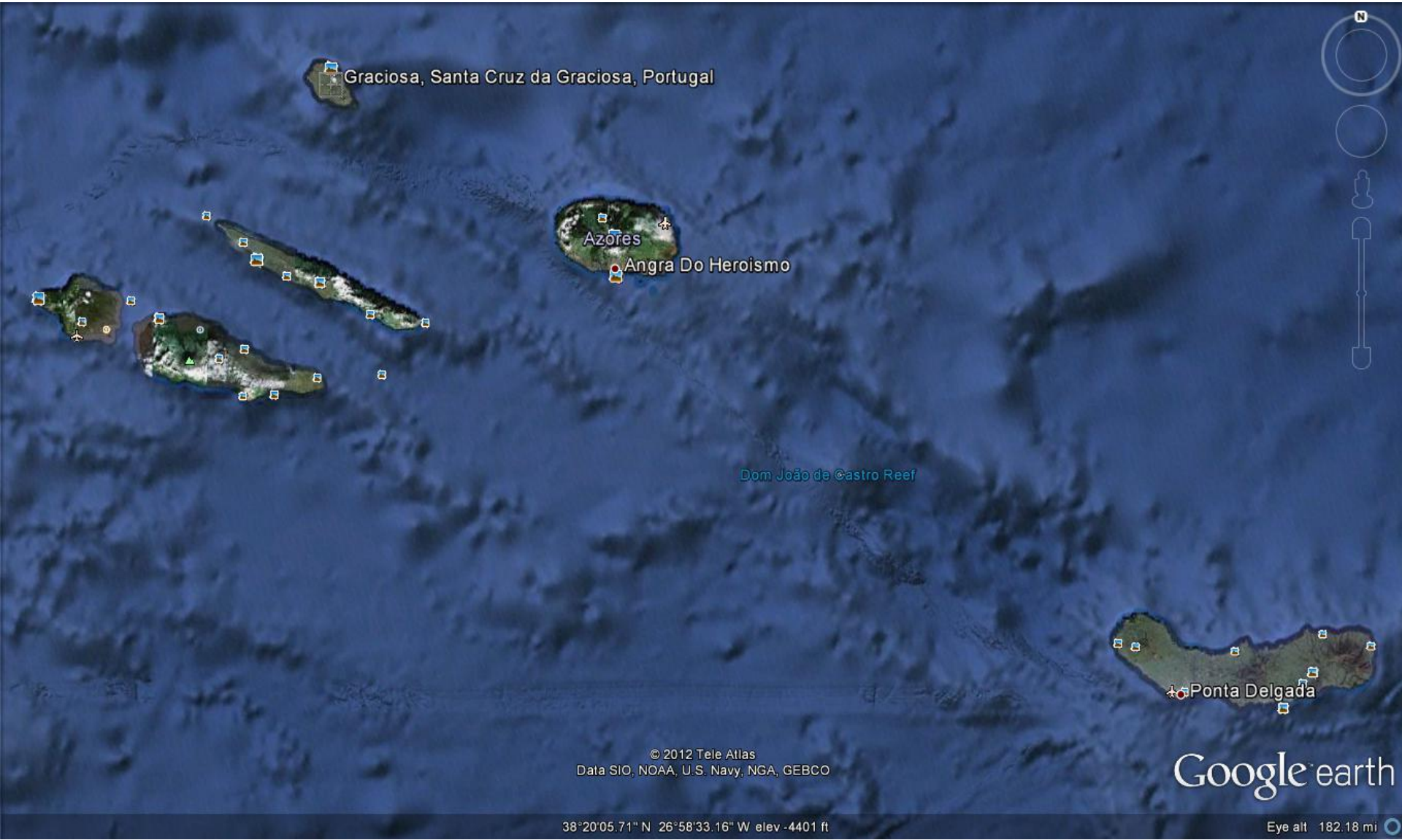
Graciosa, Santa Cruz da Graciosa, Portugal
Azores
Angra Do Heroismo
Dom João de Castro Reef
Ponta Delgada
© 2012 Tele Atlas
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth
38°20'05.71" N 26°58'33.16" W elev -4401 ft
Eye alt 182.18 mi

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Dores
Image © 2012 DigitalGlobe
Google earth
Imagery Date: 2/5/2006
2006
39°05'29.04" N 28°02'04.82" W elev 79 ft
Eye alt 10255 ft

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The Graciosa Airport Site:

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AMF AMF1

2009 - 2010

6 sea containers were placed adjacent the Graciosa Airport terminal building.

Instruments were placed to the west and north of the AMF container cluster.

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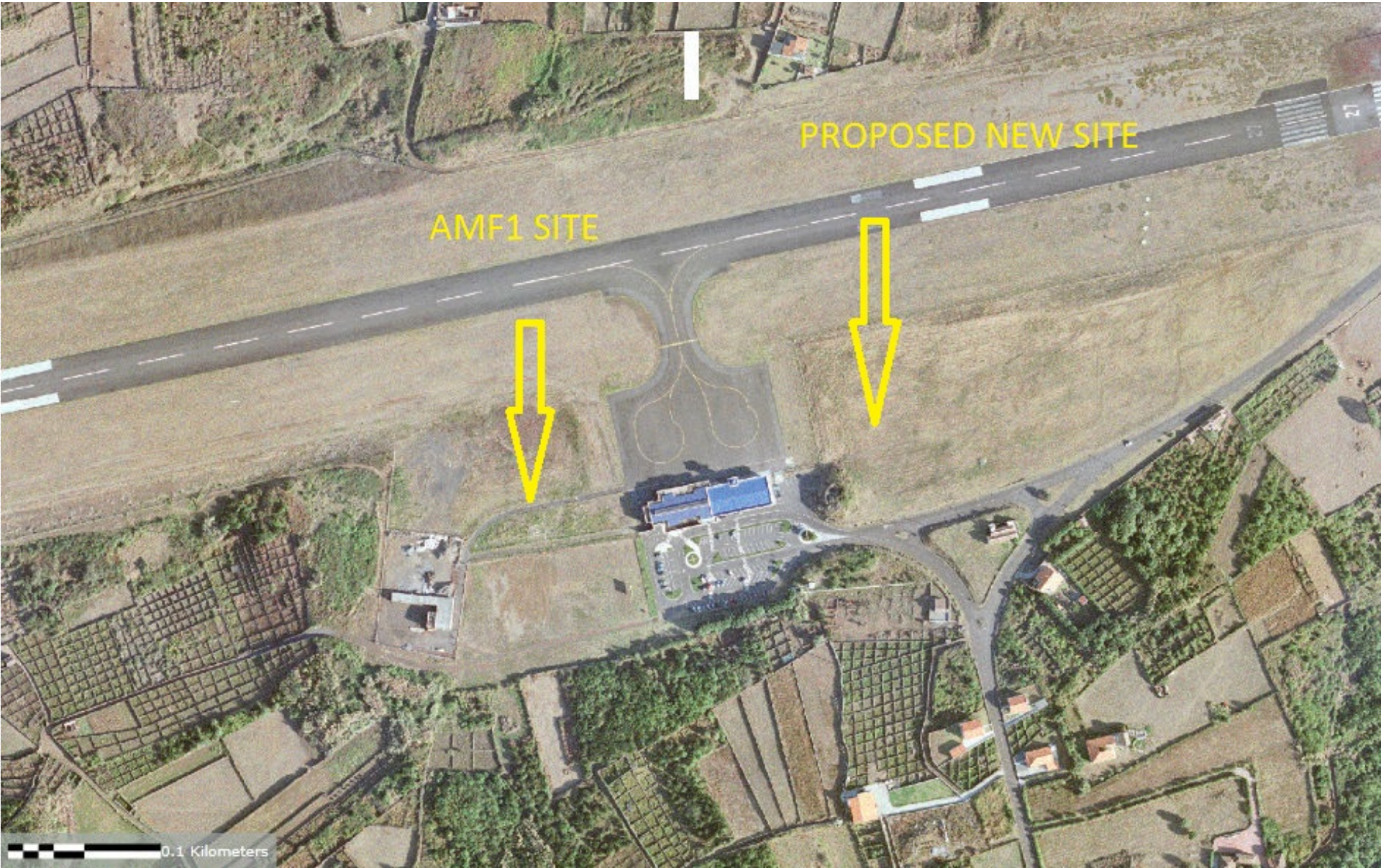
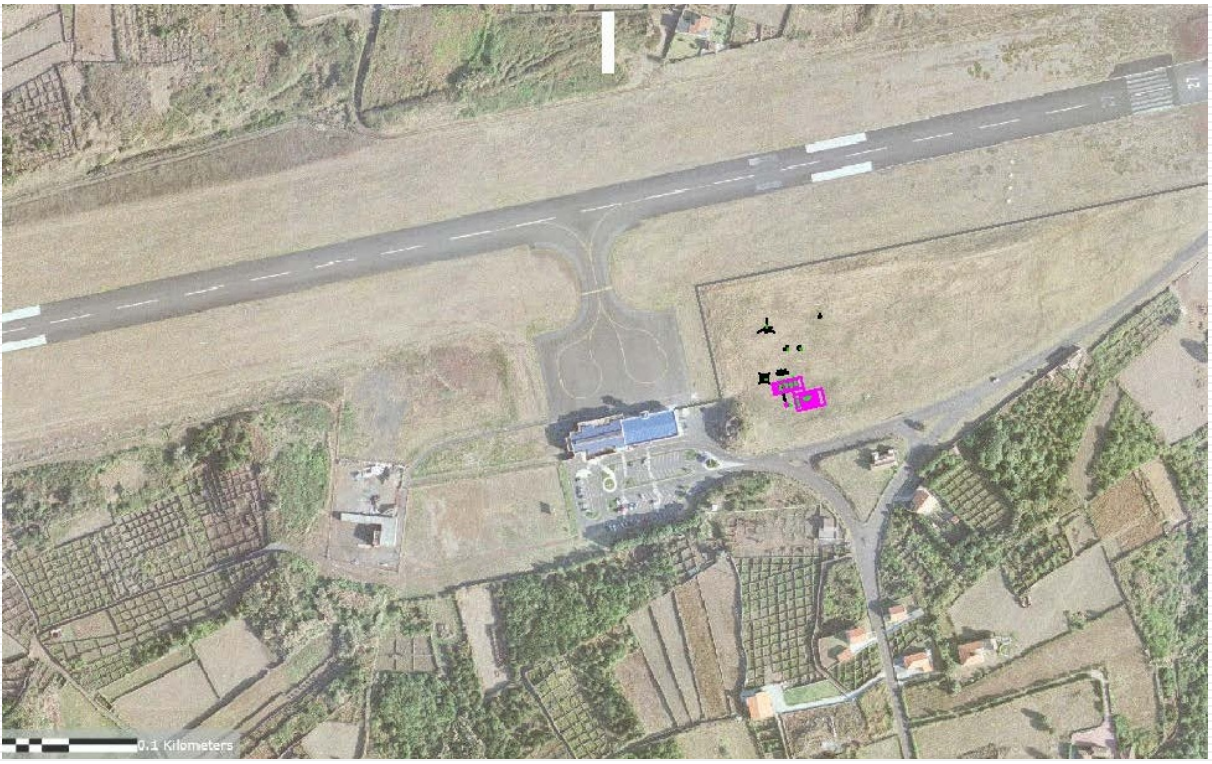


ARM Azores

The Graciosa Airport Site – an example:



In 2013 the ARM will deploy:

6 sea containers to a location to be determined

Some instruments ideally to be installed at the previous AMF1 location.

The main operations complex/building is yet to be determined.

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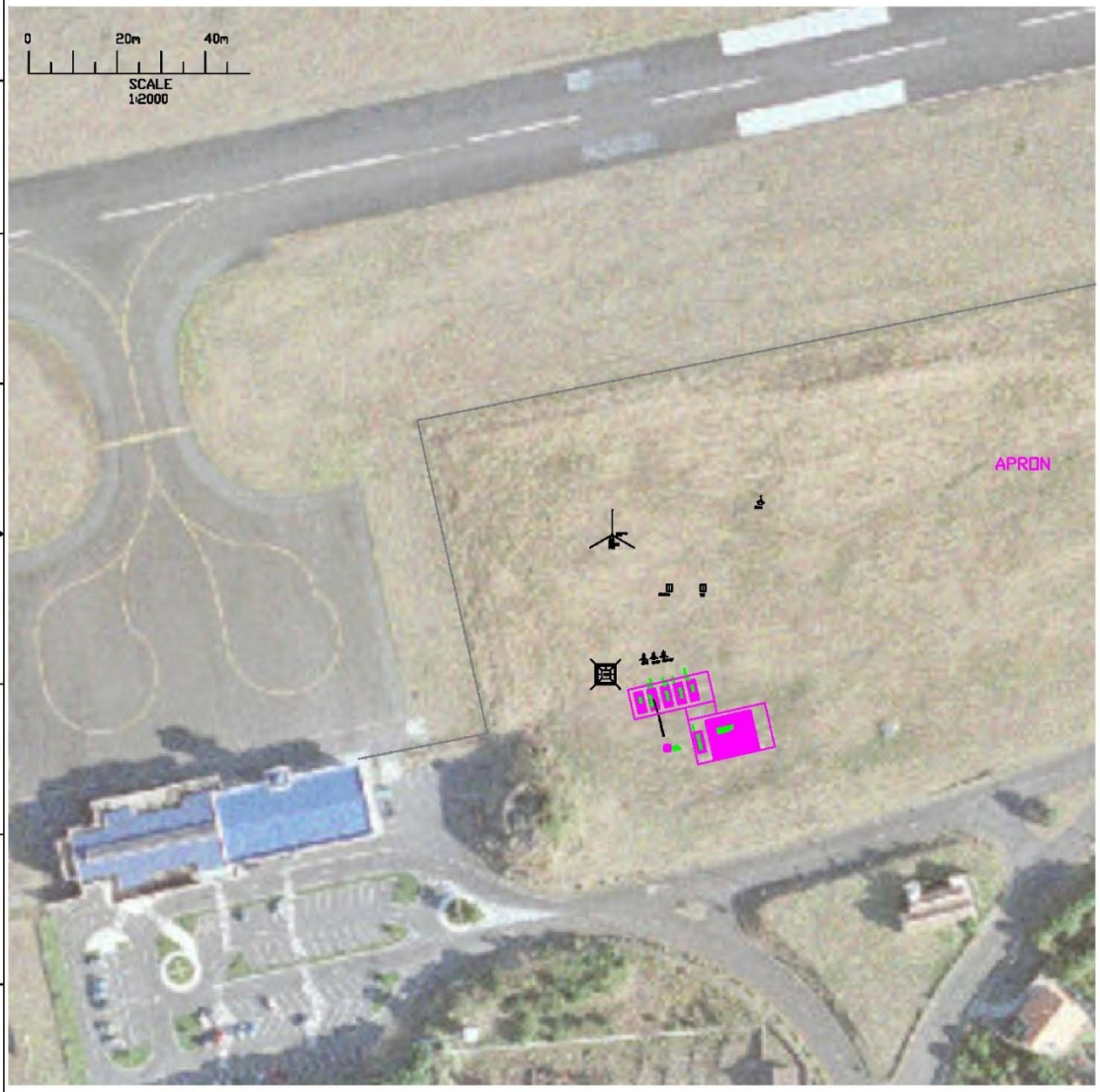

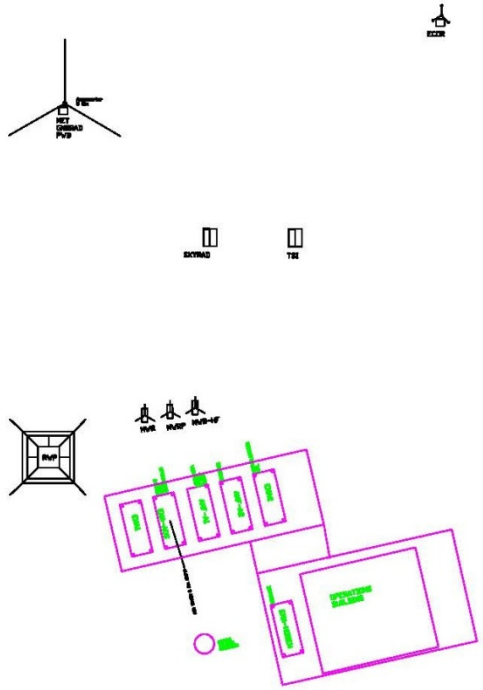

NO	DATE	CLASS REV	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP

Field Instrument Deployments and Operations (FIDO) Office

Graciosa Airport
Azores, Portugal
SITE LAYOUT

DRAWN
DESIGN
CHECKED
DATE

BLDG 81 TA-61

SUBMITTED
Kim Nitschke

APPROVED FOR RELEASE
Kim Nitschke

Los Alamos NATIONAL LABORATORY
PO Box 1663 Los Alamos, New Mexico 87545

SHEET
OF 1

CLASSIFICATION UNC
REVIEWER Kim Nitschke
DATE

PROJECT ID
ENA

DRAWING NO
DRW(ENA)001.001

REV

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- Full operational support including a resident technician on Graciosa Island
- Increase in instrument capability since AMF1
- Balloon launching 24/7
- User facility - visiting scientists (local / international) and technical personnel
- Site visits and education outreach – school children (K-12), public

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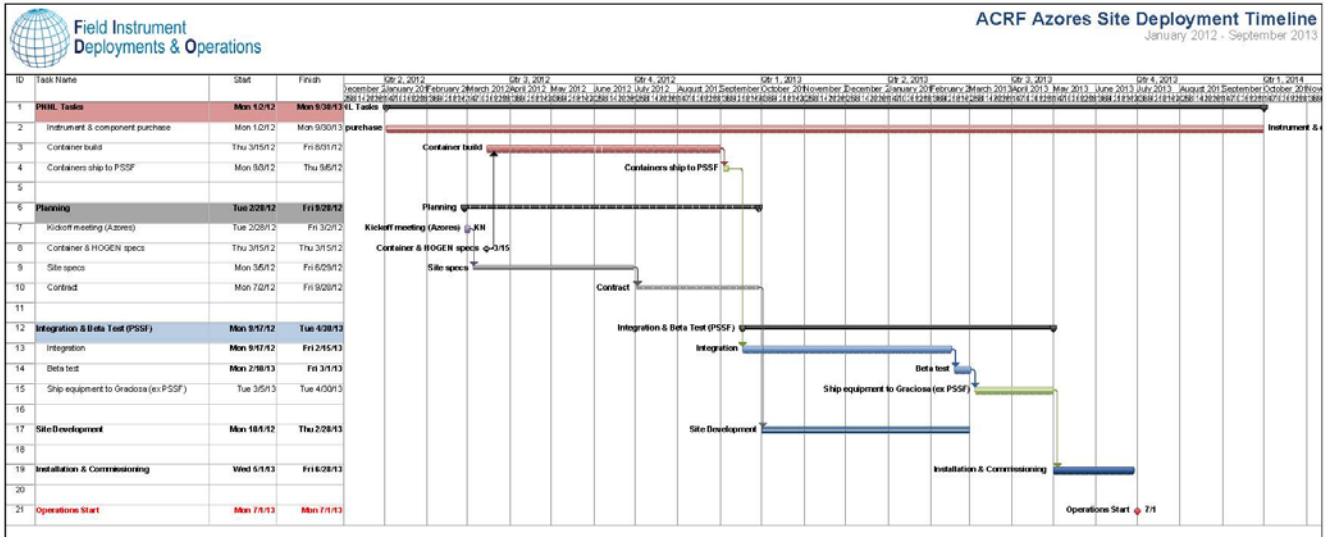
Azores site:

Site selection:	May 2012
Construction Contract:	September 2012
Site preparations:	October 2012 - March 2013
Equipment Arrival:	May 2013
Installation:	May – July 2013
Operations:	**July 1 2013 -**



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COMPONENT		
	2012	2013
Lidars		
Micro Pulse Lidar	1	
Doppler Lidar	1	
HSRL		1
Atmospheric and Boundary State		
Radiation/Sky - Ground	1	
MFRSR/MFR	1	
Meteorology (T,P,H,WS,WD)	1	
Boundary Layer Cloud System (Ceilometer)	1	
Digicora III (2 flts/day)	1	
ECOR		1
1290 Wind Profiler		1
Disdrometer (Parsivel)		1
2DVD		1
Radars		
Scanning Cloud Radar (Ka/W band)		1
Zenith Cloud Radar (Ka-band) W-band for AMF	1	
X (or C)-Band Precipitation Radar		1
Aerosol Systems		
Aerosol Enclosure	1	
Aersol Instruments		
Sampling Tower	1	
3 Wavelength Particle/Soot Absorption Photometer (PSAP)	1	
Ambient Nephelometer, 3 Wavelength		1
Humidified Nephelometer, 3 Wavelength		1
f(RH) Controller/Humidification	1	
Condensation Particle Counter (CPC)		1
Single Column Cloud Condensation Nuclei Counter		1
Ozone Monitor	1	
Hygroscopic Tandem Differential Mobility Analyzer (HTDMI)	1	
Present Weather Sensor		1
Ultra High Sensitivity Aerosol Spectrometer (UHSAS)		1
CO Analyzer		1
Methane/CO2/H2O Analyzer	1	
f(RH) and HTDMA dryer	1	
Cavity Attenuated Phase Shift (CAPS) Extinction	1	
Computing and Accessories	1	
Radiomentry		
AERI	1	
MWR (3C)	1	
Infrastructure		
Data System and Networking	1	
Enclosures and Infrastructure (Azores)		
Generator Set and Van	1	
Operations Vans	4	
Hydrogen Generator and Van	1	

ARM ENA

Collaboration:

- The Regional Government of the Azores, Regional Secretariat for Science, Technology, and Infrastructure
- University of the Azores (UAC)
- The Portugal Meteorological Institute (IM/DRA)
- Pico International Chemical Observatory, a component of the North Atlantic Regional Experiment (PICO-NARE)
- Sociedade Açoreana de Transportes Aéreos (SATA)

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