Third VOCALS Science Mtg March 21-23, Miami, FL
organized around themes: PBL&clouds; gases, clouds, aerosols; upper ocean physics; basic issues
~45 papers in ACP special issue; 60-70 total
VOCALS observational analysis along 20S

The PreVOCA experiment: modeling the lower troposphere in Southeast Pacific

M. C. Wyant¹, R. Wood¹, C. S. Bretherton¹, C. R. Mechoso², J. Bacmeister³, M. A. Balmaseda⁴, B. Barrett⁵, F. Codron⁶, P. Earnshaw⁷, J. Fast⁸, C. Hannay⁹, J. W. Kaiser⁹, H. Kitagawa¹⁰, S. A. Klein¹¹, M. Köhler⁴, J. Manganello¹², H.-L. Pan¹³, F. Sun², S. Wang¹⁴, and Y. Wang¹⁵

compilation of data and models along 20S

Southeast Pacific Atmospheric Composition and Variability Sampled Along 20°S During VOCALS-REx

G. Allen, H. Coe¹, S. J. Abe², P. Barrett², A. Clarke³, S. Freitag³, C. McNaughton³, S. Howell³, L. Shank³, V. Kapustin³, V. Brekhovskikh³, L. Kleinman³, Y.-N. Lee³, S. Springer³, T. Toniasso³, C. Bretherton⁶, R. Wood⁶, R. George⁶, P. Kree⁷, B. Brooks⁷, G. McKeeking⁷, K. N. Bower¹, P. I. Williams¹, J. Crosier¹, I. Crawford¹, and P. Zuidema⁸

+ Bretherton et al. 2010

7 years of cruise data compiled along 20S in deSzoëke et al., 2010
Key new REx 20S insights

- Cloud macrophysics (the typically deeper and more decoupled PBL offshore) affects cloud optical properties and precipitation at least as strongly as aerosol gradients.
  - Deep PBL $\Rightarrow$ high LWP cells, decoupling $\leftrightarrow$ precipitation
- There are extensive regions of unbroken Sc which (like POCs) are decoupled and drizzling, yet maintain droplet concentrations of 60-100 cm$^{-3}$ much higher than in POCs.
- In-situ cloud droplet conc. agrees with satellite estimates if the Sc cloud cover is not too broken.
- Winds from NCEP/ECMWF operational analyses agree with aircraft measurements $\Rightarrow$ suitable for trajectory analysis.

REx has produced a comprehensive set of 20S physical/chemical measurements distilled and gridded for model comparison. How best to package it?
Current on-going model-data intercomparison now with aerosols

PreVOCA: VOCALS Model Assessment

March 2008

Funding for PreVOCA is provided by the National Science Foundation and the National Oceanographic and Atmospheric Administration, with additional contributions from various national and international research institutions.

VOCALS Homepage | VOCALS at the University of Washington | Rob Wood's homepage

Participating Groups/Models
Model data formats
Mailing List
Submission information
Results
Observational datasets

News:

- October 10th 2007:
  - PreVOCA Model Assessment draft document available

- April 23rd 2008:
  - PreVOCA First Results Available

GOAL:

Critically assess the ability of global and regional atmospheric, oceanic, and chemical transport models to simulate and predict synoptically-varying clouds, meteorology, ocean circulation and aerosols in the southeast Pacific (SEP) subtropical stratocumulus regime for a month in the southern spring season. All participating models must be run in some form of weather forecast mode.

WHY?

VOCALS is motivated on the need to 1) reduce the systematic biases of atmospheric ocean GCMs in the SEP, 2) improve understanding and simulation of aerosol-cloud-drizzle interactions in the marine PBL, and 3) improve understanding and simulation of ocean budgets of heat and salinity in the SEP. Therefore we need to assess the performance of

2 CPTs: NOAA and NSF
Low cloud climatology

CAM4

CAM5
5-day forecasts at 85W, 20S

Mean cloud structure, SE Pacific

Falling down

CAM4

Breaking up

CAM5

Medeiros
VOCALS

Coupled Ocean-Atmosphere-Land Hypotheses

1. Improvement of CGCMs performance in the Eastern Tropical Pacific is key to successful simulation of ITCZ/SPCZ, which will also benefit simulation of other regions.

2. Oceanic mesoscale eddies play a major role in the transport of heat and fresh water from coastally upwelled water to regions further offshore.
VOCALS

Coupled Ocean-Atmosphere-Land Hypothesis

3. The diurnal subsidence wave ("upsidence wave") originating in northern Chile/southern Peru has an impact upon the diurnal cycle of clouds that is well-represented in numerical models.

Aerosol-Cloud Drizzle Hypotheses

1. Variability in the physicochemical properties of aerosols has a measurable impact upon the formation of drizzle in stratocumulus clouds over the SEP.

2. Precipitation is a necessary condition for the formation and maintenance of pockets of open cells (POCs) within stratocumulus clouds.

3. The small effective radii measured from space over the SEP are primarily controlled by anthropogenic, rather than natural, aerosol production, and entrainment of polluted air from lower free-troposphere is an important source cloud condensation nuclei (CCN).

4. Depletion of aerosols by coalescence scavenge is necessary for the maintenance of POCs.

BAMS article in conception phase; probably organized more around highlights than the hypotheses
“V” in VOCALS stands for VAMOS

how to contribute to VAMOS modeling plan?
VAMOS future activities?

time is right.....