

Improving understanding, model simulations, and prediction of the Southeast Pacific Climate System

**Third VOCALS Science Meeting
21-23 March 2011. U. Miami, Florida**



Universities

Arizona
Arizona State
California Los Angeles
California Irvine
California San Diego
California Santa Cruz
Chile, Chile
Concepción, Chile
Colorado Boulder
Colorado State
Drexel
Hawaii
Iowa
Leeds, UK
Manchester, UK
Miami
N. Andres Bello, Chile
Naval Post. School
North Carolina State
Oregon State
Purdue
Reading, UK
Washington
Wyoming

Logistic Support:
UCAR JOSS

Research Institutions

Brookhaven Nat.
COLA
CNRM/GAME France
CNRS/LMD France
IMARPE Peru
Inst. Geofísico del Peru
IPRC
JISAO
LEGOS
LOCEAN France
NASA/GSFC
NCAR
NCAS, UK
NOAA/ESRL
NOAA/GFDL
NOAA PMEL
NRL
Pacific Northwest
Scripps
Woods Hole

VOCALS Goals

Elimination of CGCM systematic errors in the SEP, and improved model simulations of the coupled system in the region and global impacts of its variability.

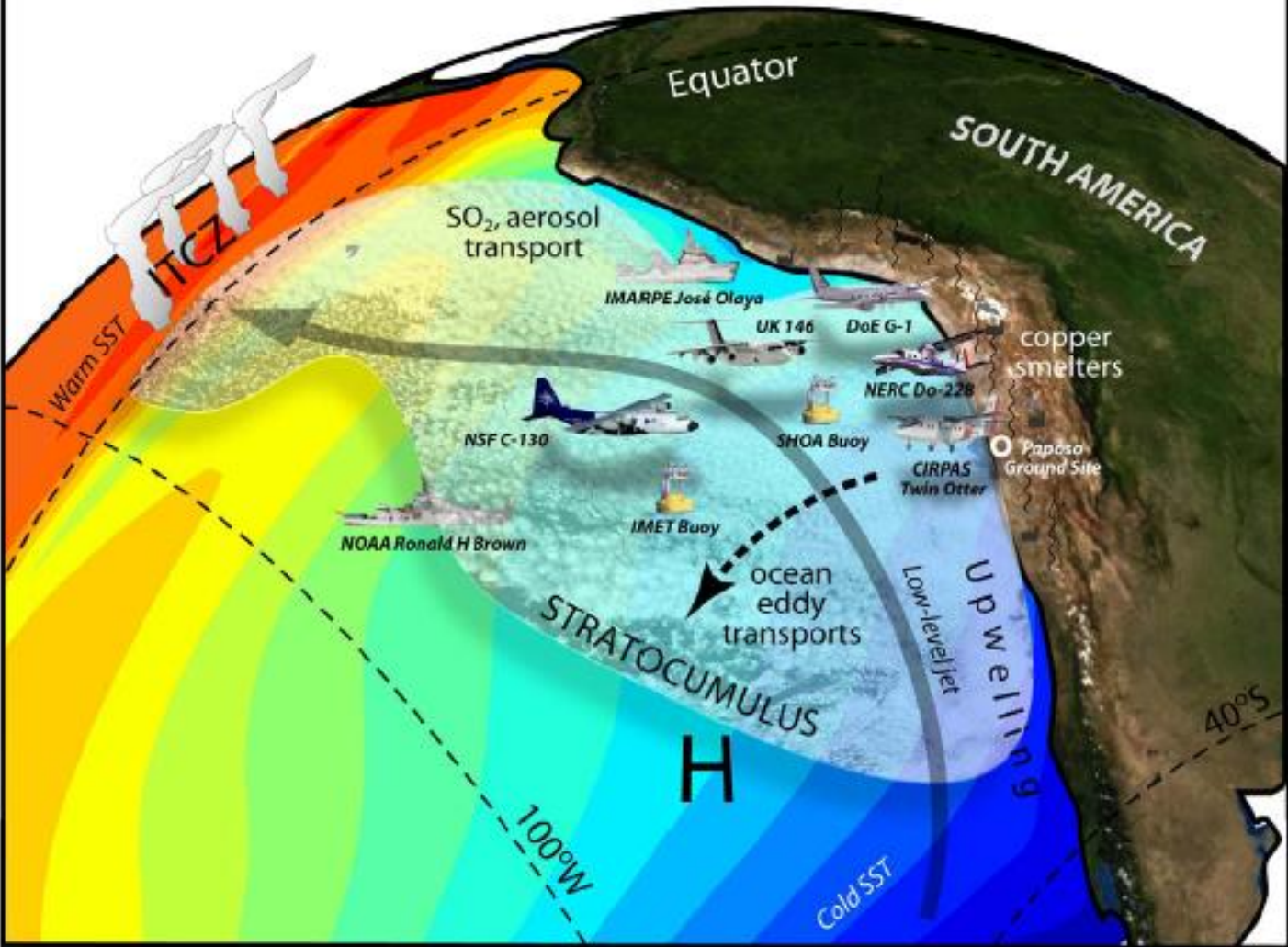
Improved understanding and regional/global model representation of aerosol indirect effects over the SEP.

www.eol.ucar.edu/projects/vocals

Oper. Centers

BMRC Australia
CPTec Brazil
ECMWF Int.
JMA Japan
MetOffice UK
NCEP US

VOCALS Regional Experiment



Equator

SOUTH AMERICA

SO₂, aerosol transport

IMARPE José Olaya

UK 146

DoE G-1

copper smelters

NERC Do-228

Paposa Ground Site

Warm SST

ITCZ

NSF C-130

NOAA Ronald H Brown

SHOA Buoy

IMET Buoy

CIRPAS Twin Otter

ocean eddy transports

STRATOCUMULUS

Upwelling
Low-level jet

H

100°W

Cold SST

40°S

Meeting Goals

- **Review of VOCALS Science**
- **Three primary objectives:**
 - Assess the validity of VOCALS Hypotheses in the framework of what has been learnt so far.
 - Synthesis of VOCALS contributions to its scientific objectives.
 - Further development of VOCALS “legacy” and future plans.

Meeting Organization

- Thanks to P. Zuidema for hosting
- “Sequential Agenda” (all plenary)
- Sessions on Themes followed by discussions
- Rapporteurs presenting summaries on Wed morning
- Posters exhibited in lunch/coffee break out rooms
- Lunch and coffee served on Tue and Wed

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. A significant improvement can be achieved through better representing the effects of stratocumulus clouds on the underlying surface fluxes and those of oceanic mesoscale eddies in the transport of heat.



VOCALS

Coupled Ocean-Atmosphere-Land Hypotheses

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.

4. The entrainment of cool fresh intermediate water from below the surface layer during mixing associated with energetic near-inertial oscillations generated by transients in the magnitude of the trade winds is an important process to maintain heat and salt balance of the surface layer of the ocean in the SEP.



VOCALS

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.



VOCALS

Aerosol-Cloud Drizzle Hypotheses

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 the lower free-troposphere is an important source of cloud condensation nuclei (CCN).

4. Depletion of aerosols by coalescence scavenging is necessary for the maintenance of POCs, and is a significant term in the CCN budget over the SE Pacific region.

