

Ground-Based Aerosol Measurements during RICO

Olga L. Mayol-Bracero

Institute for Tropical Ecosystem Studies and
Department of Chemistry

University of Puerto Rico, Rio Piedras Campus

RICO Final Planning Meeting

September 1-2, 2004, Boulder, Colorado



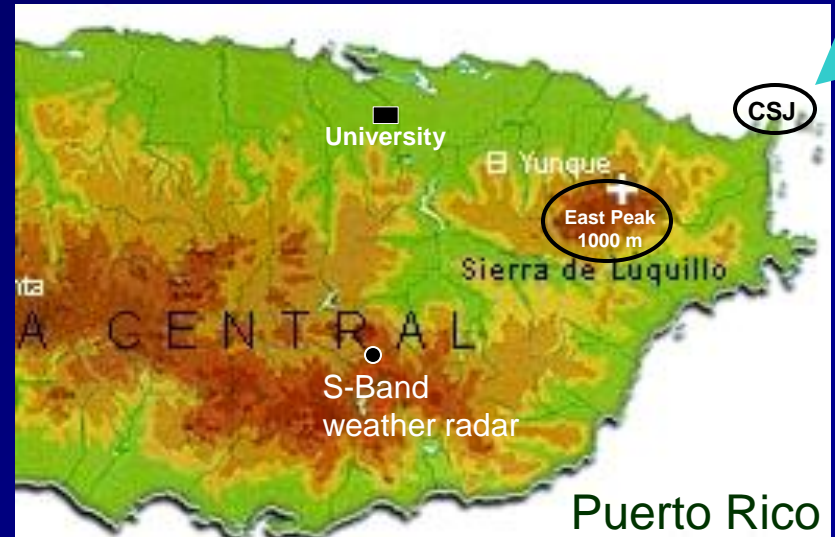
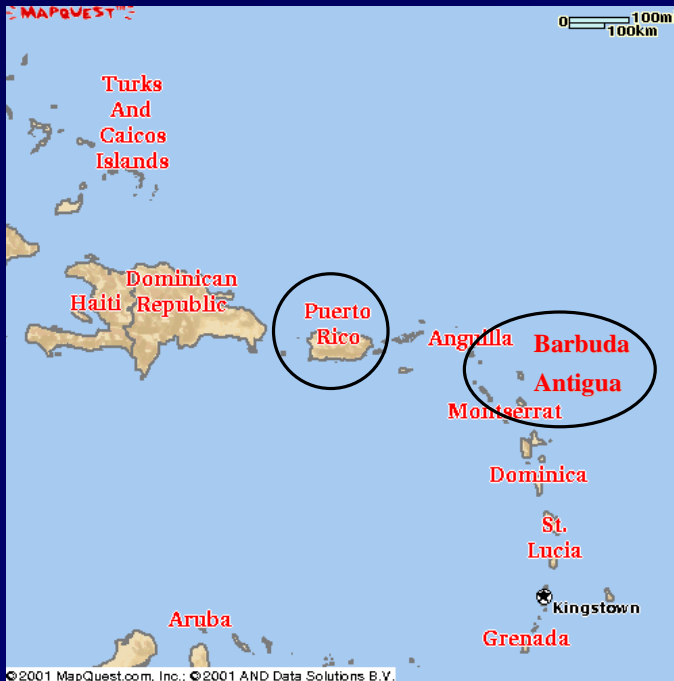
Participants

- University of Puerto Rico – Río Piedras Campus
 - O. L. Mayol-Bracero
- Universidad Nacional Autónoma de México
 - G. B. Raga, D. Baumgardner
- Max Planck Institute for Chemistry – Mainz, Germany
 - G. Frank, M. O. Andreae, S. Borrmann
- Vienna University of Technology, Austria
 - H. Puxbaum, A. Kasper-Giebl
- Institute of Atmospheric Sciences and Climate, Bologna, Italy
 - M. C. Facchini
- UMIST, UK
 - H. Coe, James Allan
- University of Leeds, UK
 - M. H. Smith, A. Blyth
- Meteo-France
 - L. Gomes, J.-L. Brenguier

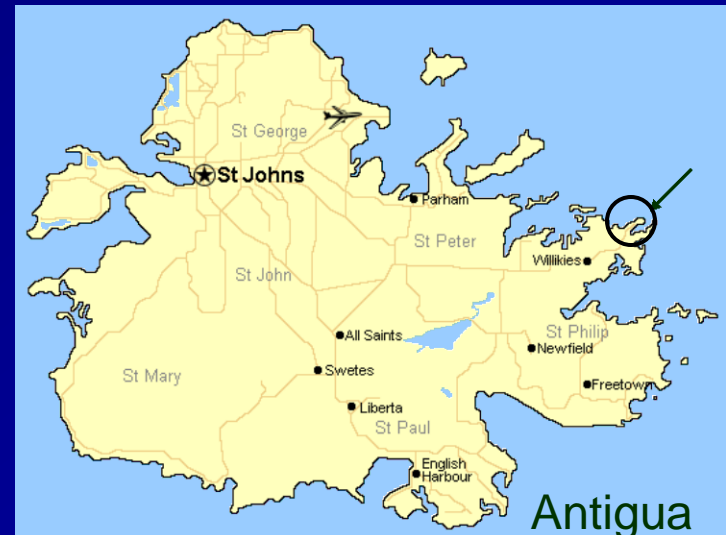
Two fundamental RICO questions we want to address are:

- What is the spatial and temporal variability of aerosol chemical and physical properties in the trade wind environment?
- How do aerosols impact the microphysics of trade wind cumuli?

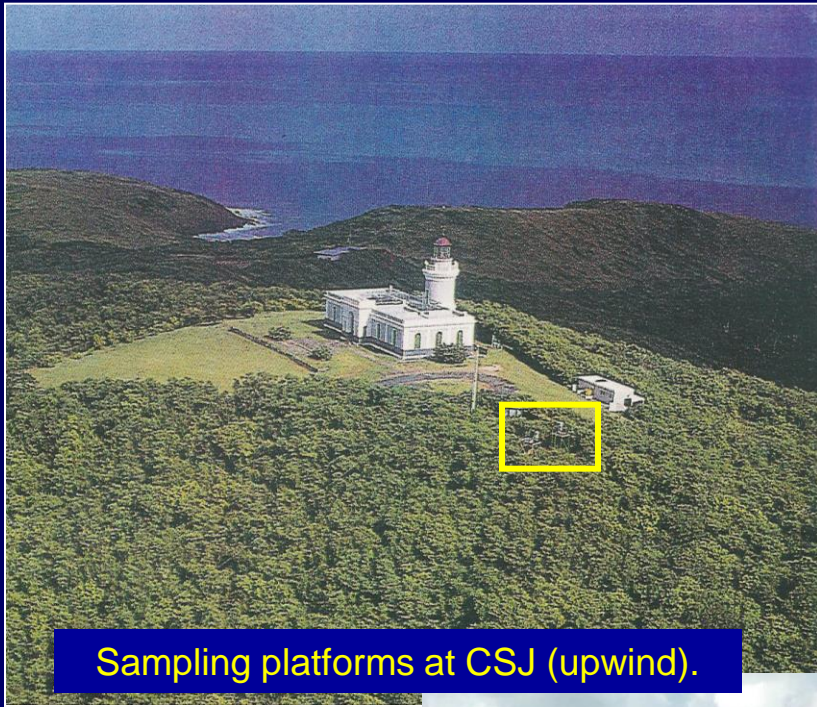
Sampling Locations



- Cape San Juan (CSJ), Puerto Rico
- East Peak, Puerto Rico
- Antigua



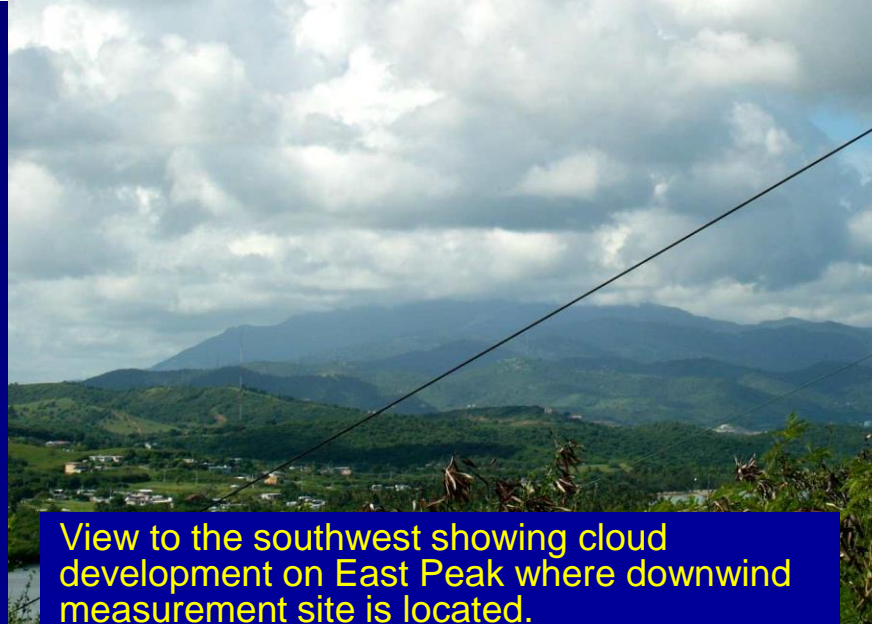
Cape San Juan - Marine Site (clean)



Sampling platforms at CSJ (upwind).



View to the southeast showing early rain from shallow convection.



View to the southwest showing cloud development on East Peak where downwind measurement site is located.

Instruments to be Deployed at CSJ, Puerto Rico

INSTRUMENT	INSTITUTION
Low-Pressure Impactor (DLPI, Dekati)	UPR-RP
Low-Pressure Impactor (MOUDI, MSP)	UPR-RP
Stacked-Filter Units (SFUs, NILU)	UPR-RP
Hi-Volume Filter Sampler (Solomon et al., 1983)	UPR-RP MPIC Germany
CPC (Model 3022A, TSI)	UPR-RP
3-D CCN Counter (MPIC + DMT)	MPIC Germany
Scanning mobility particle sizer SMPS (Grimm)	MPIC Germany
Aethalometer (AE-31 Magee Scientific) with URG PM 2.5 cyclone	UPR-RP
Nephelometer (Model 3563, TSI) with URG PM 2.5 inlet	UPR-RP
Sunphotometer (CE318-1, CIMEL)	UPR-RP
OPC PMS LasAir II	UNAM, Mexico
CPC (Model 3010, TSI)	UNAM, Mexico
CCN Counter (University of Wyoming)	UNAM, Mexico

East Peak - Mountain Site

Trailer



Mountain site at CNF-East Peak (downwind).



This is the view looking upwind to the lighthouse research site, pointed to by the arrow.

Instruments to be Deployed at East Peak, Puerto Rico

INSTRUMENT	INSTITUTION
Stacked-Filter Units (SFUs, NILU)	UPR-RP
Cloud Water Collector	UPR-RP
CCN Counter (MPIC)	MPIC Germany
SPMS	MPIC Germany
Aerosol Mass Spectrometer	MPIC Germany
Aerosol Mass Spectrometer	UMIST, UK
Low-Pressure Impactors (MOUDI, MSP)	UNAM, Mexico
CPC (Model 3010, TSI)	UNAM, Mexico
OPC PMS LasAir II	UNAM, Mexico
Particle Soot Absorbing Photometer, PSAP (Radiance Research)	UNAM, Mexico
Nephelometer (Radiance Research)	UNAM, Mexico
PM-1 or heater	UNAM, Mexico
Rain Water Collector	UNAM, Mexico
PMS F SSP-100	UNAM, Mexico
PMS 2D-C	UNAM, Mexico
PMS 2D-P	UNAM, Mexico

Antigua - Marine Site



**still looking for “trailer” and scaffolding!
working with power situation!
Met station!**

Instruments to be Deployed in Antigua

INSTRUMENT	INSTITUTION
Low-Pressure Impactor (MOUDI)	UPR-RP
Stacked-Filter Units (SFUs)	UPR-RP
CPC (Model 3025A, TSI)	Meteo-France
CCN Counter (University of Wyoming)	Meteo-France
Volatility system	University of Leeds, UK
PCASP-X	University of Leeds, UK
Aethalometer	University of Leeds, UK

Sampling Schedule

- Period 1: RICO – Puerto Rico Aerosol and Cloud Study (PRACS)
 - November 21 – December 2 (East Peak and CSJ)
 - December 2 – 21 (East Peak, CSJ and Antigua)
- Period 2: January 3 – 26 (Antigua and CSJ) East Peak will not be fully operating.

Measurement Strategy

- Meteorological data will be collected continuously at each station.
- Coordination is planned between the NCAR C130 and the three sampling stations for up wind flights during the ferry flights to Antigua (Dec 4 and Jan 3) and on the way back to Colorado (Dec 21 and Jan 26). This is for intercomparison purposes with real-time measurements such as particle number, scattering and absorption coefficients,...
- Aerosol filter sampling, cloud/fog water collection, and real-time measurements will be conducted on a daily basis.
- Fog/cloud water sampling will be only at the East Peak.
- **Filter samples will be taken only when the wind direction is from the northeast in order to minimize contamination from inland sources.**

Analyses (Filter/Impactor and Cloud/Fog Samples)

Technique	Species Determined	Institution that will Perform Analysis
Evolved Gas Analysis, EGA	Total carbon, organic carbon, elemental carbon (TC, OC, EC)	National University of México, UNAM
Thermo/optical analysis	TC, EC, OC	UPR-RP
Total Organic Carbon, TOC	Water-soluble organic carbon (WSOC)	UPR-RP and Institute of Atmospheric Sciences and Climate, ISAC, Bologna, Italy
¹ H-Nuclear Magnetic Resonance, ¹ H-NMR	Chemical functional groups	ISAC, Bologna, Italy
High-Performance Liquid Chromatography, HPLC	Neutral compounds, mono- and dicarboxylic acids, polycarboxylic acids	ISAC, Bologna, Italy
Ion Chromatography, IC	Water-soluble ions	Vienna University of Technology, Austria

Gravimetric analyses of substrates - Vienna University of Technology
Measurements of surface tension of water extracts – ISAC

Diagnostic and Prognostic Modeling

- Wind field predictions with MM5 – NWS – PR*
- Wind field predictions with MM5, Cloud microphysics with ARPS - UNAM
- Cloud development and chemical processing - UNAM
- Diagnosis of aerosol fluxes and cloud development - UNAM

* NWS will launch higher frequency of rawinsondes during research period.

Preliminary Analyses and Results during the Experiment

- Preliminary analyses of aerosol filter samples will be performed with the EGA, thermal/optical and TOC analyzers at the UPR-RP.
- Real-time measurements will be processed and quality assured every evening.
- These results will be made available on a web site for RICO investigators.



**Intensive-field phase of the project:
November 21 – Dec 21 & January 3 – 26, 2004
e-mail: omayol@adam.uprr.pr**