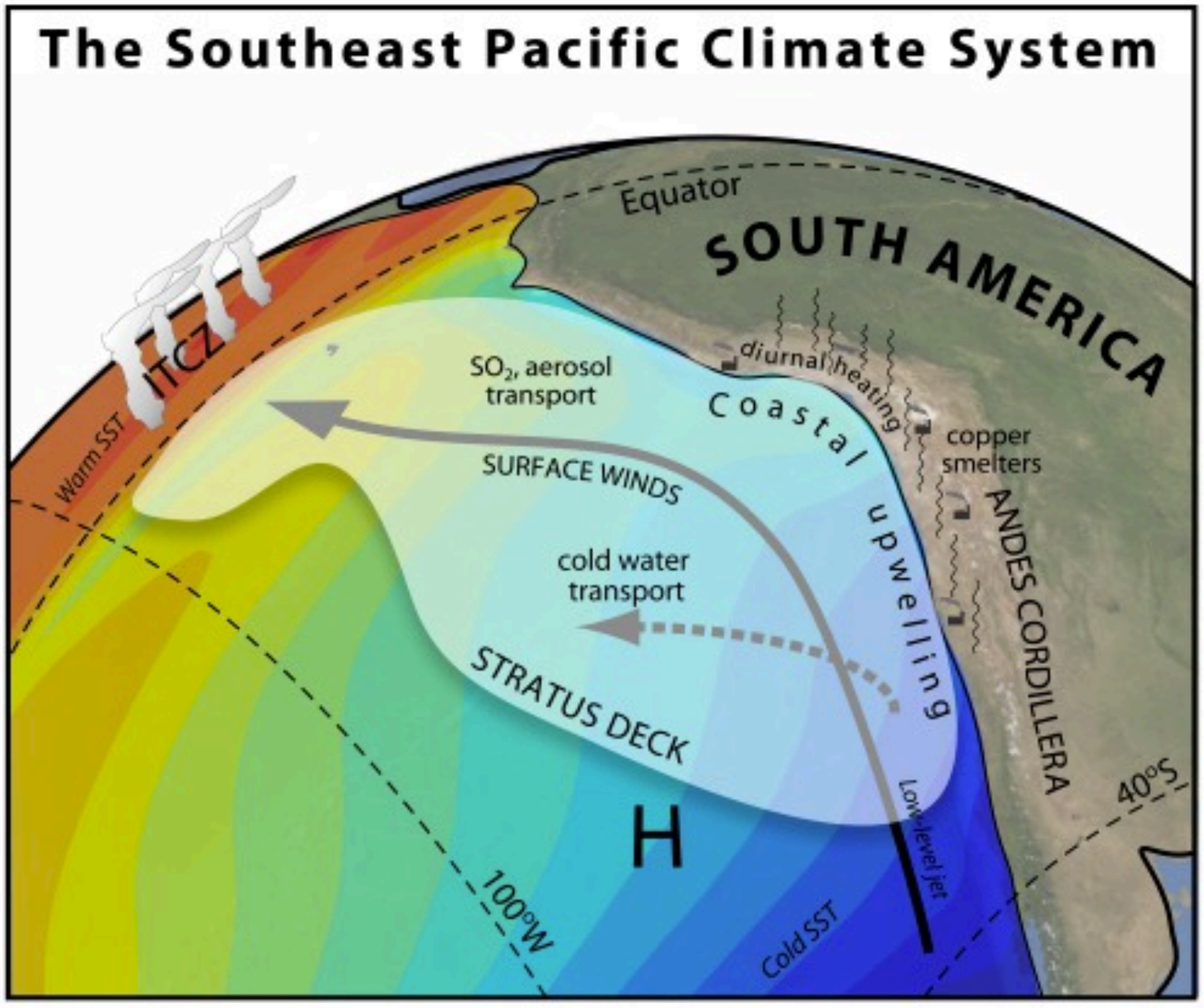

The Southeast Pacific Climate System
Equator
SOUTH AMERICA
ITCZ
Warm SST
SO_2, aerosol transport
diurnal heating
copper smelters
ANDES CORDILLERA
SURFACE WINDS
Coastal upwelling
cold water transport
STRATUS DECK
H
Low-level jet
Cold SST
100°W
40°S

Third VOCALS Science Mtg March 21-23, Miami, FL

organized around themes: PBL&clouds; gases, clouds, aerosols; upper ocean physics; basic issues

AGENDA

Monday 21st March

09:00-10:00: Plenary Session: Welcome and VOCALS Status

09:00-09:10: Mechoso, C R and R Wood: Welcome
09:10-09:30: Wood, R and C R Mechoso: Summary of VOCALS, meeting goals and organization
09:30-09:45: Bretherton, C.: A synthesis of published VOCALS studies on marine boundary layer and cloud structure along 20S
09:45-10:00: Coe, H: A synthesis of studies on particulate composition in the VOCALS-REx region

10:00-10:30: BREAK

10:30-12:00: THEME 1: PBL and Clouds

10:30-10:45: Brenguier, J: Optical thickness and liquid water path: k coefficient aerosol/cloud/radiation
10:45-11:00: Berner, A: LES Modeling of VOCALS RF06: Dynamics, Entrainment, and Microphysical Feedbacks
11:00-11:15: Leon, D: Drizzle and mesoscale organization in SEP stratocumulus
11:15-11:30: Brewer, A: Characterization of sub-cloud vertical velocity distributions and precipitation-driven outflow dynamics using a ship-based, scanning Doppler lidar during VOCALS-Rex
11:30-11:45: de Szoeke, S: Vertical structure and surface radiative effects of marine stratocumulus clouds from 7 years of ship observations
11:45-12:00 Poster summaries (Bretherton, Zuidema, Wilcox)

12:00-13:00: LUNCH AND POSTER VIEWING

13:00-15:00: THEME 1: PBL and Clouds

13:00-13:15: Fairall, C: Cloud microphysics and turbulence from the PSD Wband Radar and the CSD Lidar
13:15-13:30: Mechem, D: Numerical simulation of heavily drizzling cloud regimes in VOCALS
13:30-13:45: Burleyson, C: Observations of the diurnal cycle of marine stratocumulus clouds and precipitation
13:45-14:00: Yuter, S: Observations of the life cycle of marine stratocumulus drizzle cells
14:00-14:15: Zheng, X: Boundary layer, cloud, and aerosol variability in the southeast Pacific coastal marine stratocumulus during VOCALS-REx

15:30-17:30: THEME 2: Gases, Aerosols and Cloud Related Processes

15:30-15:45: Clarke, A: Aerosol Dynamics over the VOCALS region: Sources, Entrainment, Nucleation a CCN
15:45-16:00: Anderson, J: Transport and mixing of polluted aerosols above and below cloud during VOCALS-Rex from an individual-particle perspective
16:00-16:15: Huebert, B: DMS as an integrator of dynamic, chemical, and biological processes during VOCALS
16:15-16:30: Kazil, J: Chemical, aerosol, and cloud processes in closed and open cells
16:30-16:45: George, R: Using WRF-Chem to understand interactions between synoptic and microphysical variability during VOCALS
16:45-17:00: Yang, Q: Investigating impacts of aerosols on marine stratocumulus clouds observed during VOCALS-Rex using WRF-Chem simulations

11:15-12:00: Theme 3. Upper Ocean Physics and Biology. Eddies, Air-Sea Interaction

11:15-11:30: Putrashan, D: SST-wind stress coupling and impact of mesoscale SST features on atmospheric boundary layer off the coast of Peru and Chile
11:30-11:45: Subramanian, A: Results from data assimilation experiments and adjoint sensitivity studies in the South East Pacific.
11:45-12:00: Poster Summaries (Bretherton for Wang, Holte)

12:00-13:00: LUNCH AND POSTER VIEWING

13:00-14:00 Theme 3. Upper Ocean Physics and Biology. Eddies, Air-Sea Interaction

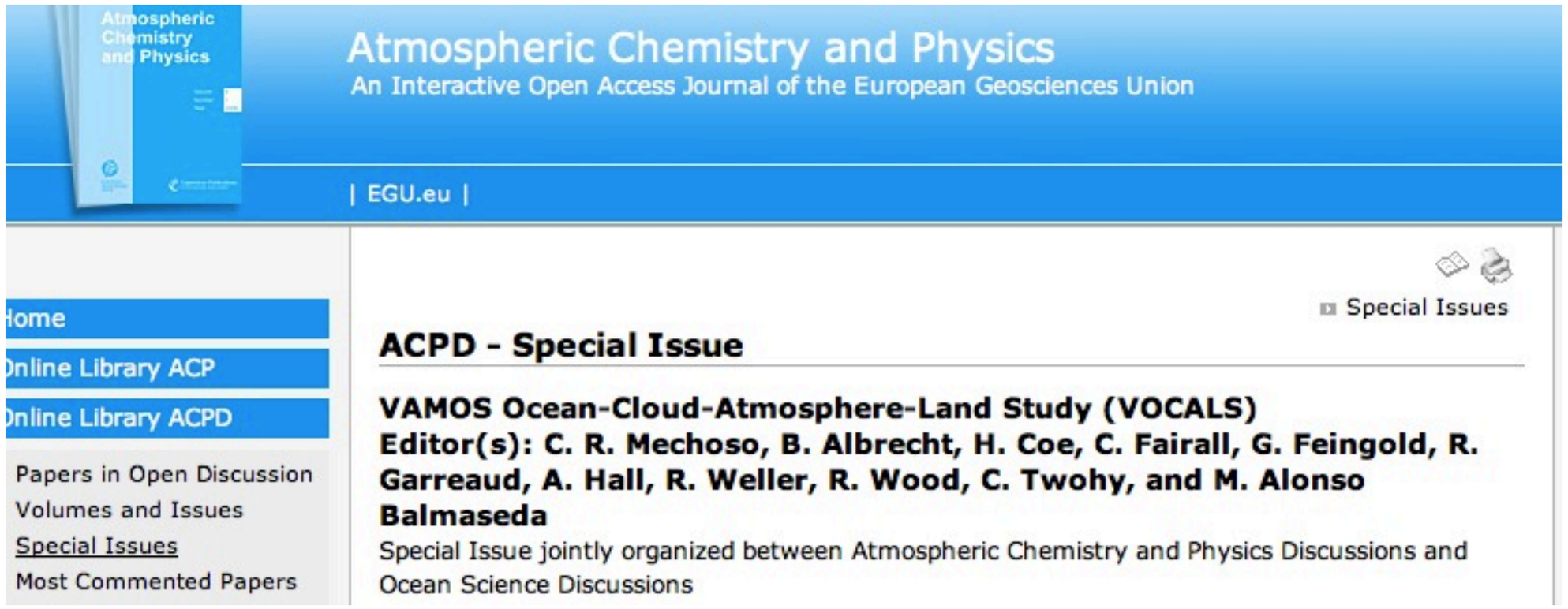
13:00-13:15: Fairall, C: Surface fluxes in the VOCALS region
13:15-13:30: Zappa, J: Measurements of upper-ocean turbulence and air-sea interaction during VOCALS REx
13:30-13:45: Farrar, T: Influence of oceanic processes on SST and upper-ocean heat content
13:45-14:00: Grados, C: From large-scale to submesoscale dynamics in the VOCALS region

14:00-15:00: Theme 4. Modeling and Basic Issues

14:00-14:15: de Szoeke, S: Simulation of Surface Fluxes in the Tropical Pacific
14:15:14:30: Mechoso, C R: A discussion of the processes that maintain a cool ocean surface under the stratus decks of the Southeast Pacific
14:30-14:45: Medeiros, B: Southeast Pacific stratocumulus in CAM4 and CAM5
14:45-15:00: Abel, S: The representation of drizzle in the Met Office Unified Model

15:00-15:30: BREAK

15:30-15:45: Barrett, P: Boundary layer thermodynamics and decoupling in the South Eastern Pacific along 20 South
15:45-16:00: Allen, G: Gravity waves observed as a causal mechanism for transition from closed to open cellular convection in the remote South East Pacific
16:00-16:15: Garreaud, R.: Climatology of the VOCALS region and diurnal cycle
16:15-16:30: Toniazzo, T: Processes regulating the seasonal changes in the SEP during the Southern Hemisphere spring
16:30-16:45: Garreaud, R: VOCALS-CUpEx: The Chilean Upwelling Experiment



~45 papers in ACP special issue; 60-70 total

compilation of data and models along 20S

The PreVOCA experiment: modeling the lower troposphere in Southeast Pacific

M. C. Wyant[1], R. Wood[1], C. S. Bretherton[1], C. R. Mechoso[2], J. Bacmeister[3], M. A. Balmaseda[4], B. Barrett[5], F. Codron[6], P. Earnshaw[7], J. Fast[8], C. Hannay[9], J. W. Kaiser[4], H. Kitagawa[10], S. A. Klein[11], M. Köhler[4], J. Manganello[12], H.-L. Pan[13], F. Sun[2], S. Wang[14], and Y. Wang[15]

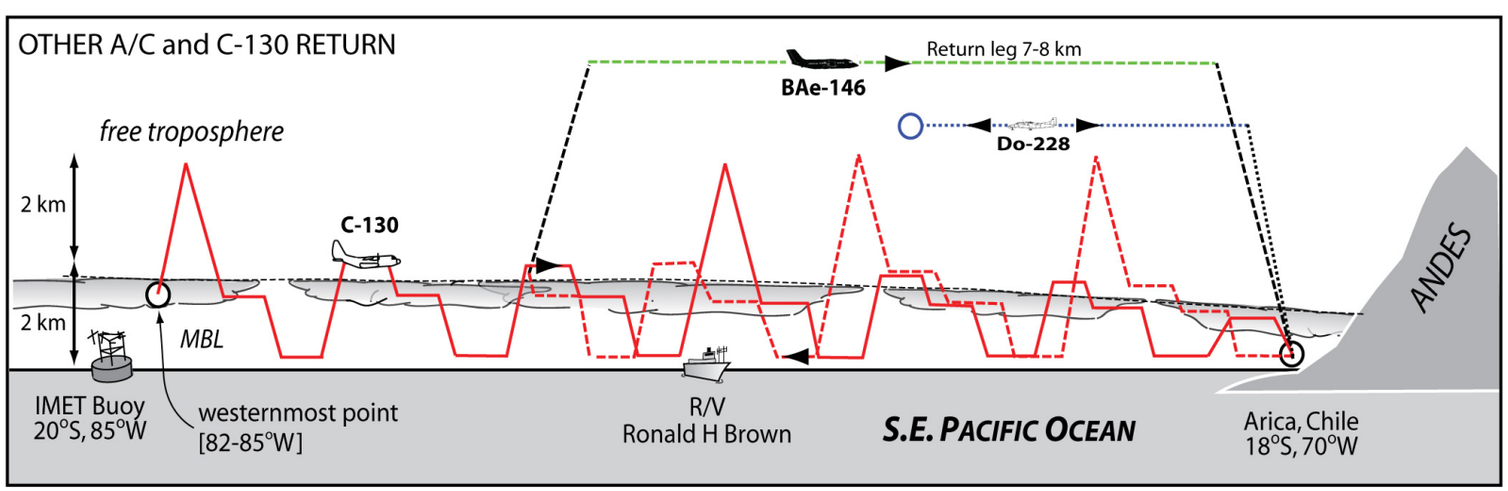
VOCALS observational analysis along 20S

Manuscript prepared for Atmos. Chem. Phys.
with version 3.2 of the LaTeX class copernicus.cls.
Date: 19 October 2010

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

G. Allen[1], H. Coe[1], S. J. Abel[2], P. Barrett[2], A. Clarke[3], S. Freitag[3], C. McNaughton[3], S. Howell[3], L. Shank[3], V. Kapustin[3], V. Brekhovskikh[3], L. Kleinman[4], Y-N. Lee[4], S. Springston[4], T. Toniazzo[5], C. Bretherton[6], R. Wood[6], R. George[6], P. Krecl[7], B. Brooks[7], G. McKeeking[1], K. N. Bower[1], P. I. Williams[1], J. Crosier[1], I. Crawford[1], and P. Zuidema[8]

+ Bretherton et al. 2010



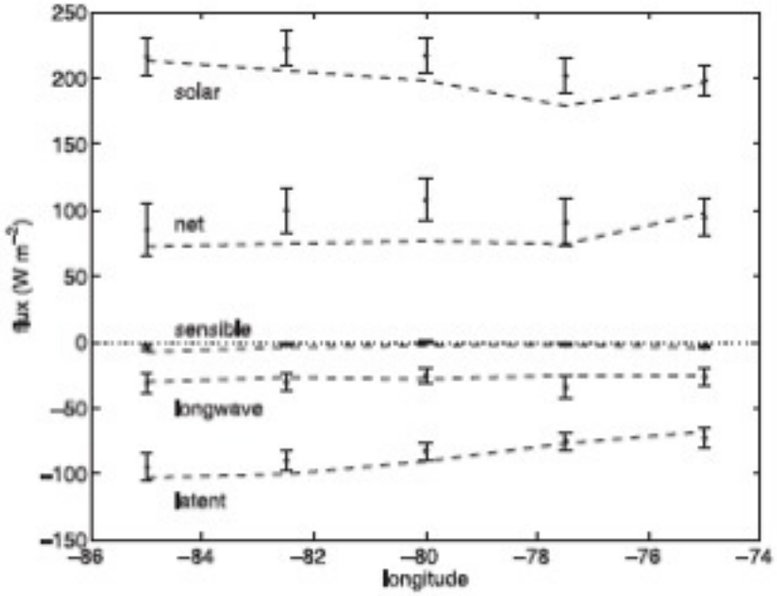


FIG. 3. Longitude-binned (2.5°) surface heat flux averaged from the nine 20°S transects (dots) and the five transects in October (dashed lines). Whiskers are the sampling standard error of the measurements.

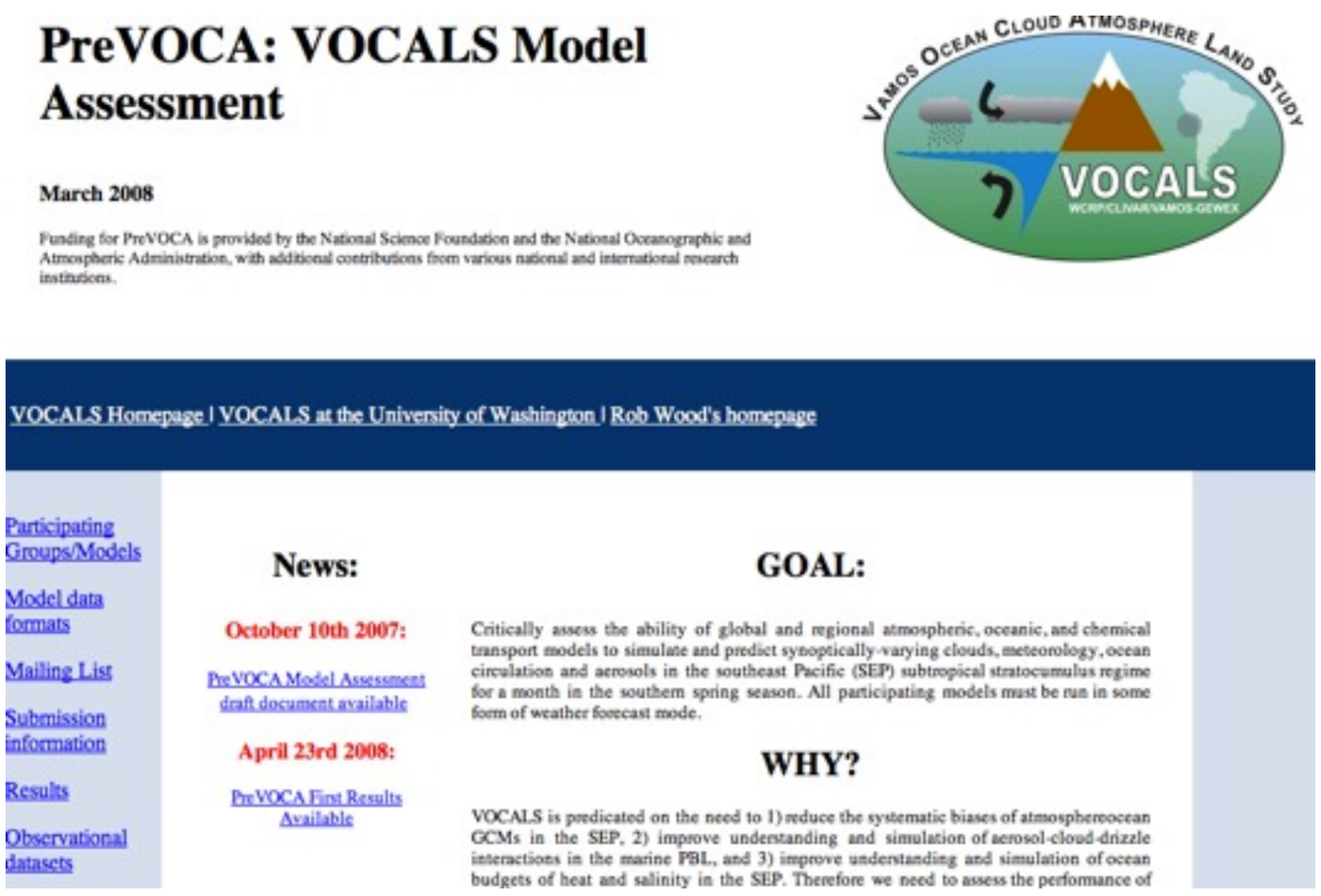
7 years of cruise data compiled along 20S in deSzoeke et al., 2010

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 ➔ high LWP cells, decoupling ←➔ 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 ➔ 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.

VAMOS OCEAN CLOUD ATMOSPHERE LAND STUDY
VOCALS
WCRP/CLIVAR/VAMOS-GEWEX

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:

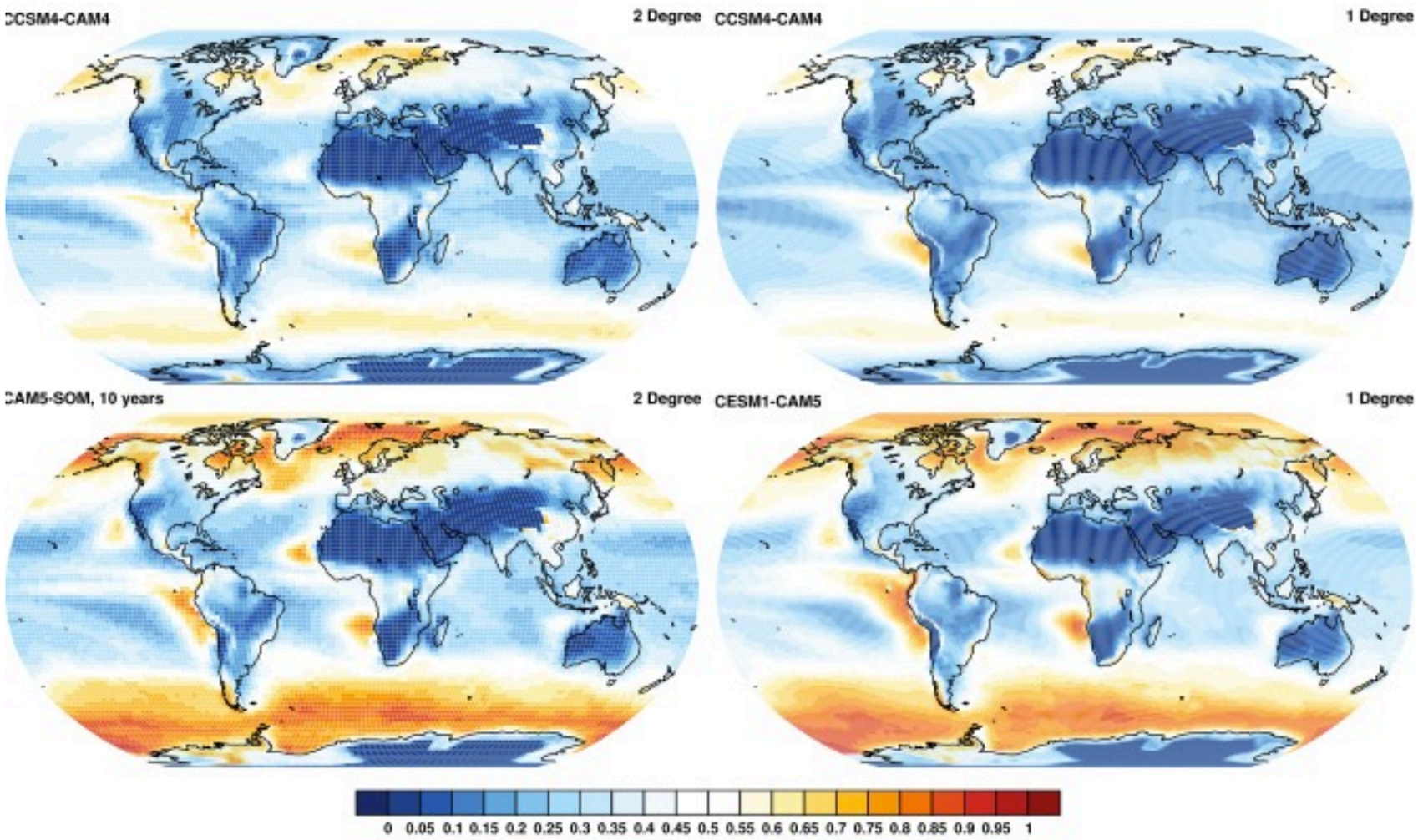
Critically assess the ability of global and regional atmospheric, oceanic, and chemical transport models to simulate and predict synoptically-varying clouds, meteorology, ocean circulation and aerosols in the southeast Pacific (SEP) subtropical stratocumulus regime for a month in the southern spring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

WHY?

VOCALS is predicated on the need to 1) reduce the systematic biases of atmosphereocean 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

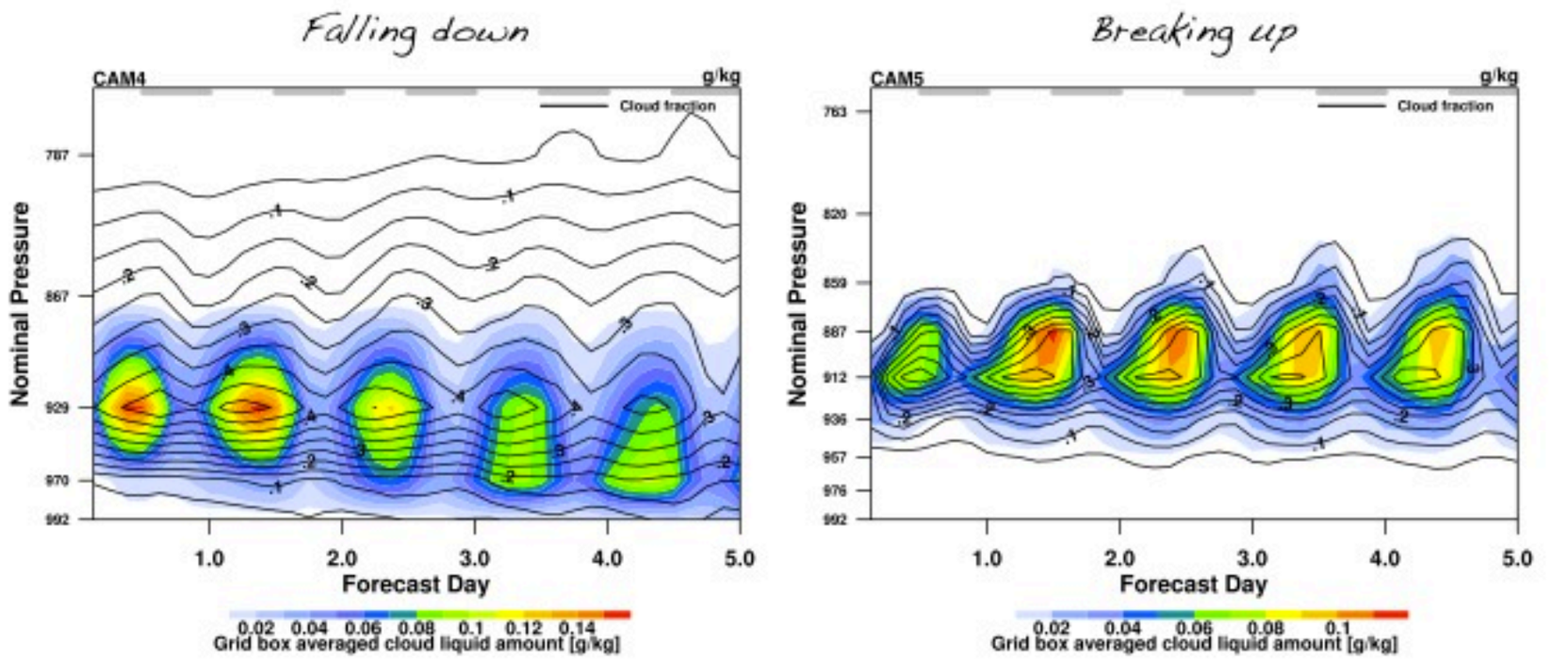
Low cloud climatology



CAM4

CAM5

5-day forecasts at 85W, 20S



Medeiros

CAM4 CAM5

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

Aerosol-Cloud Drizzle Hypotheses

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

4. Depletion of aerosols by coalescence scave 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.....

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.