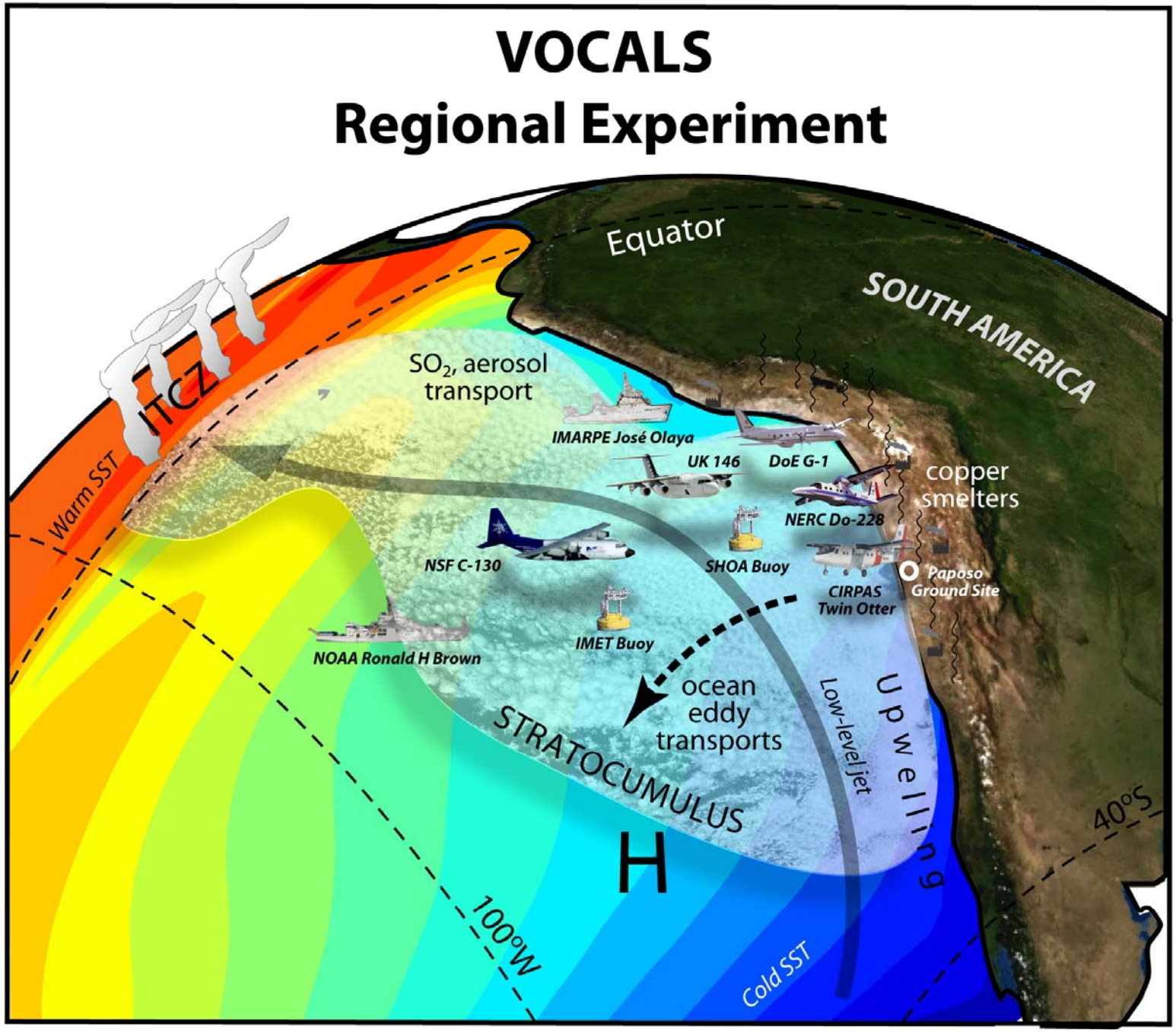
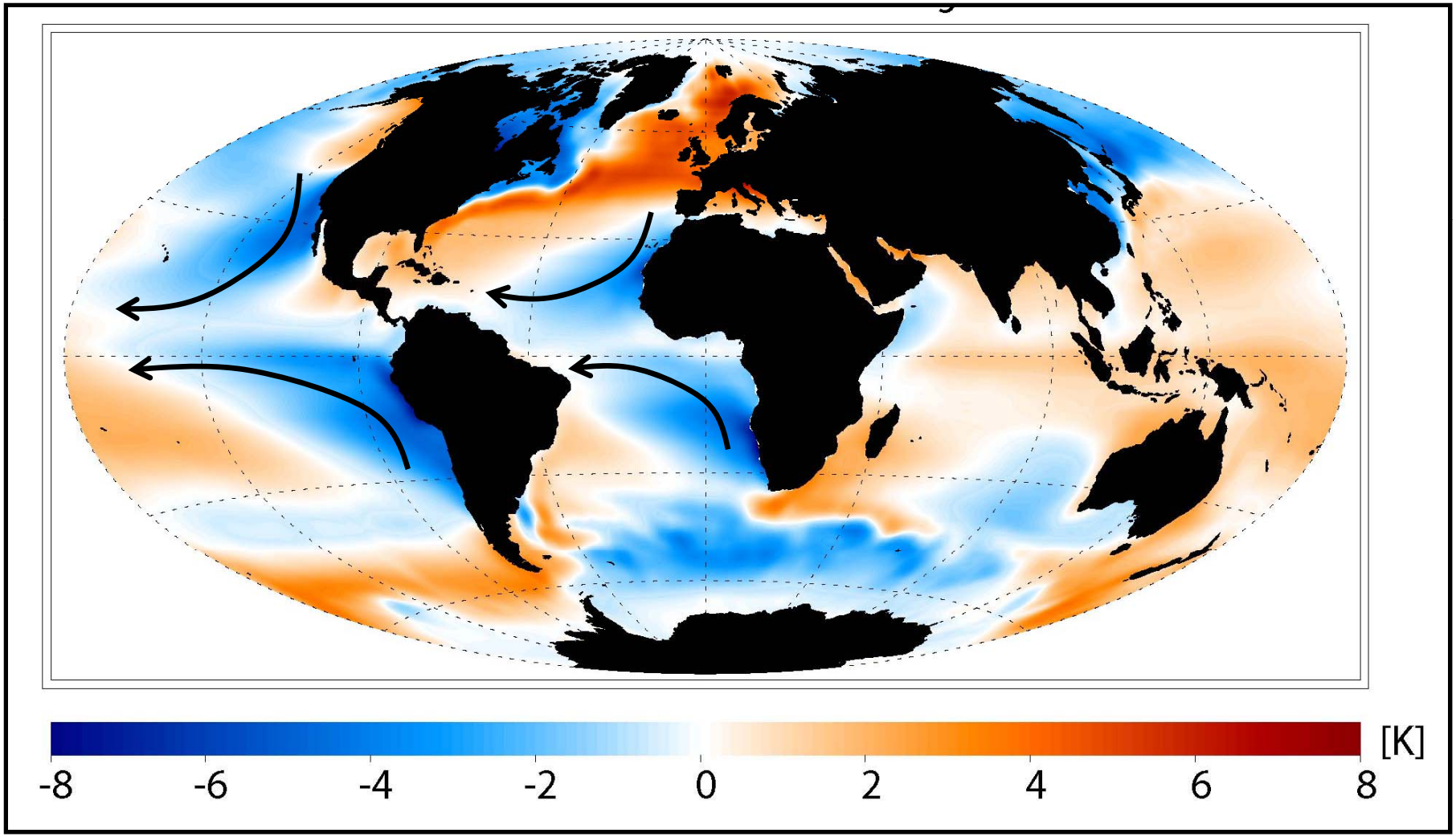
VOCALS-REx Themes and Hypotheses

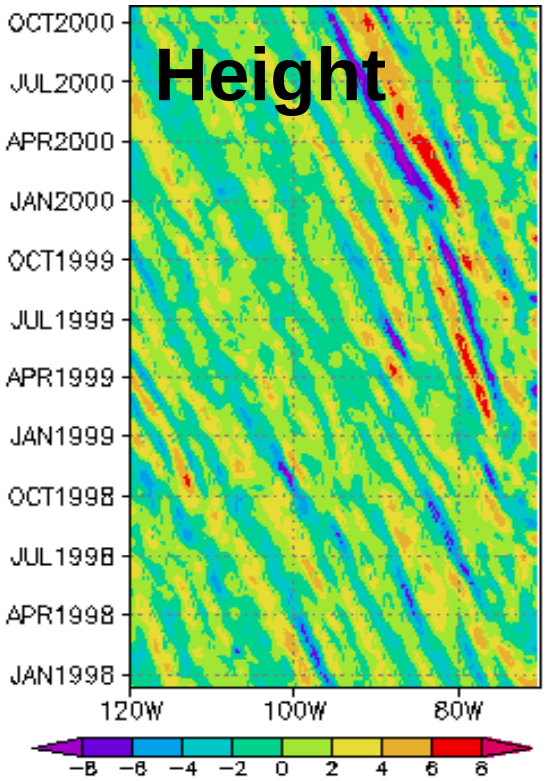

VOCALS
Regional Experiment
Equator
SOUTH AMERICA
ITCZ
Warm SST
SO_2, aerosol transport
IMARPE José Olaya
UK 146
DoE G-1
copper smelters
NERC Do-228
NSF C-130
SHOA Buoy
Paposo Ground Site
CIRPAS Twin Otter
IMET Buoy
NOAA Ronald H Brown
ocean eddy transports
STRATOCUMULUS
H
Low-level jet
Upwelling
40°S
100°W
Cold SST

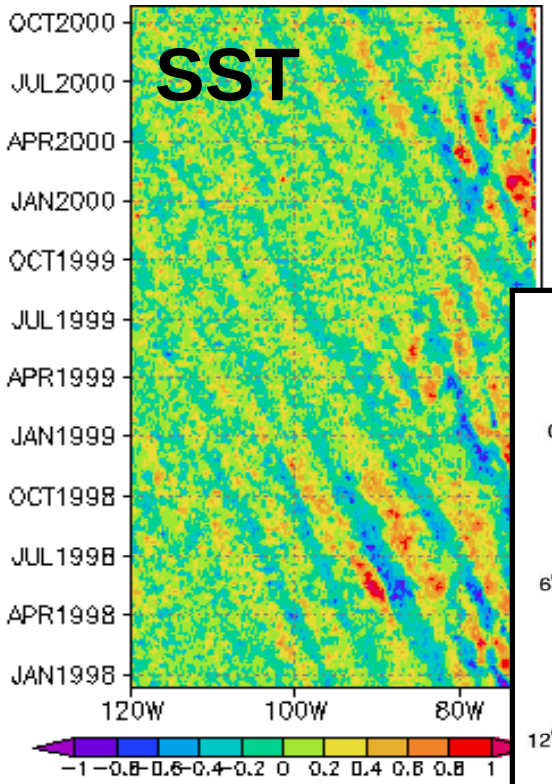
Annual mean SST

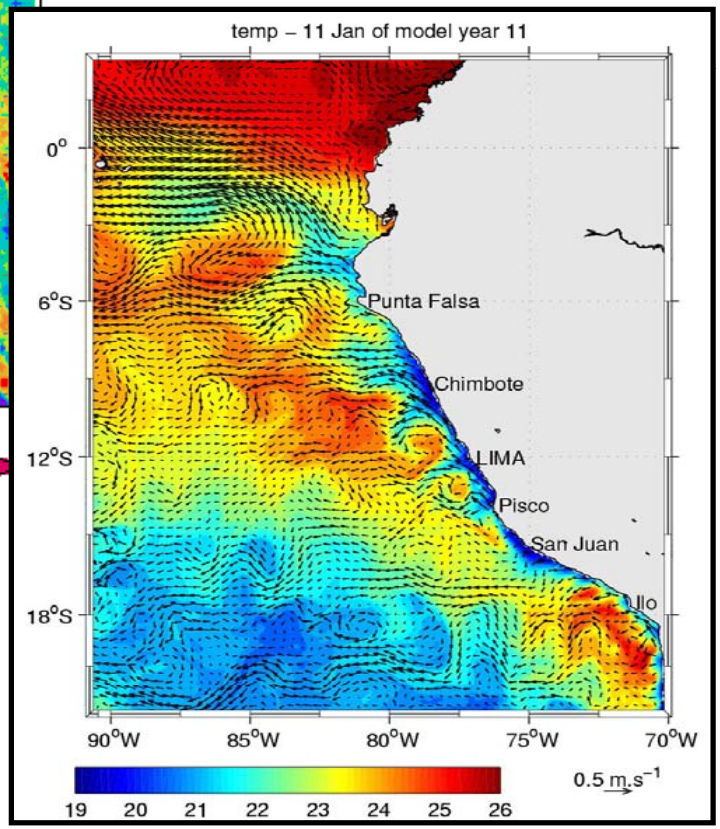
[anomaly from zonal mean]



Oceanic processes

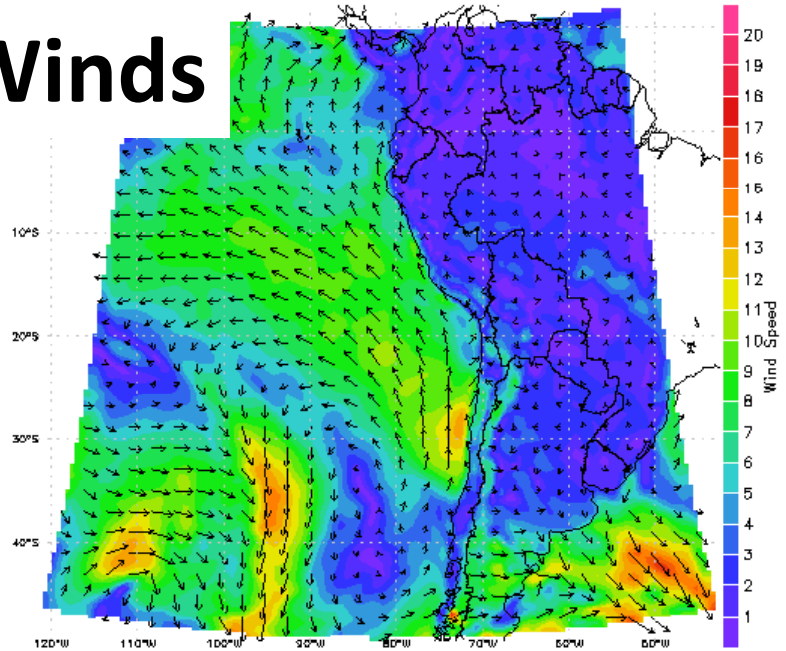




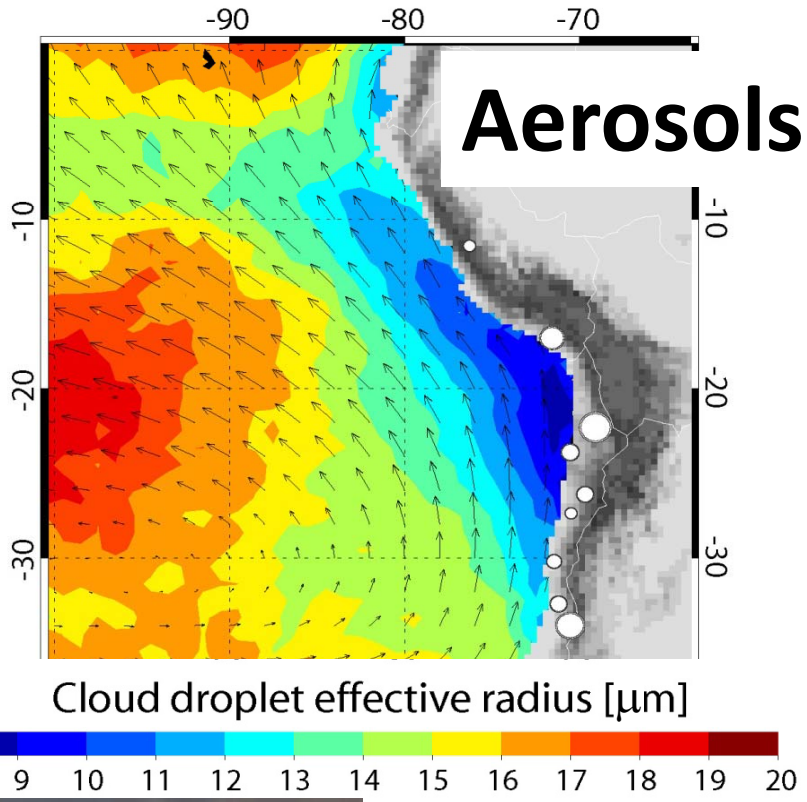


Atmospheric processes

Winds

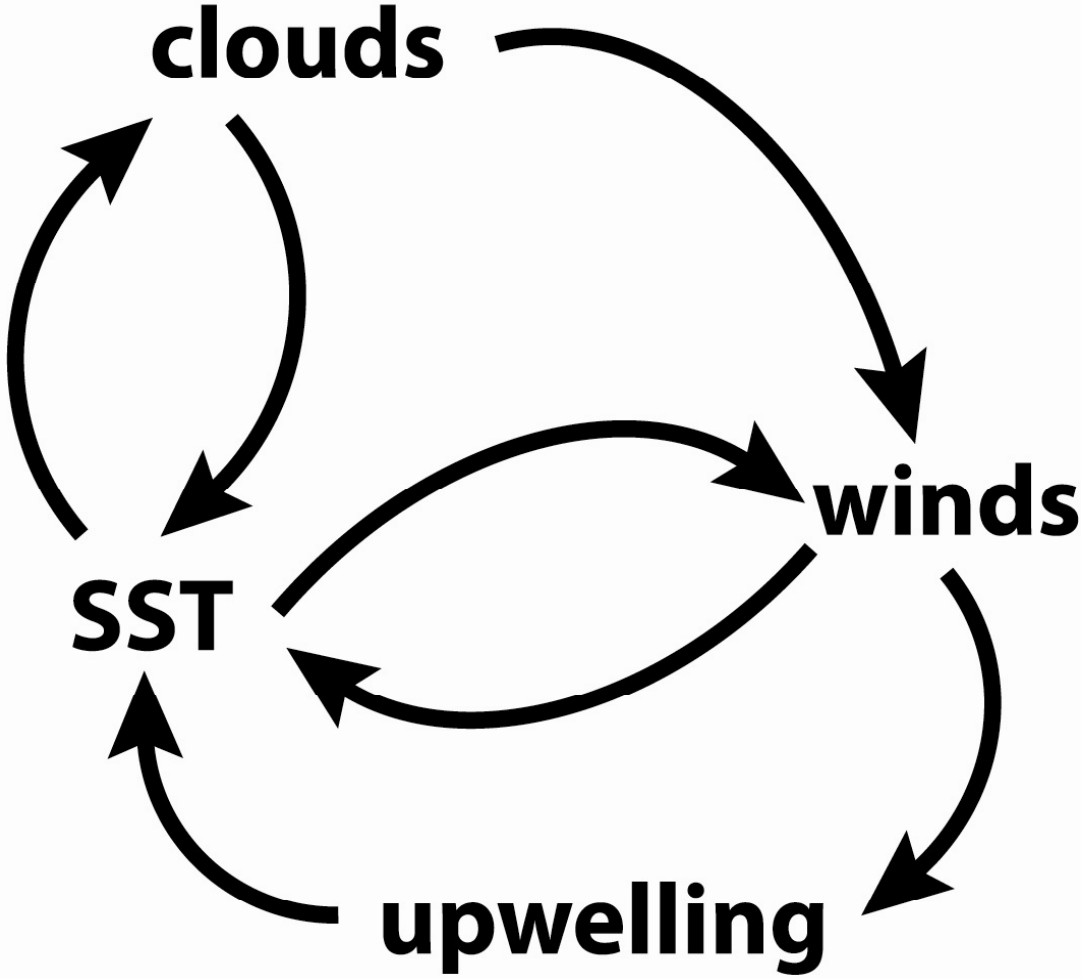


Aerosols



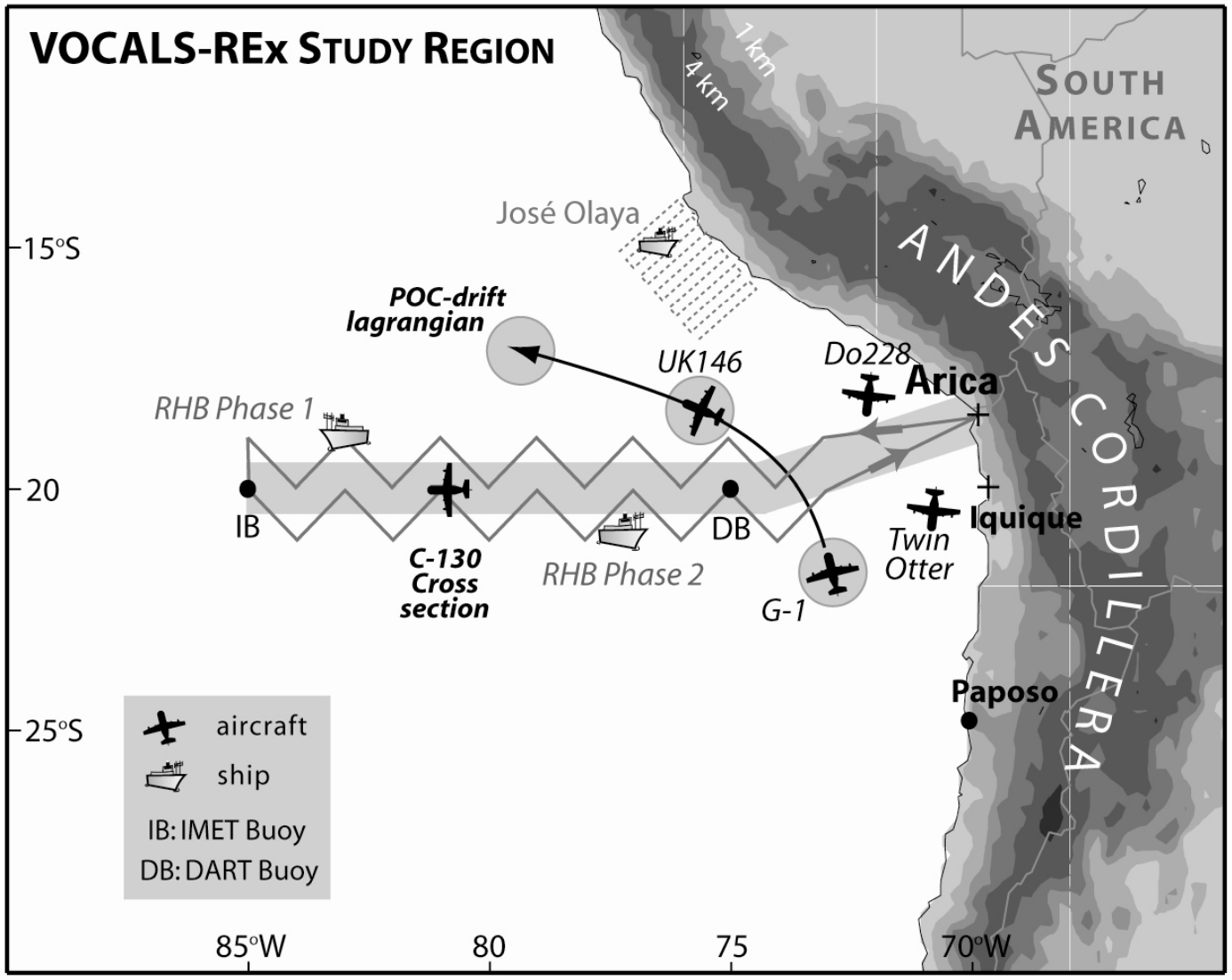
Clouds and precipitation

The SEP Coupled System



VOCALS-REx Platforms

VOCALS-REx Study Region



VOCALS Regional Experiment (REx)

Themes

- **Aerosol-cloud-drizzle interactions** in the marine boundary layer (MBL) and the physicochemical and spatiotemporal properties of aerosols

- **Chemical and physical couplings** between the upper ocean, the land, and the atmosphere.

COUPLED-OCEAN-ATMOSPHERE-LAND HYPOTHESES

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

- By changing the physical and chemical properties of the upper ocean, upwelling has a systematic and noticeable effect on aerosol precursor gases and the aerosol size distribution over the SEP

- 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

- 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.

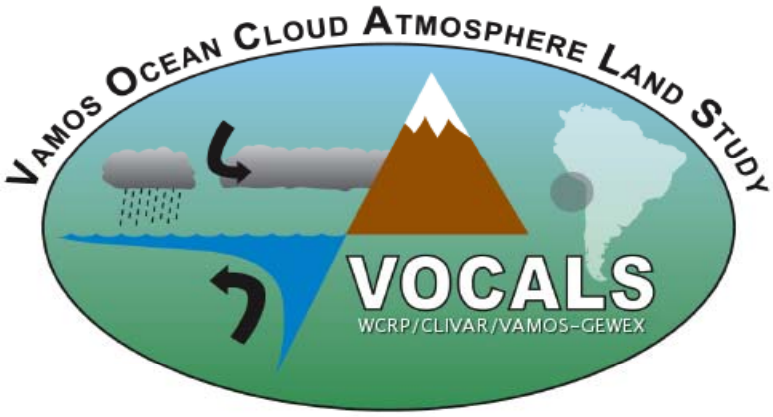
AEROSOL-CLOUD-DRIZZLE HYPOTHESES

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

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

- 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)

- Depletion of aerosols by coalescence scavenging is necessary for the maintenance of POCs.



Collaborating Institutions

C. R. Mechoso, Chair, VOCALS SWG
R. Wood, VOCALS-REx PI

Logistic Support:
NCAR JOSS

Operational Centers

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

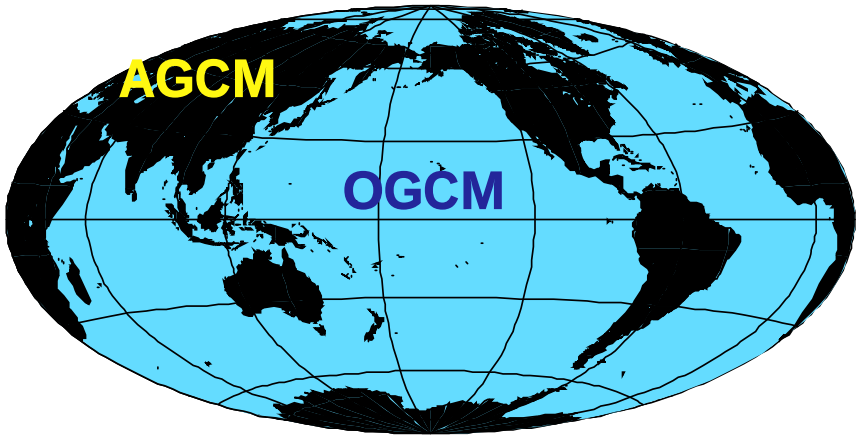
Universities

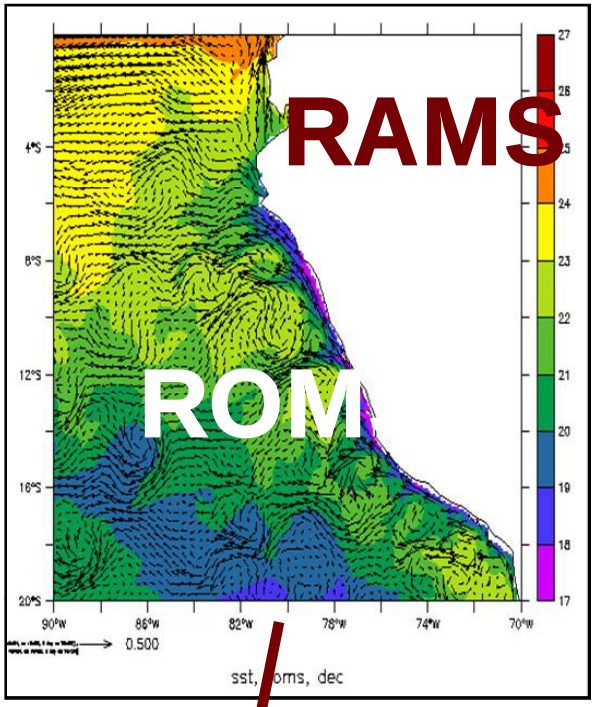
Arizona State U.
U. Concepción, Ch
CSU
Drexel U.
U. Hawaii
U. Manchester UK
U. Miami
North Carolina State
Oregon State U.
U. Reading UK
U. Arizona
U. Chile
UCLA
U. Colorado
UCSD
U. Leeds UK
U. Washington
U. Wyoming

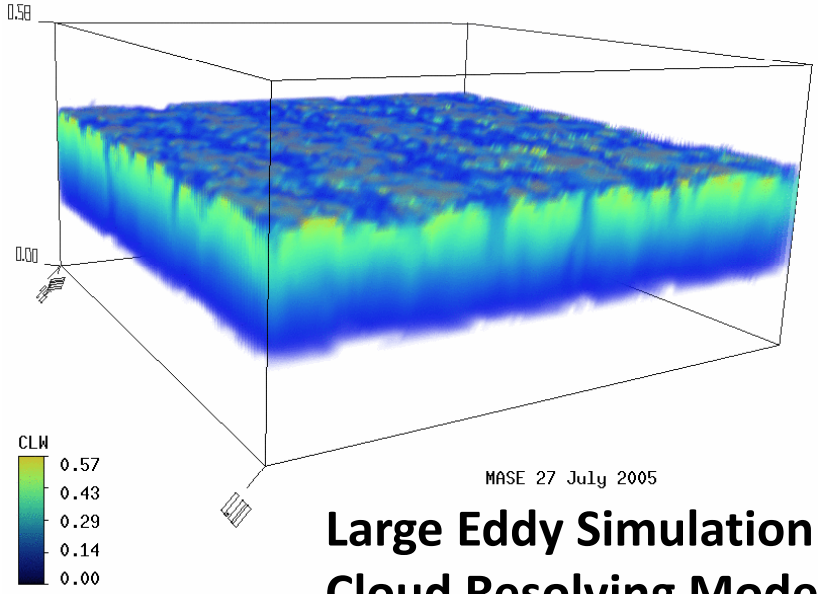
Research Labs

Brookhaven Nat.
COLA
CNRS/LMD France
IMARPE
IPRC
LEGOS
NASA GSFC
NASA JPL
NCAR
NOAA/CIRES
NOAA/GFDL
NRL
Pacific Northwest
Woods Hole

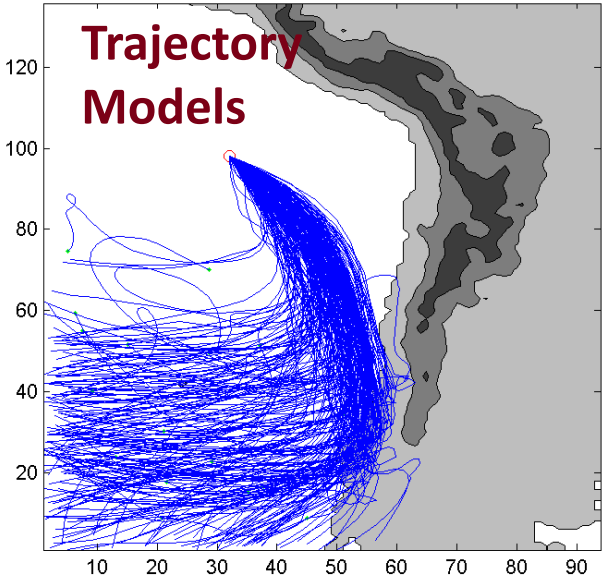
Models in VOCALS







Large Eddy Simulation
Cloud Resolving Models



VOCALS-REx Science Team

FUNCTION	PARTICIPANT
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C-130 Flight Scientist	Rob Wood, Chris Bretherton
BAe146 Flight Scientist	Hugh Coe, Phil Brown
G1 Flight Scientist	Pete Daum
Dornier Flight Scientist	Geraint Vaughan
Twin Otter Flight Scientist	Bruce Albrecht
Ronald H Brown Lead Scientist	Bob Weller
José Olaya Lead Scientist	Carmen Grados
All other VOCALS PIs	n/a
VOCALS Science Working Group (SWG)	Bruce Albrecht, Chris Bretherton, Hugh Coe, Tony Clarke, Chris Fairall, Jerome Fast, Laura Gallardo, Carmen Grados, Bill Large, C. Roberto Mechoso (Chair), Hualu Pan Yuqing Wang, Bob Weller, Rob Wood (Vice Chair) Paquita Zuidema, José Meitín and Carlos Ereño (ex officio)