

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

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

Universities

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Arizona State
California Los Angeles
California Irvine
California San Diego
California Santa Cruz
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Colorado State
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Washington
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Logistic Support:
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NCAS, UK
NOAA/ESRL
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NRL
Pacific Northwest
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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.

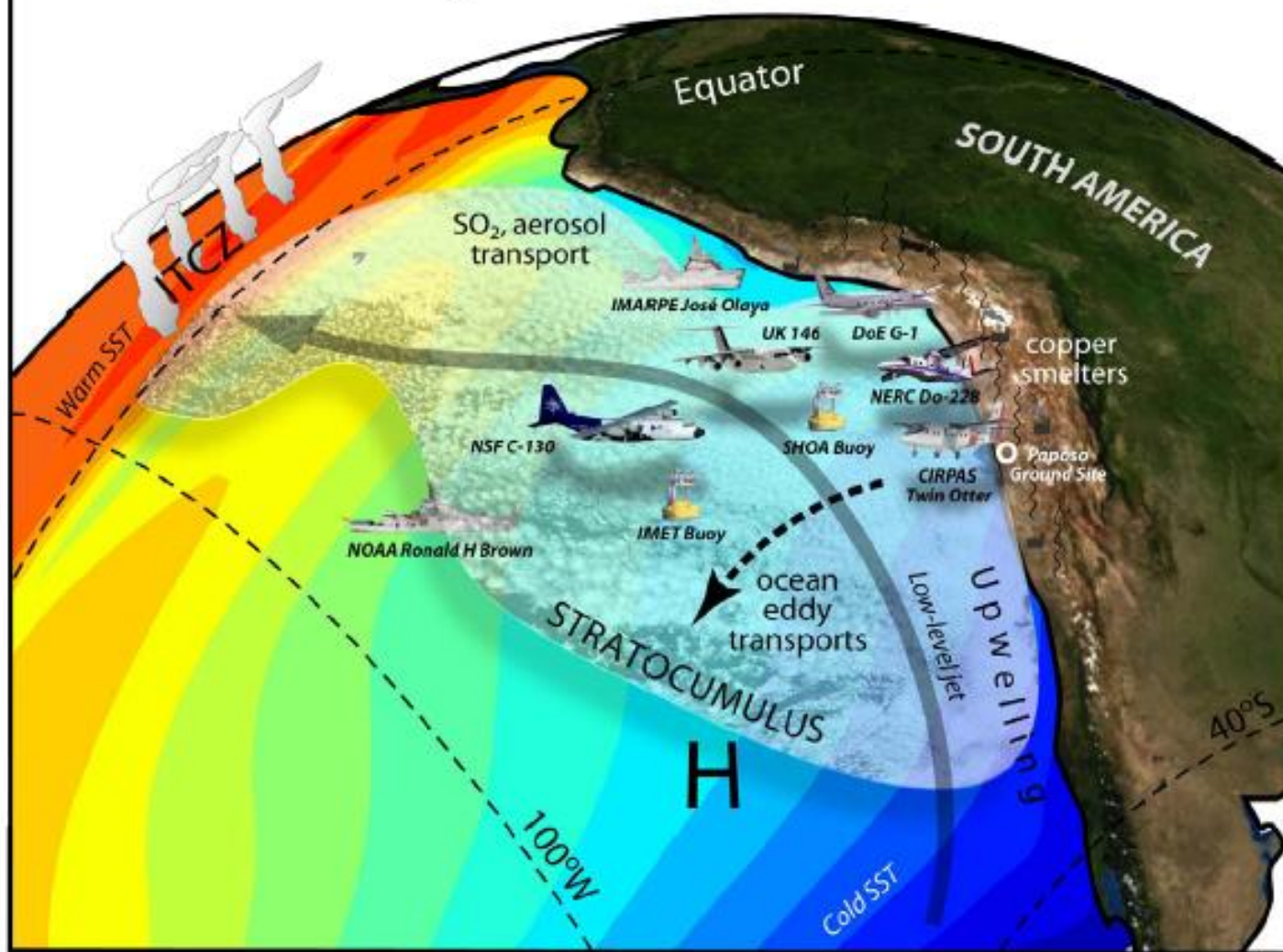
www.eol.ucar.edu/projects/vocals

Oper. Centers

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

VOCALS

Regional Experiment



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

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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

2. Oceanic mesoscale eddies play a major role in the transport of heat and fresh water from from the coastal upwelling region and in the production of sea water and atmospheric DMS in the coastal and offshore regions. Upwelling, by changing the physical and chemical properties of the upper ocean, has a systematic and noticeable effect on aerosol precursor gases and the aerosol size distribution in the MBL over the SEP.



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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.



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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.



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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.



VOCALS/VAMOS Future

- VOCALS Continues.....
- ACP issue and other journals
- Meetings of-opportunity (AGU)
- Journal paper (BAMS-type)
- Dataset generation (funding required?)
- Joint activity to challenge physical-chemical models: meteorology vs aerosol effects on clouds? WRF-Chem gives the solution one wants?
- Joint activity on model assessment in SEP/SEA: eddy activity in eddy resolving models; local topographic effects; why is PBL depth shallow near coast?
- SWG act as facilitator of communications among project members

Questions

- **Meteorology vs aerosol in reference to cloud properties (diurnal cycle)**
- **Upsidence influence on cloud in observation**