CUpEx: Chilean Upwelling Experiment
Tongoy (30°S), 21 Nov – 5 Dic 2009

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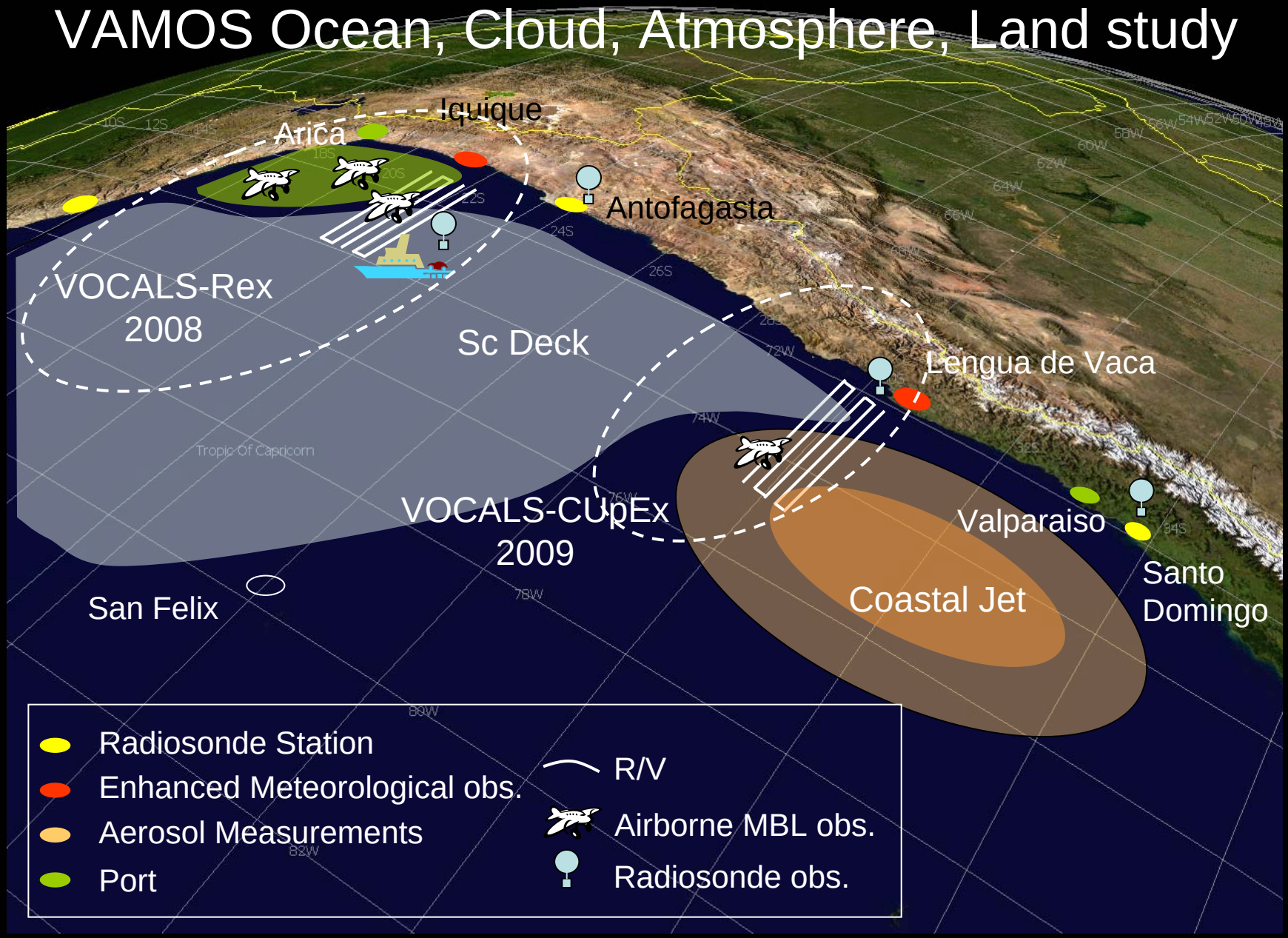
VOCALS

VAMOS Ocean, Cloud, Atmosphere, Land study



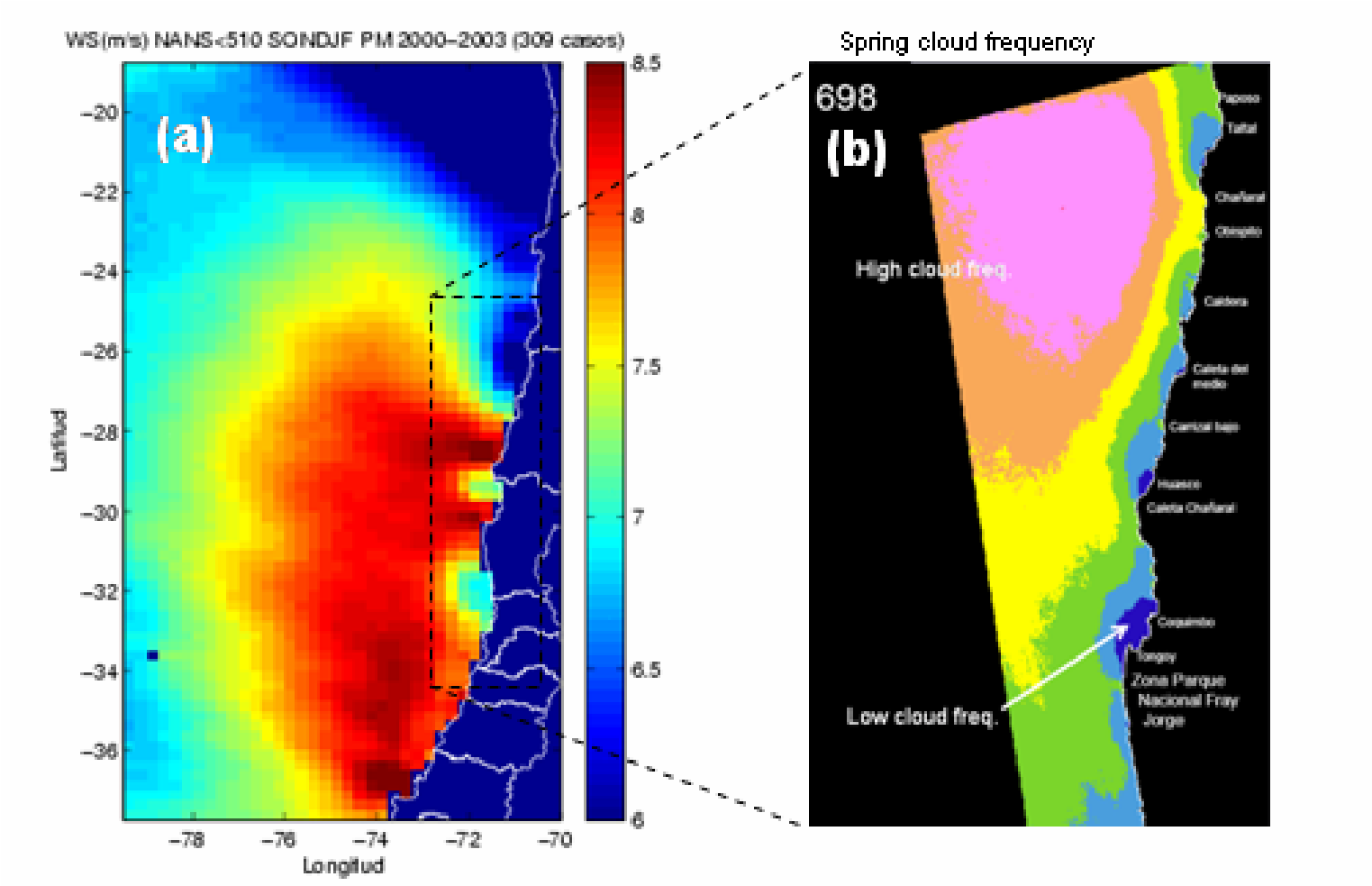
List of projects and institutions supporting CUpEx

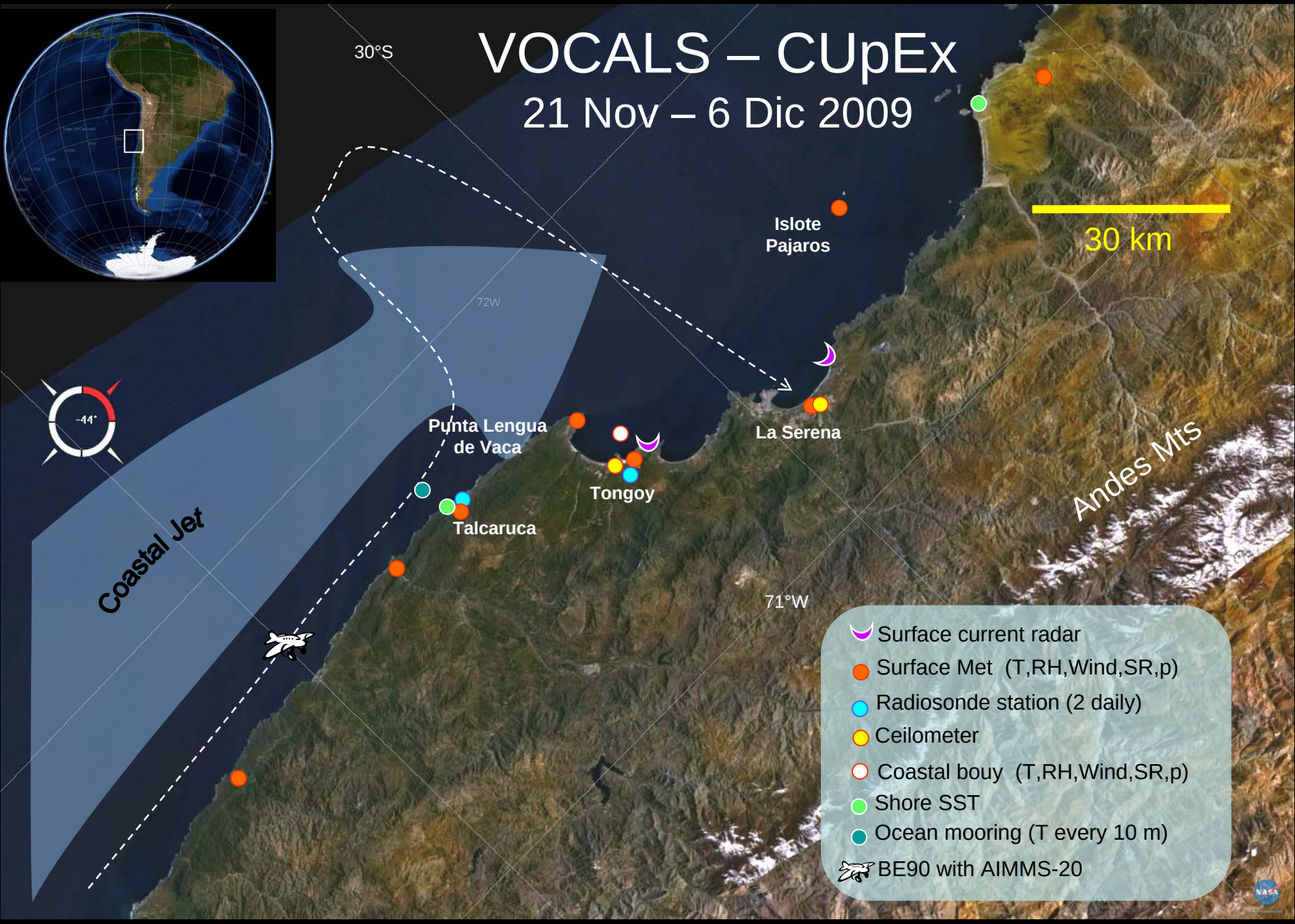
Platform & Instruments	PIs	Funding
AIMMS-20 on BE90	R. Garreaud (DGF)	FONDECYT-Grant 1090492, DGF-UCH, DGAC
AWS, Radiosondes at Tongoy and Talcaruca	J. Rutllant (DGF) R. Muñoz (DGF)	FONDECYT-Grant 1090492, DMC, CNE, DGF-UCH
Tongoy bay buoy and AWS Islote Pajaros	M. Ramos (CEAZA)	CEAZA, INOVA-Corfo, ACT19-R19 (PBCT)
Surface Current Radars	D. Figueroa (DGEO)	FONDEF-Grant D03I-1104
Ocean & coastal moorings	O. Pizarro (DGEO) M. Ramos (CEAZA)	FONDECYT-Grant 1090791 FONDECYT-Grant 1080606

DGF : Department of Geophysics, Universidad de Chile
DGEO: Department of Geophysics, Universidad de Concepción
CEAZA: Centro de Estudios Avanzados de Zonas Aridas
DGAC: Dirección General de Aeronautica Civil
DMC: Dirección Meteorológica de Chile
CNE: Comisión Nacional de Energía

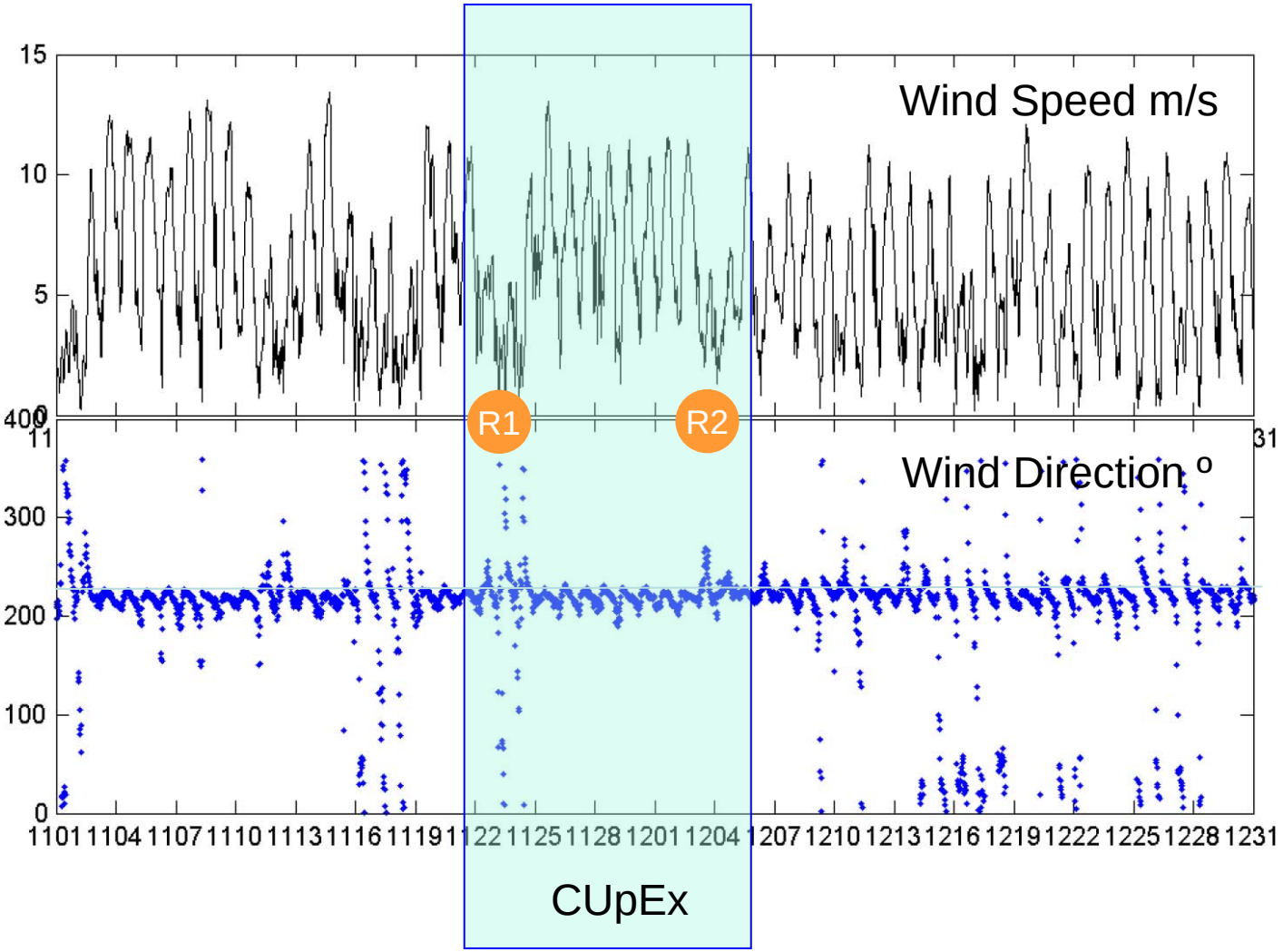
Goals of Fondecyt 1090492 (Garreaud, Muñoz, Rutllant)

Understand the alongshore structure of the MBL and its diurnal cycle



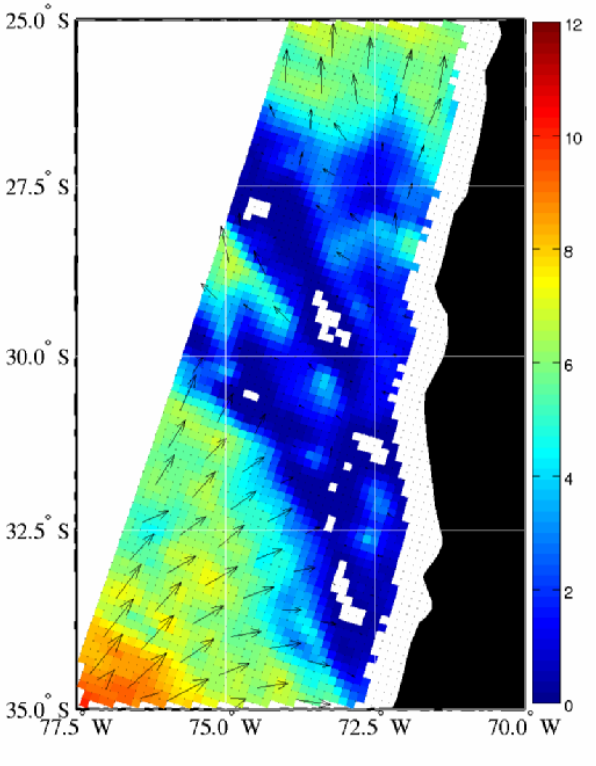

VOCALS – CUpEx
21 Nov – 6 Dec 2009
30°S
72W
71°W
30 km
Islote
Pajaros
La Serena
Punta Lengua
de Vaca
Tongoy
Talcaruca
Coastal Jet
Andes Mts
-44°
Surface current radar
Surface Met (T,RH,Wind,SR,p)
Radiosonde station (2 daily)
Ceilometer
Coastal bouy (T,RH,Wind,SR,p)
Shore SST
Ocean mooring (T every 10 m)
BE90 with AIMMS-20

3.8 m Wind speed and direction at LdV (DGF) Nov-Dec 2009



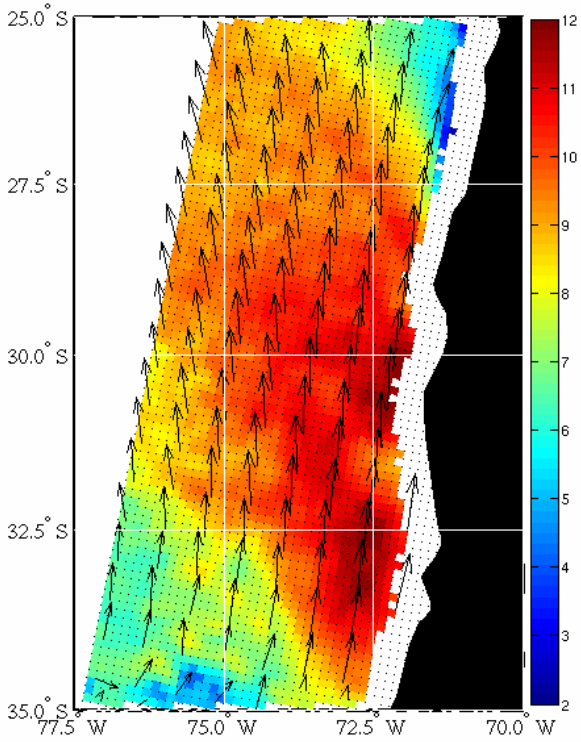
Synoptic variability during CUpEx: ASCAT 10-m winds

12Z 24-Nov



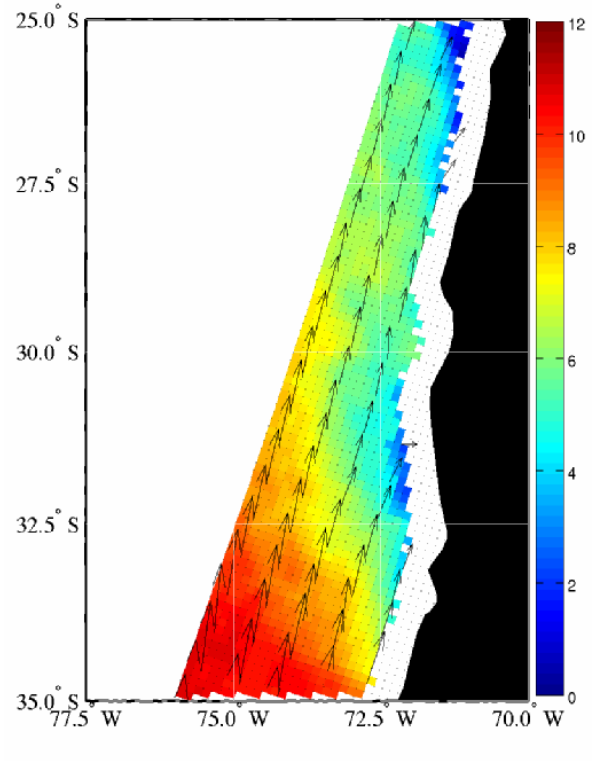
Low Wind

12Z 01-Dec



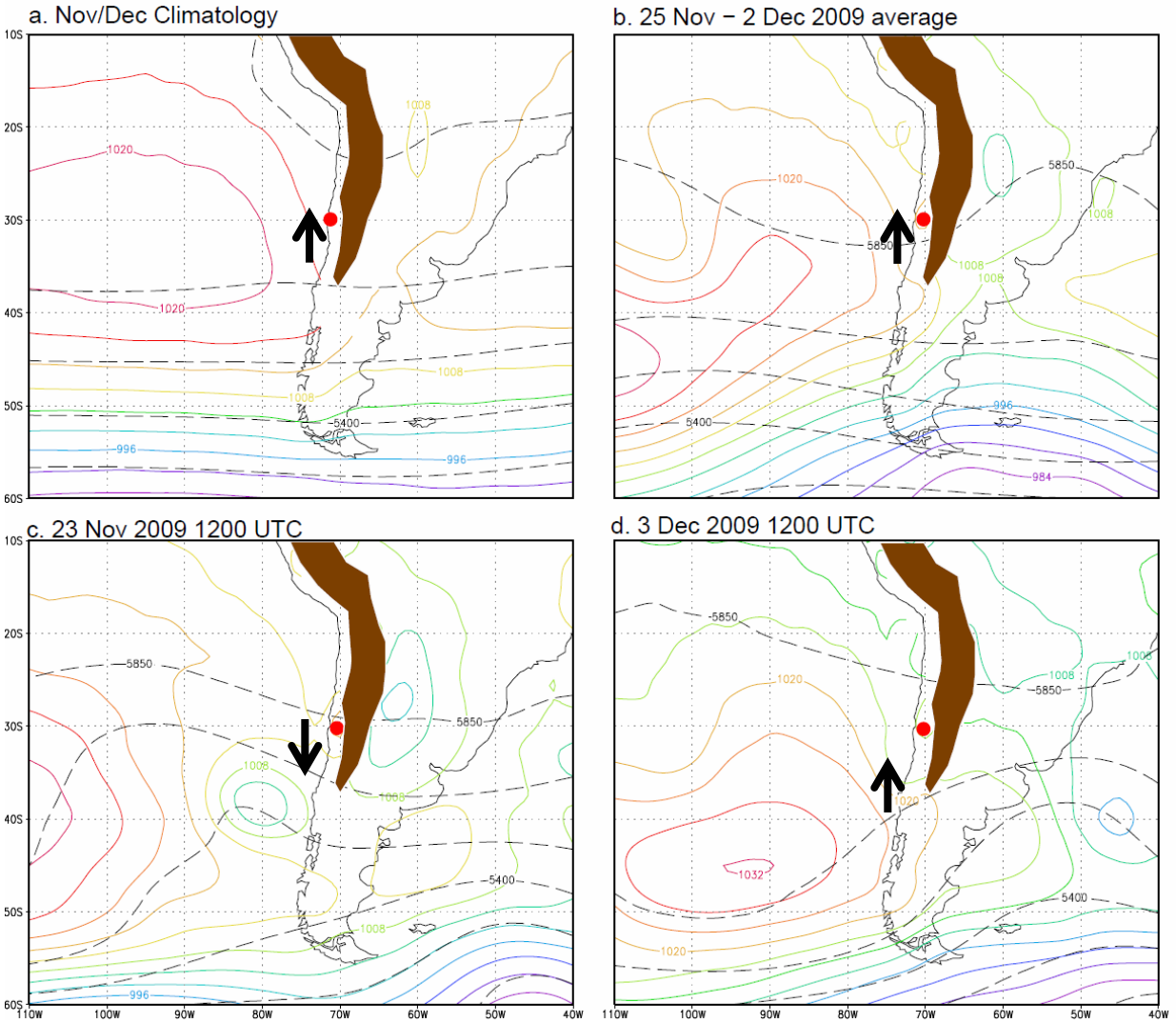
HighWind

12Z 04-Dec



Low Wind

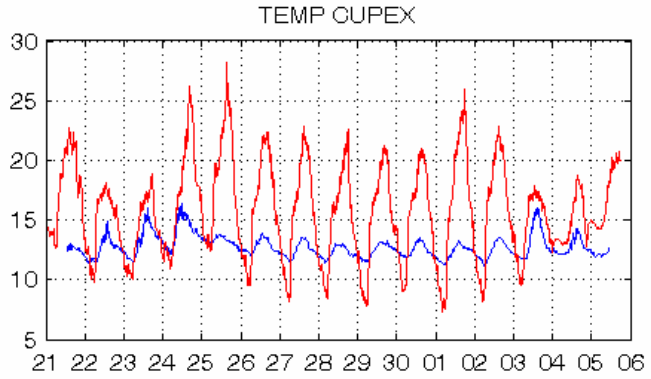
Synoptic variability during CUpEx

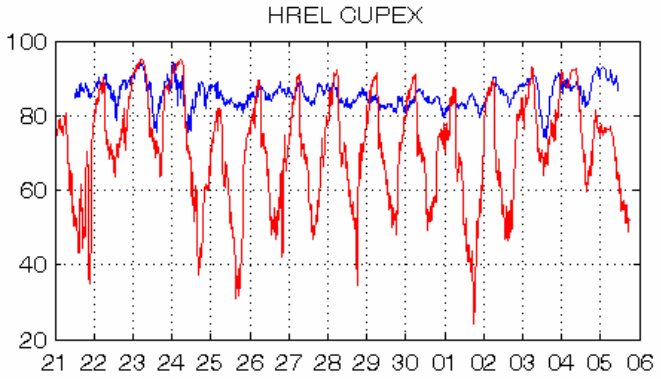


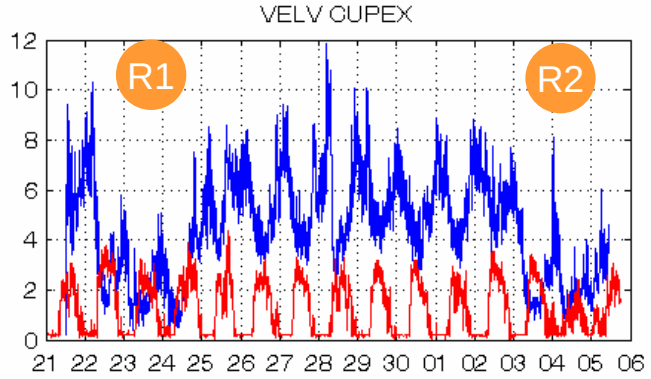
↑ PGF

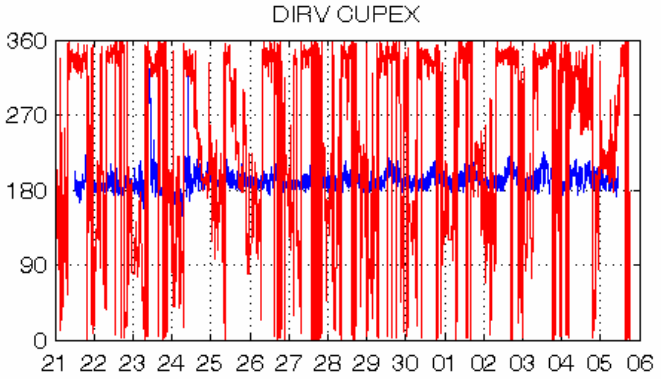
$$-\frac{1}{\rho}\frac{\partial p}{\partial y} = \frac{C_d}{H} v^2 \approx v$$

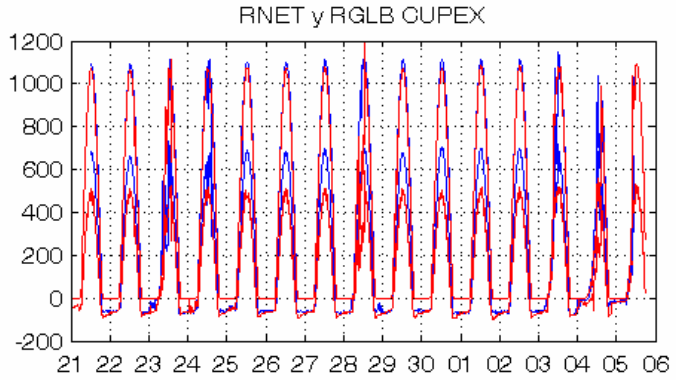
Tongoy & Talcaruca data during CUpEx

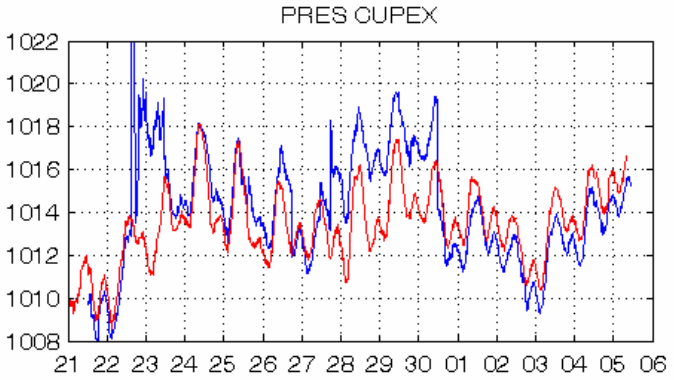






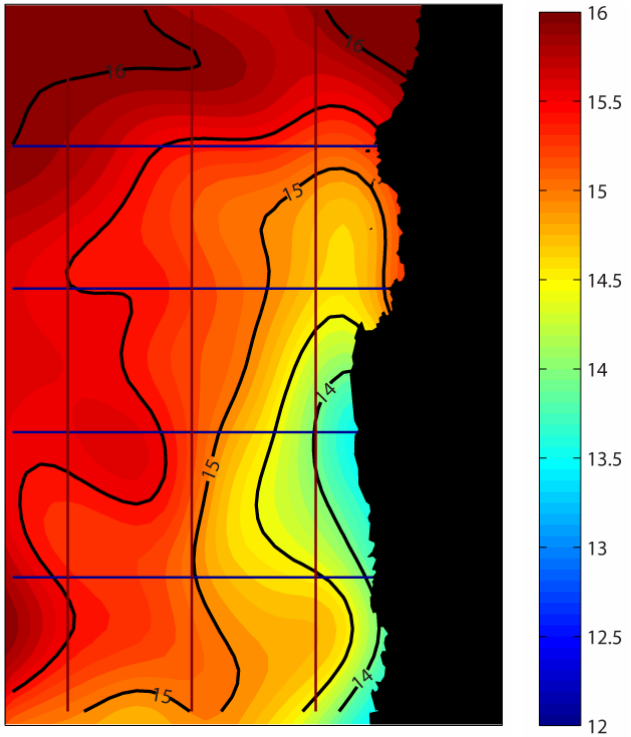




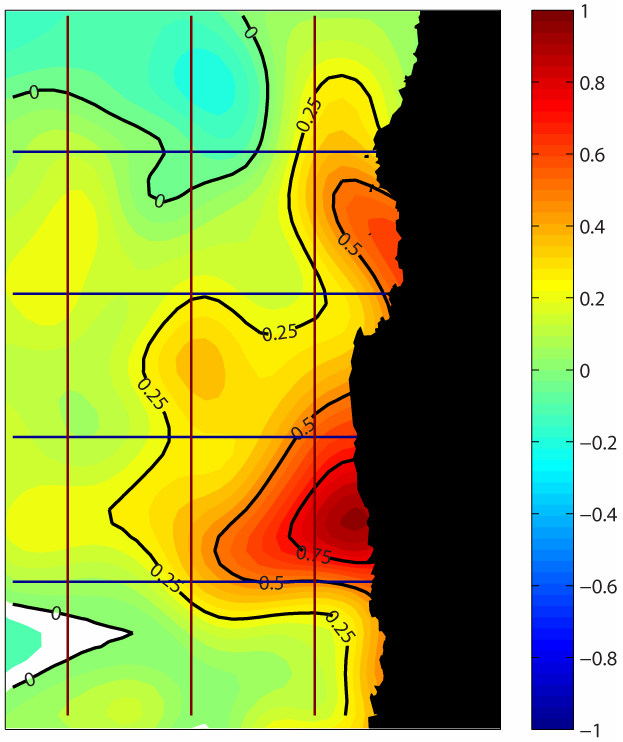


Synoptic variability during CUpEx: SSMI SST

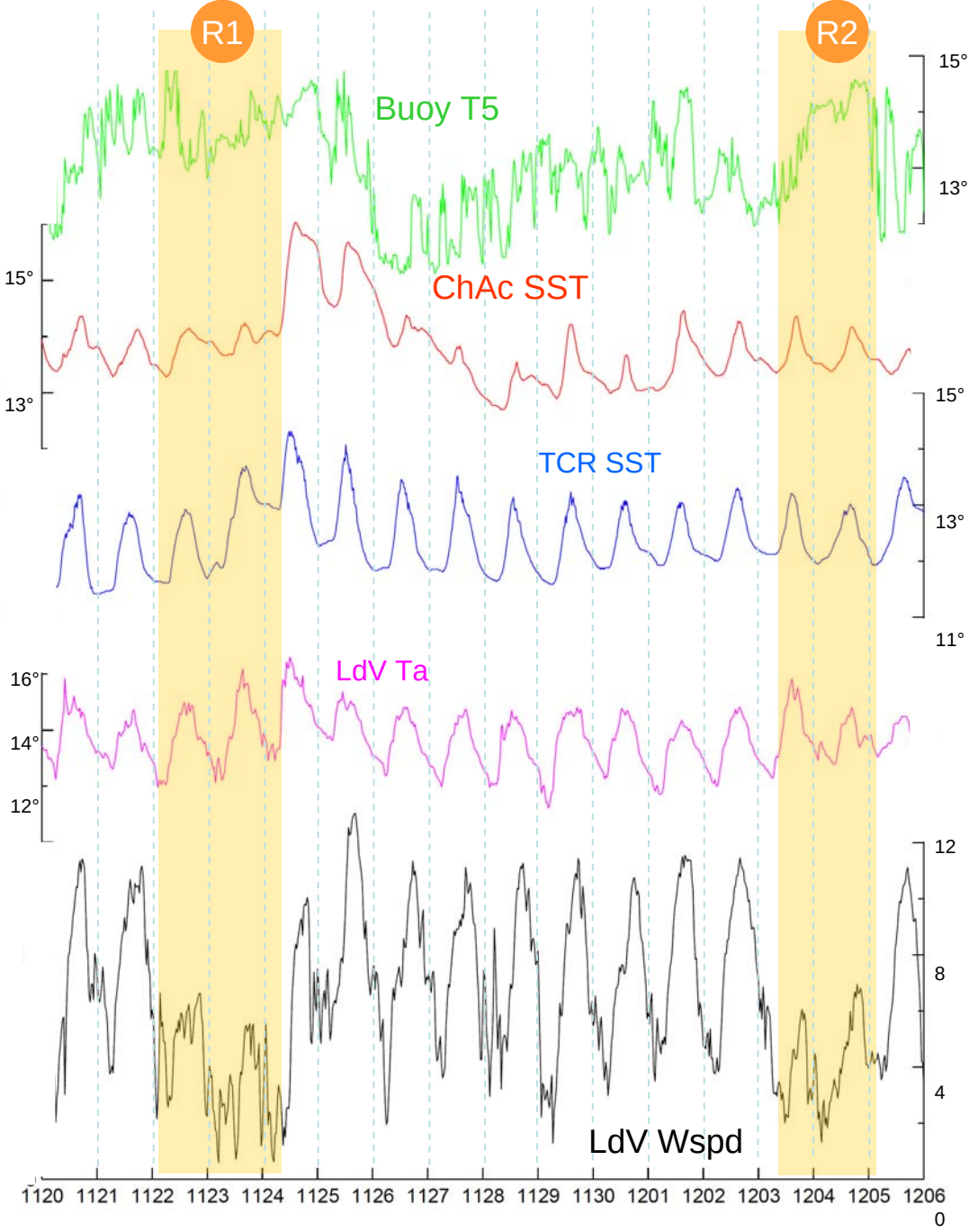
High wind SST field [C]



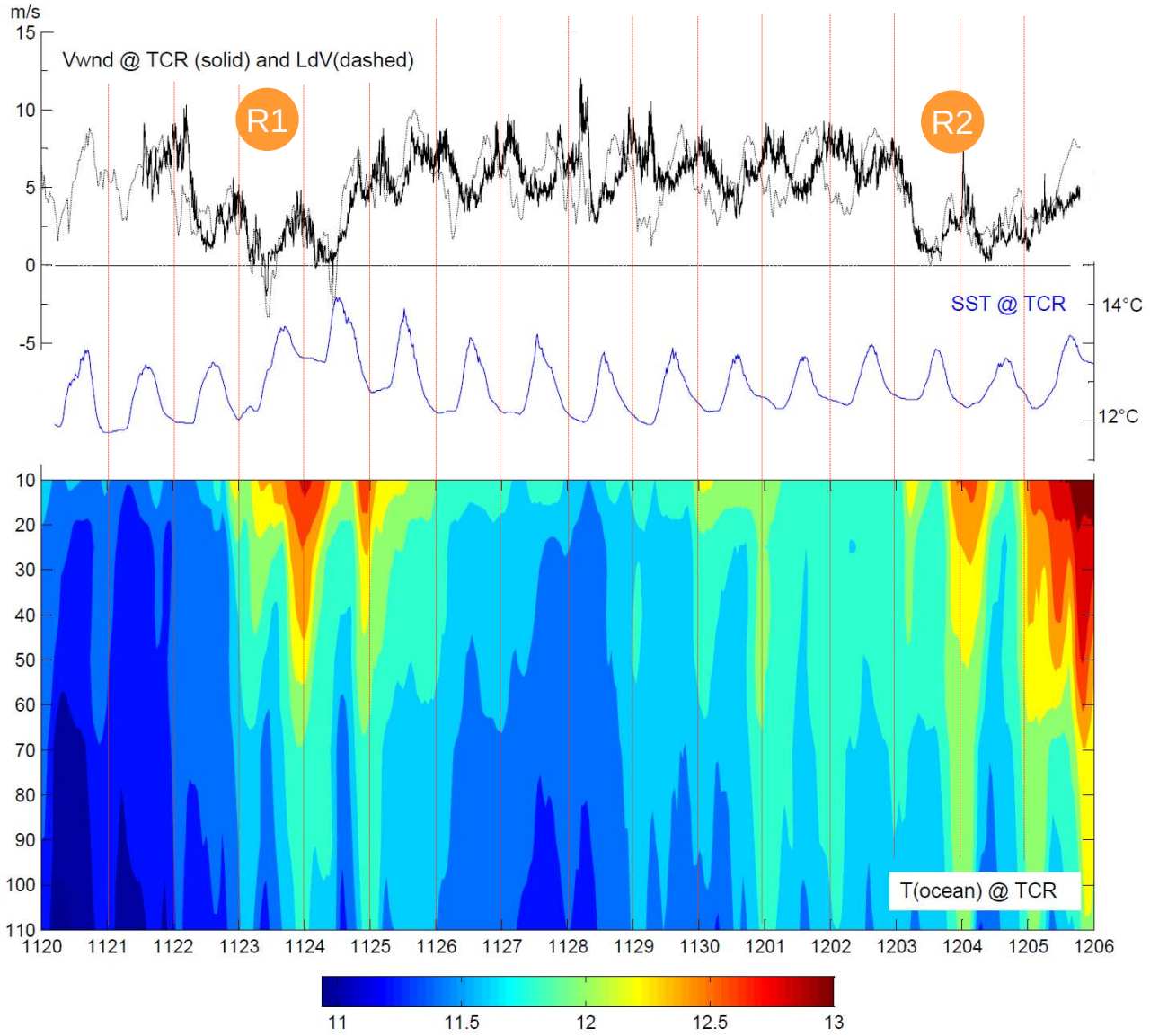
Low - High wind SST field [C]



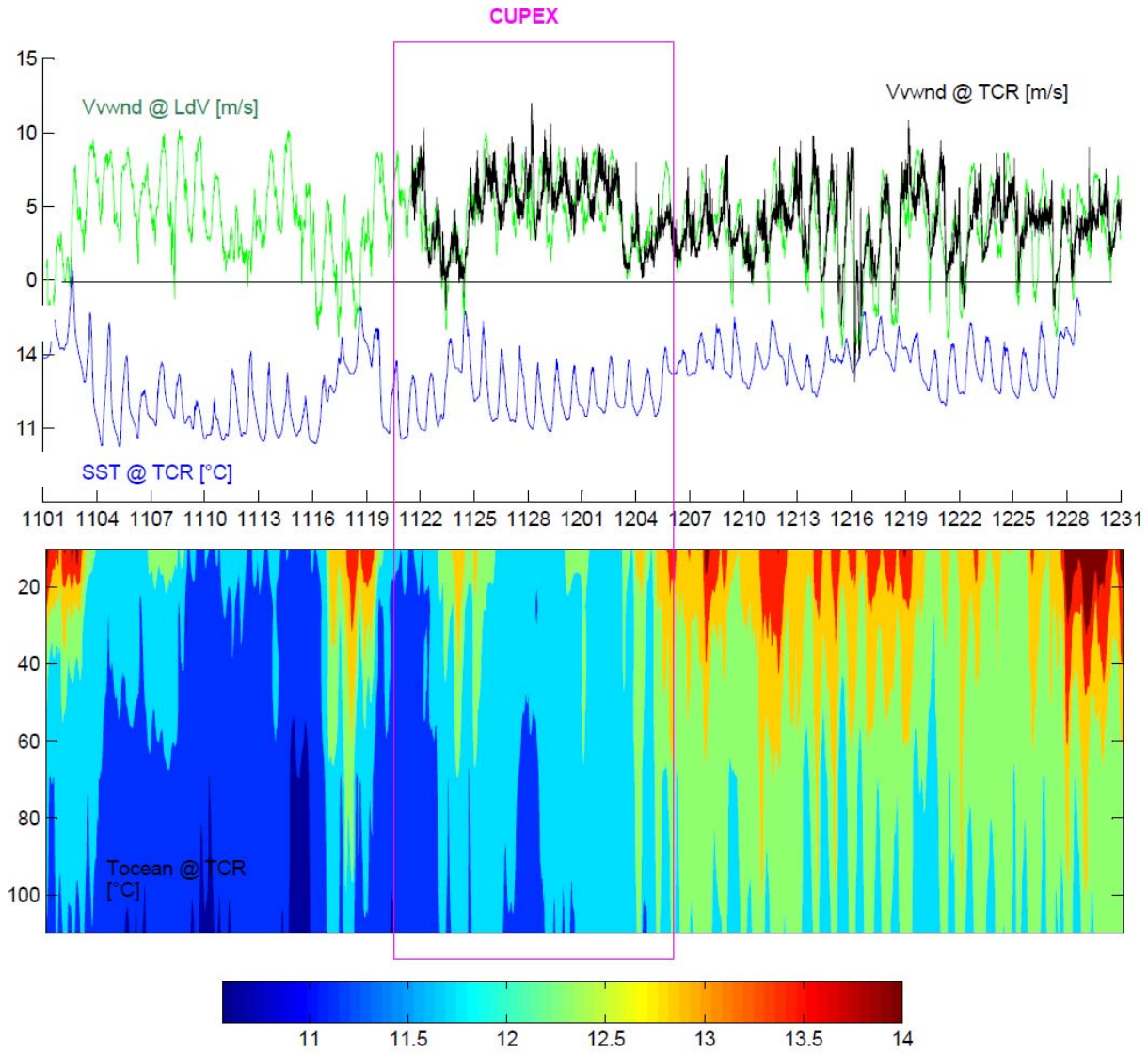
Synoptic variability during CUpEx: Local SST & wind



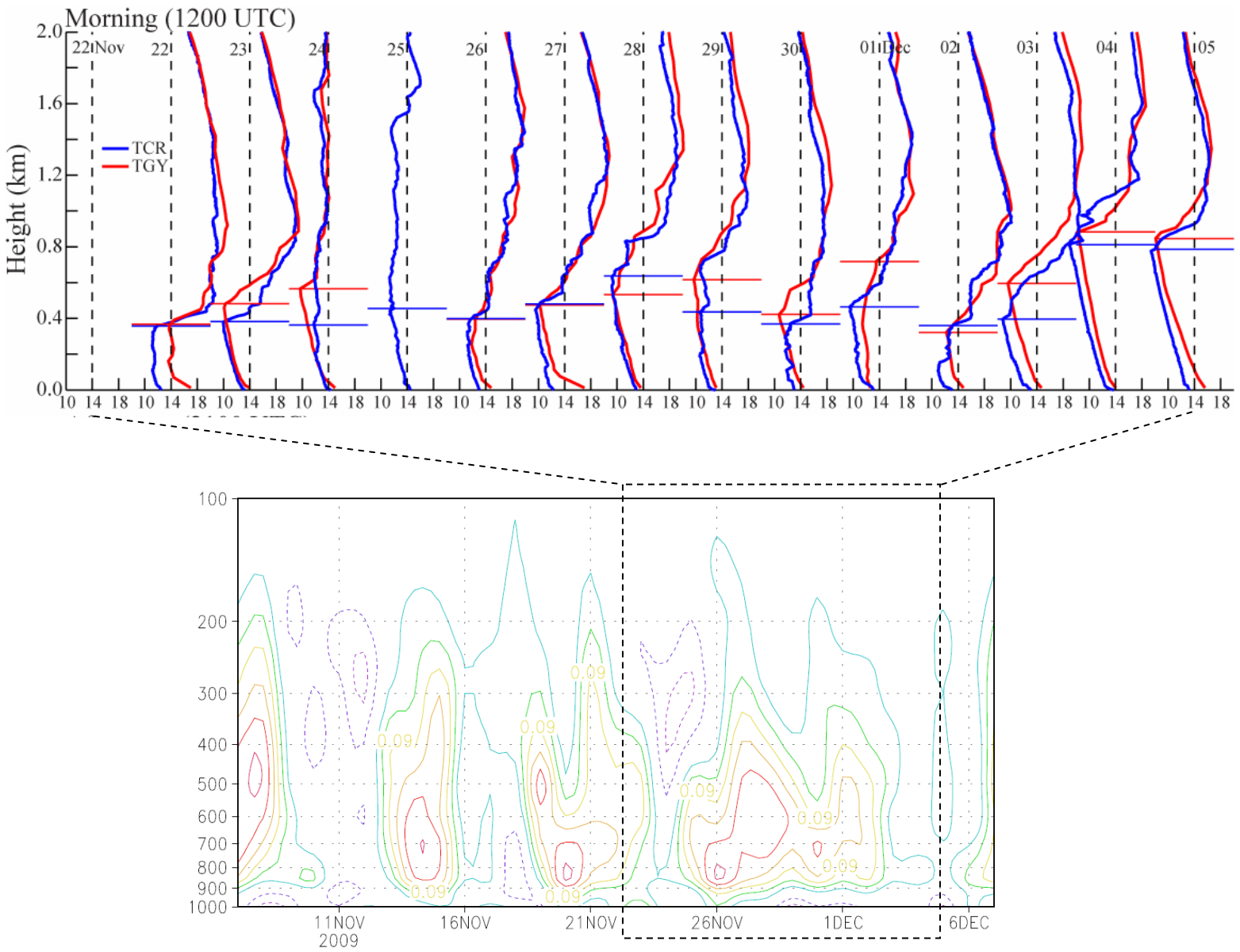
Synoptic variability during CUpEx: Local T(Ocean) & wind



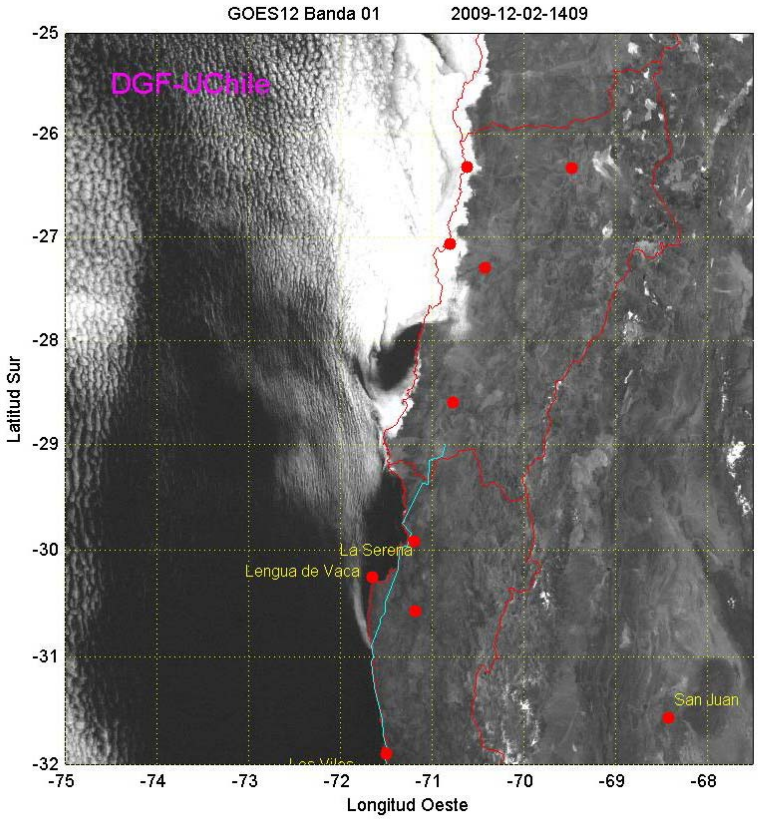
Synoptic variability during CUpEx: Local T(Ocean) & wind: Summer transition?

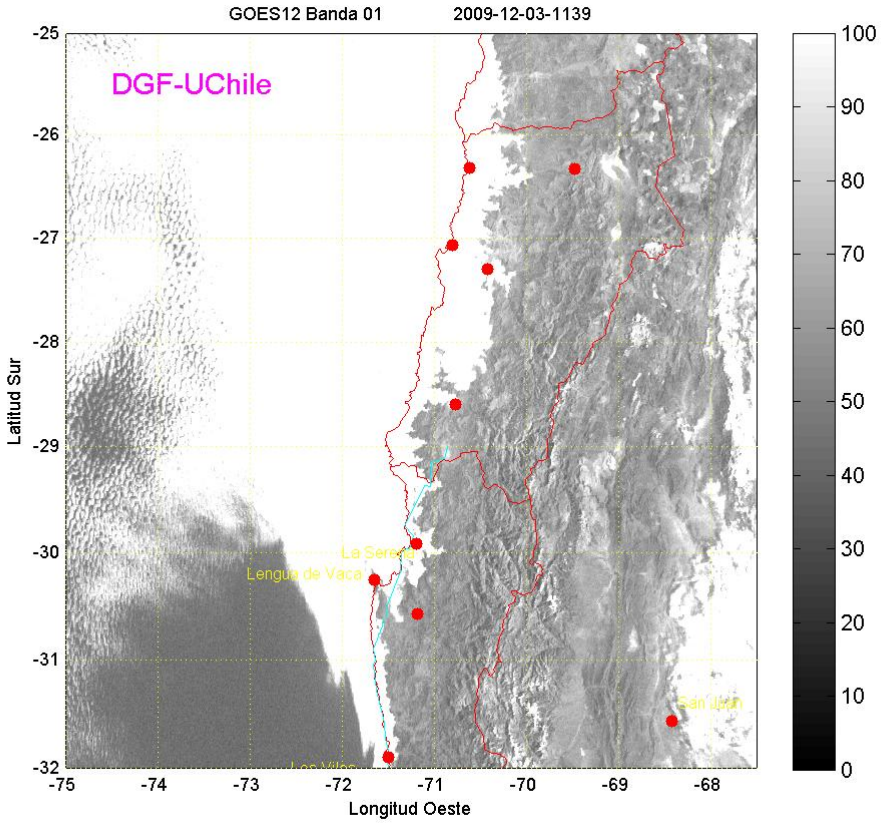


Synoptic variability during CUpEx: MBL & TI

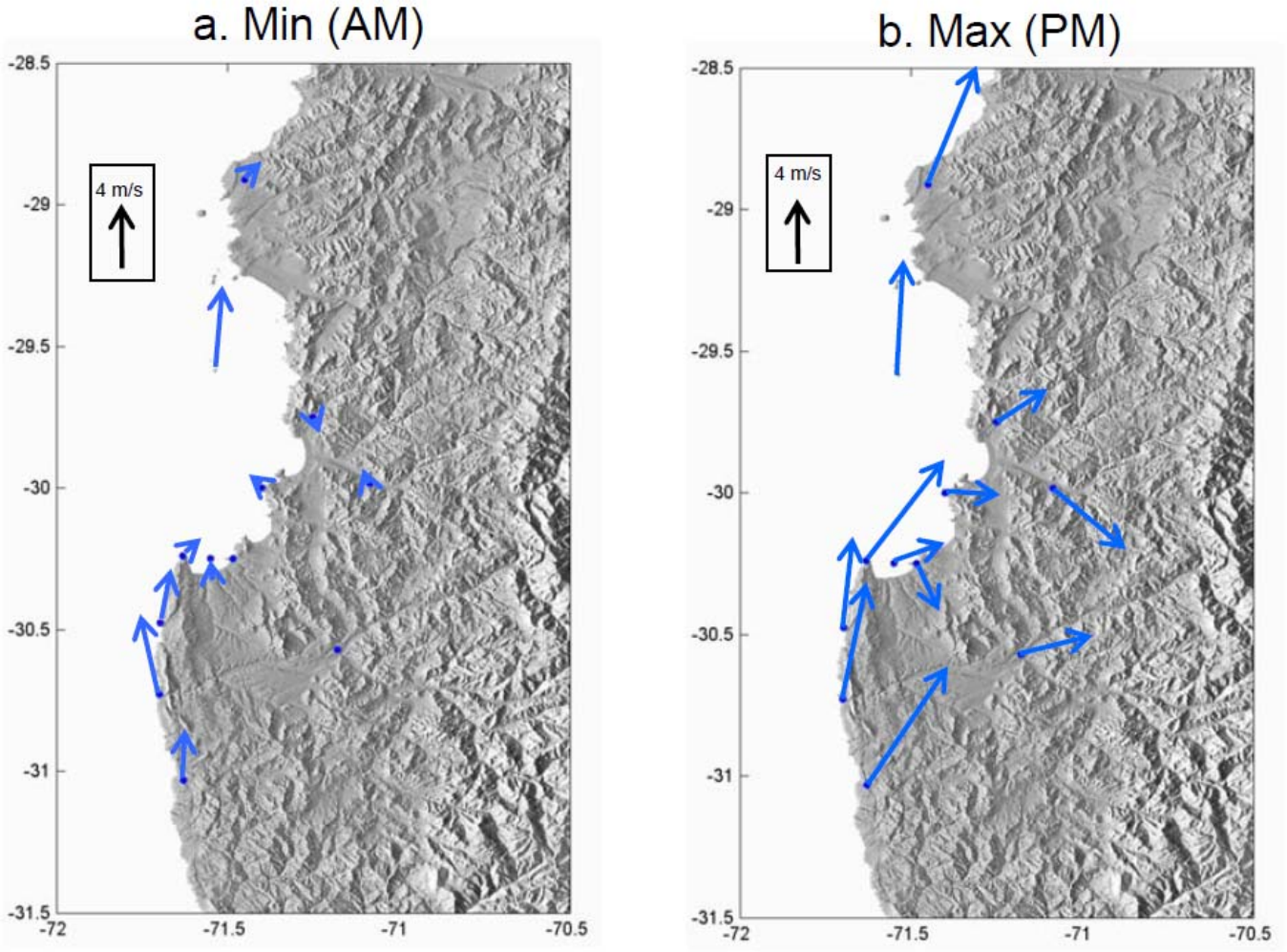


Synoptic variability during CUpEx: Clouds

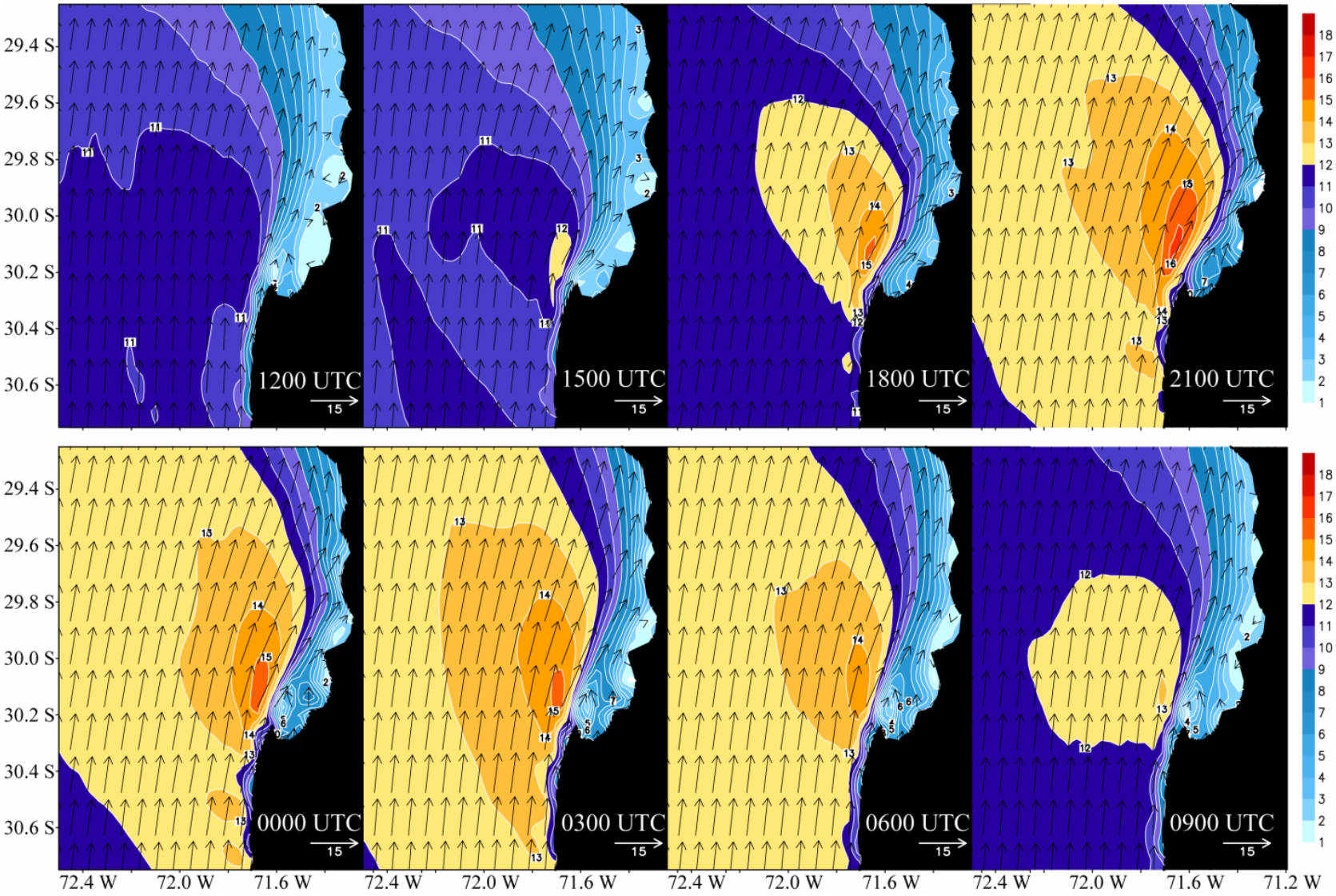




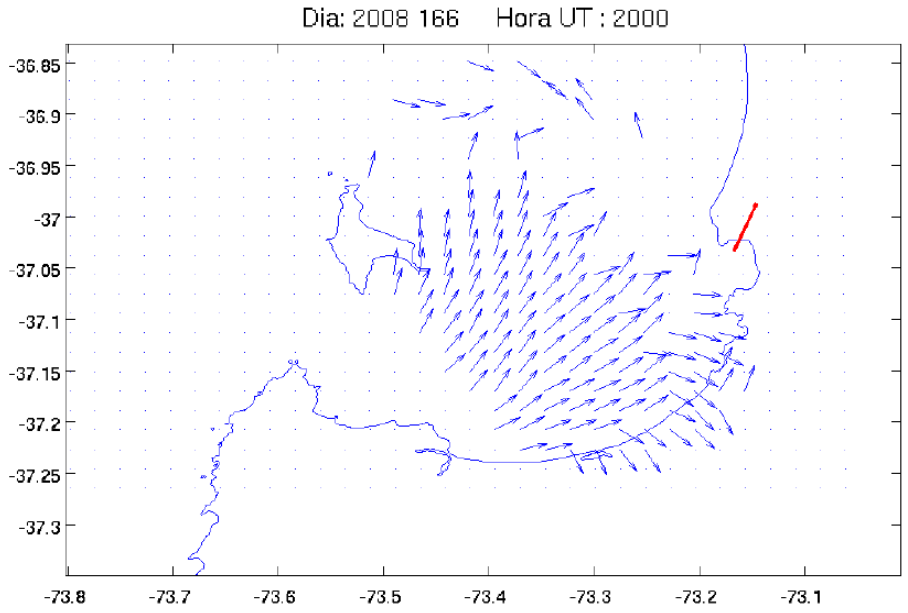
Mean diurnal cycle during CUpEx: Sfc winds

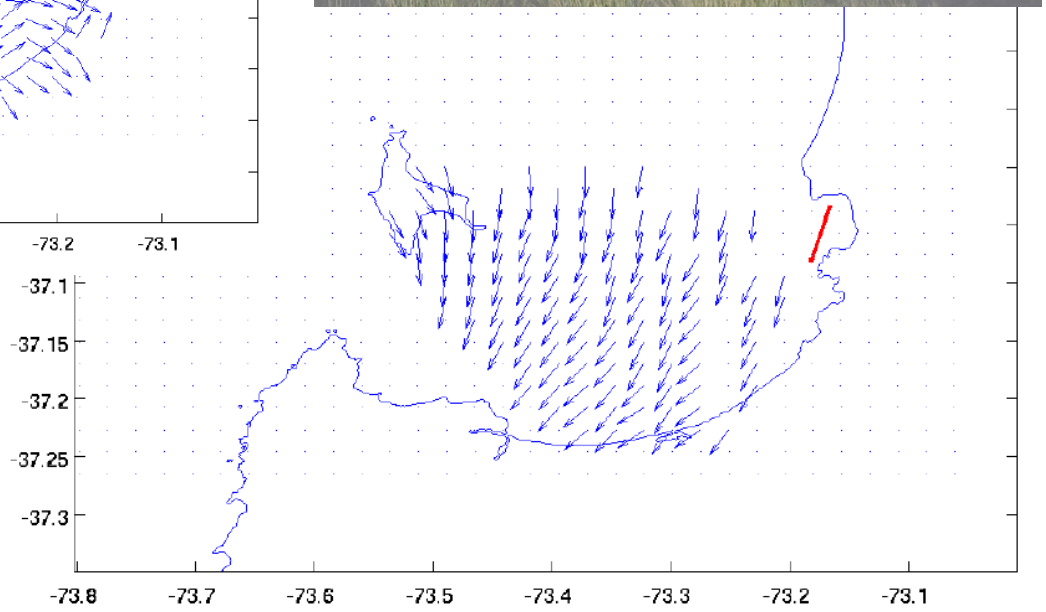


Mean diurnal cycle during CUpEx: Sfc winds (WRF 3km)



Mean diurnal cycle during CUpEx: Sfc winds

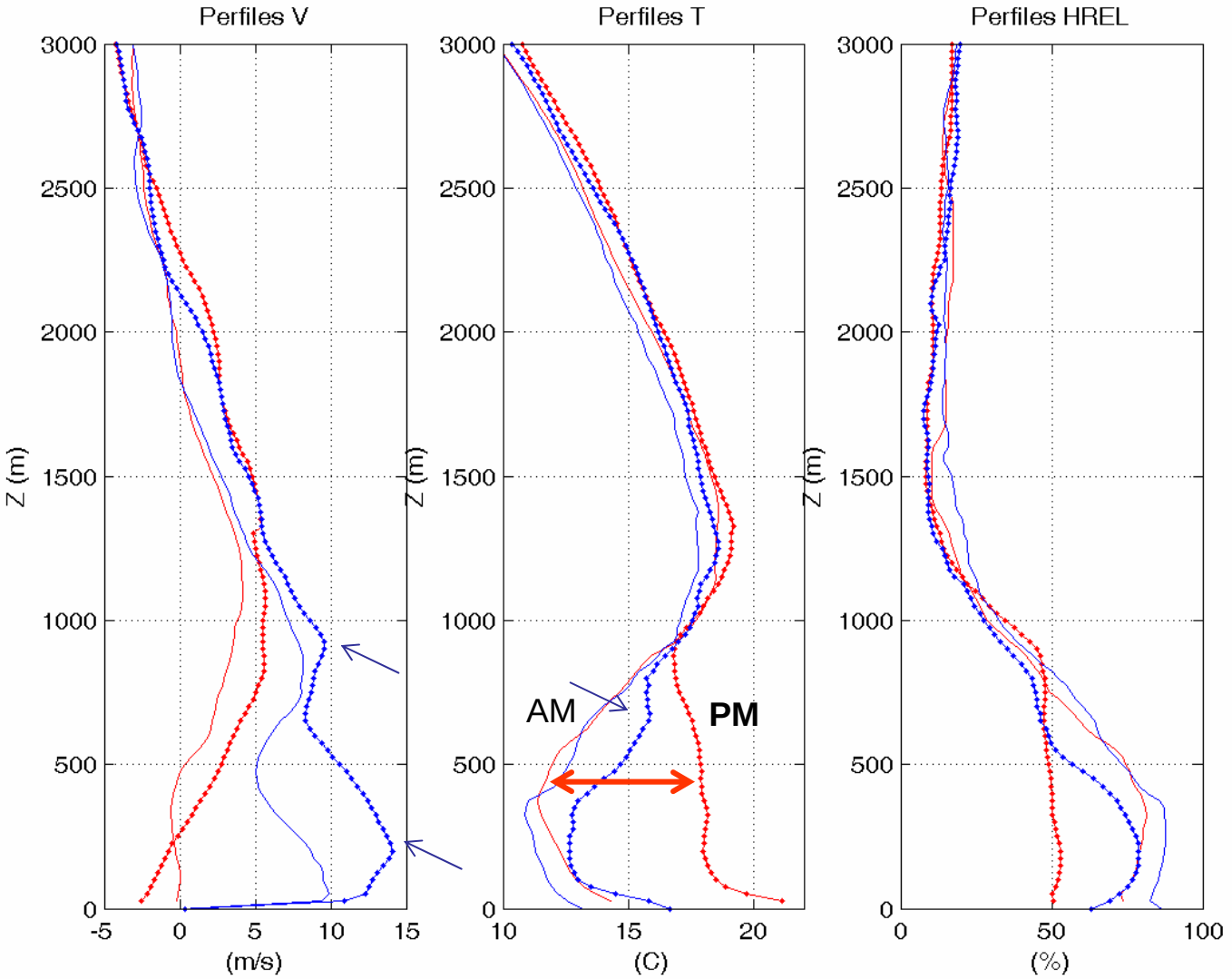




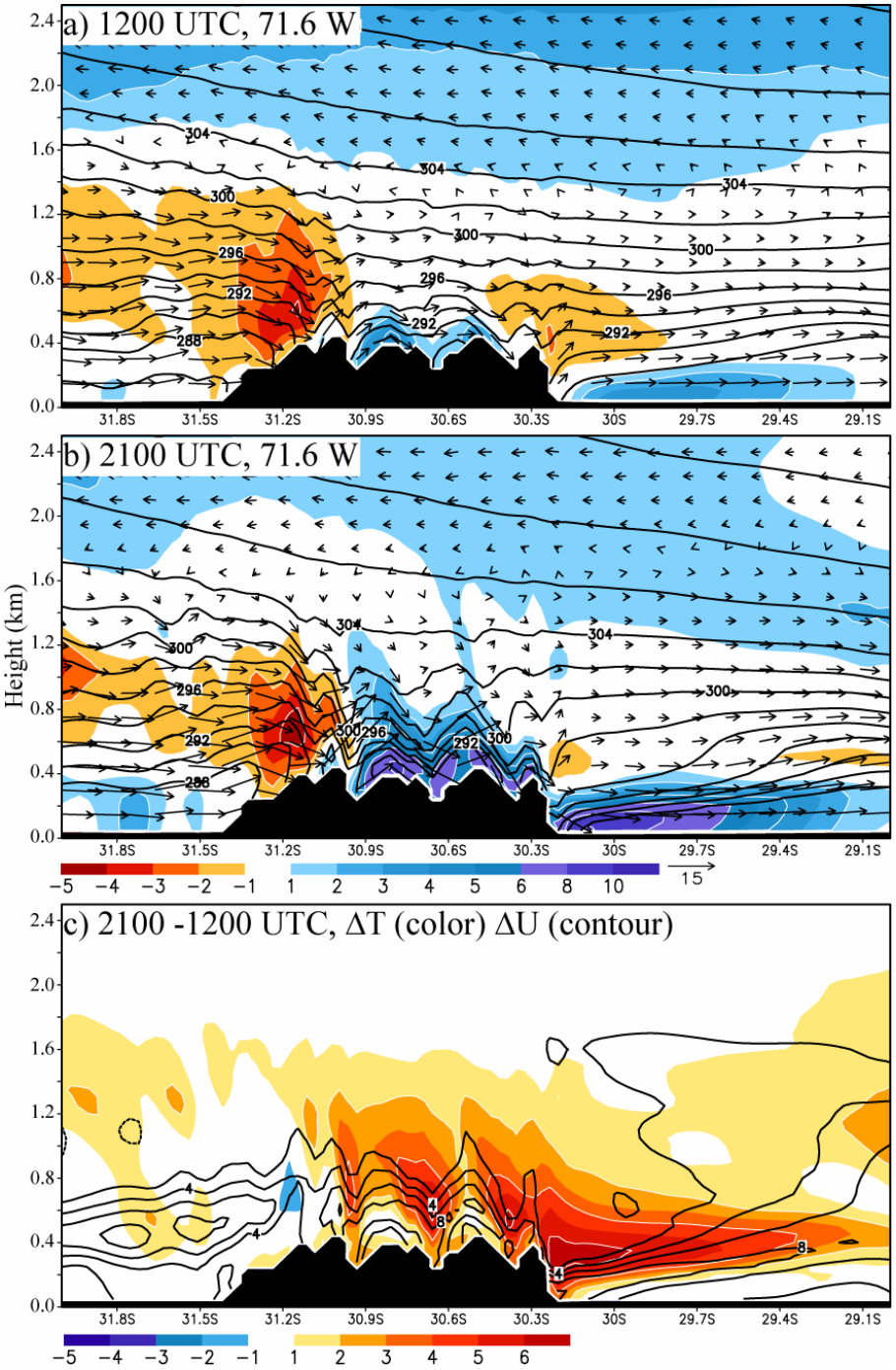
D. Figueroa, DGEO-UdeC

Mean diurnal cycle during CUpEx: Upper-air data

Tongoy (note large PM warming) & Talcaruca (note double jet structure)



Mean diurnal cycle during CUpEx: WRF Upper-air data



Alongshore Structure (71.6W)

v,w (arrows)
Theta (contours)
U-wind (colors)

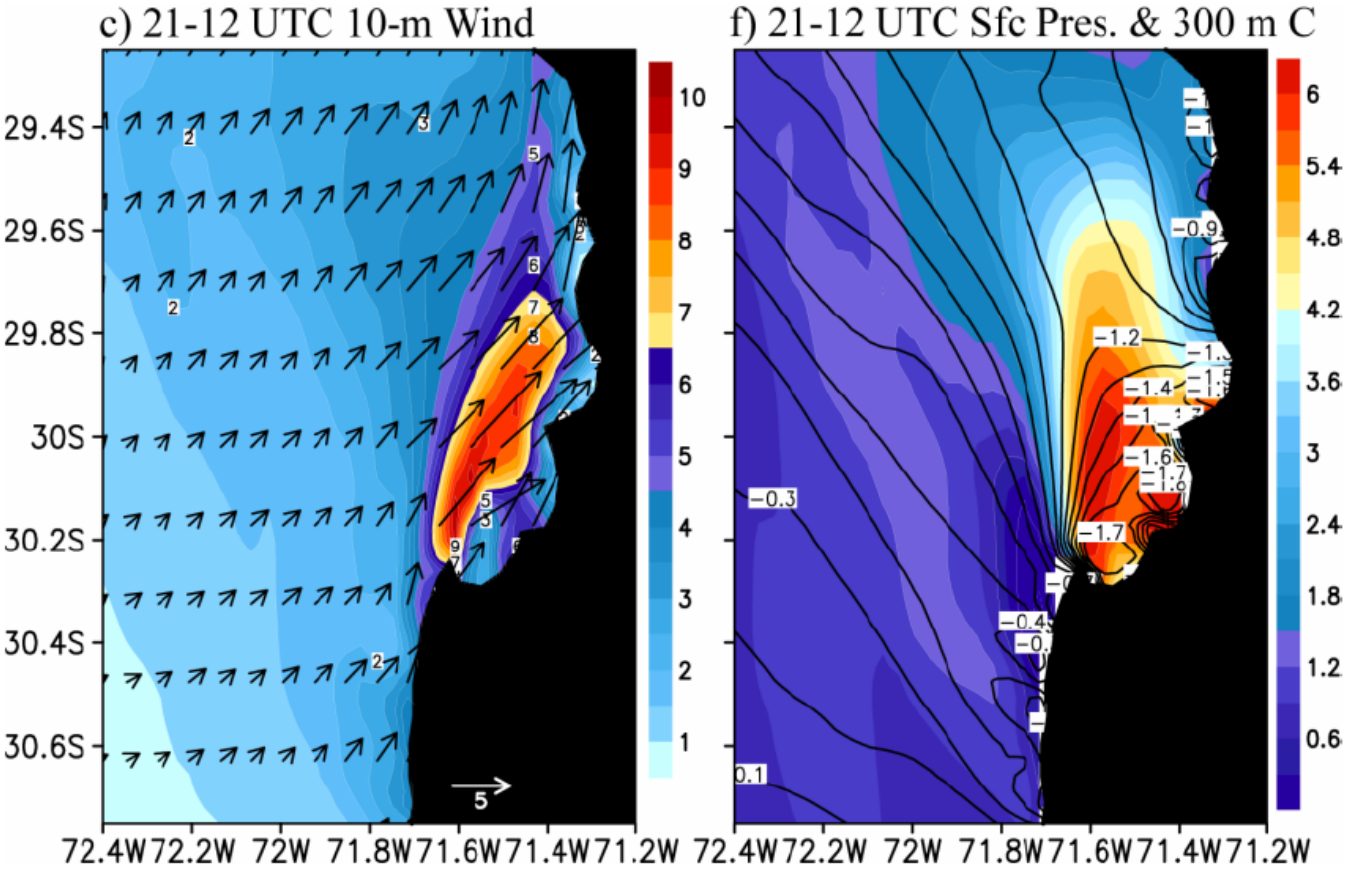
v,w (arrows)
Theta (contours)
U-wind (colors)

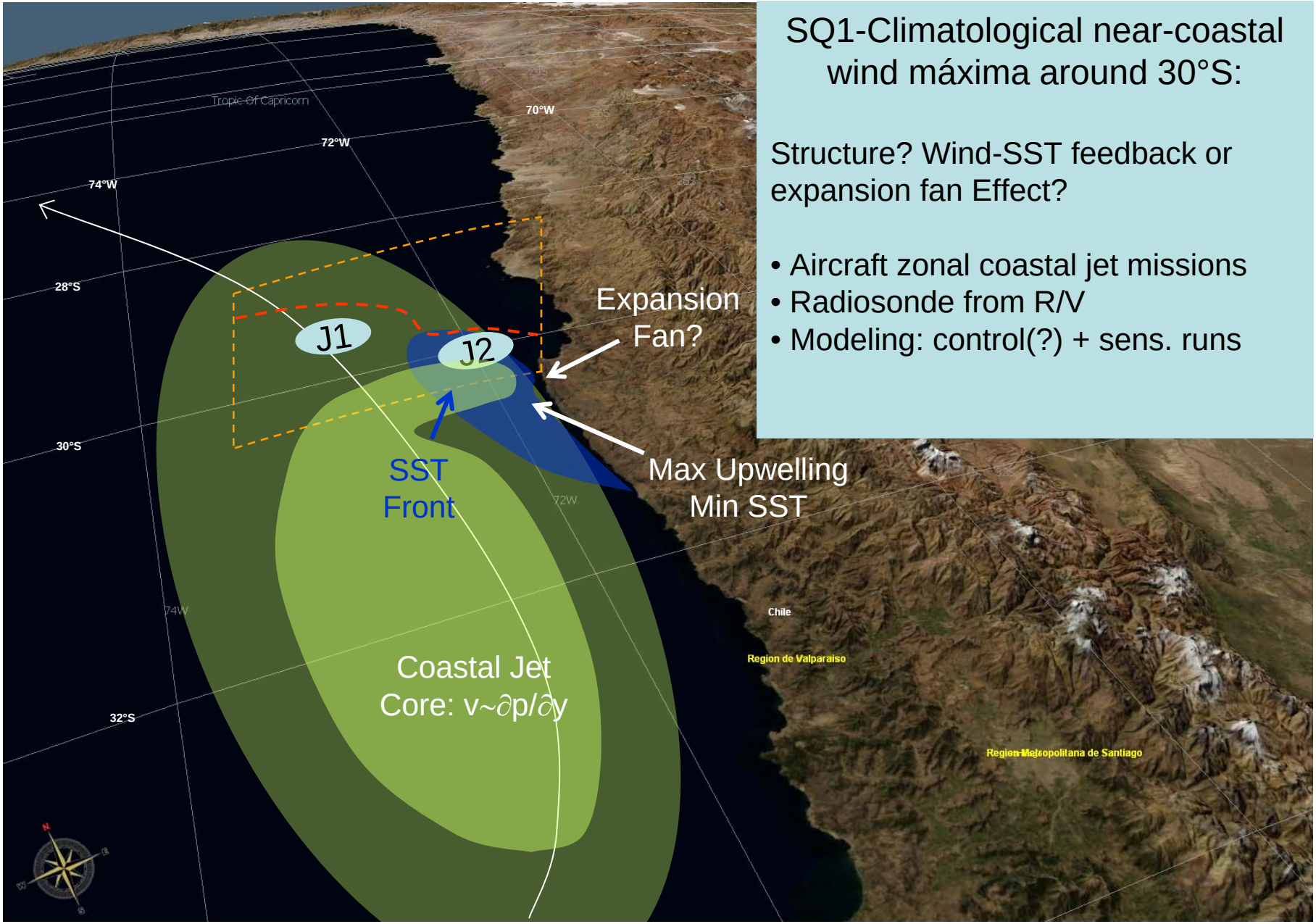
dTheta (colors)
dU-wind (contours)

Mean diurnal cycle during CUpEx: Sfc+Upper-air data

PM-AM Wind difference

PM-AM Sfc Presure & 300 m Temp



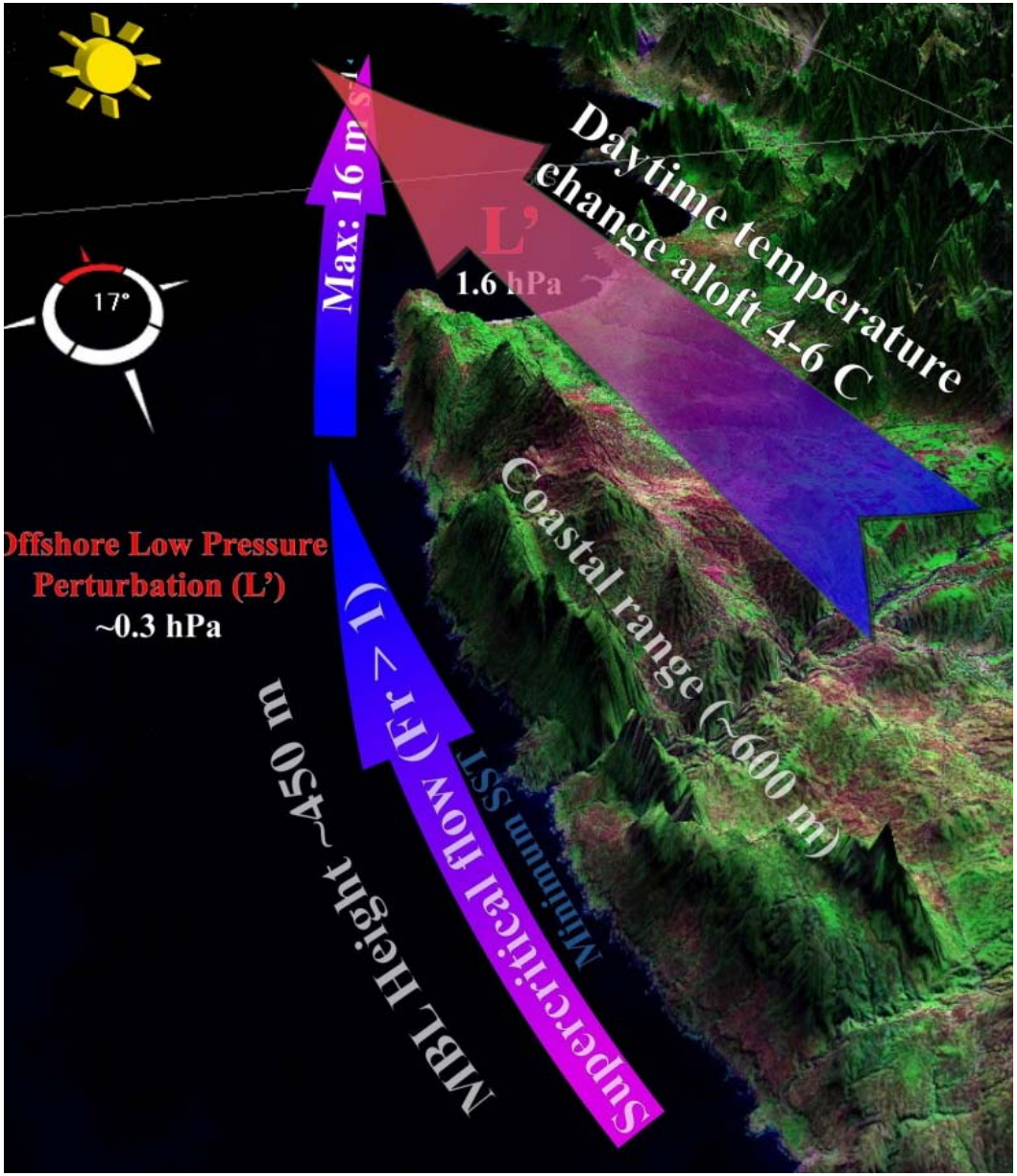


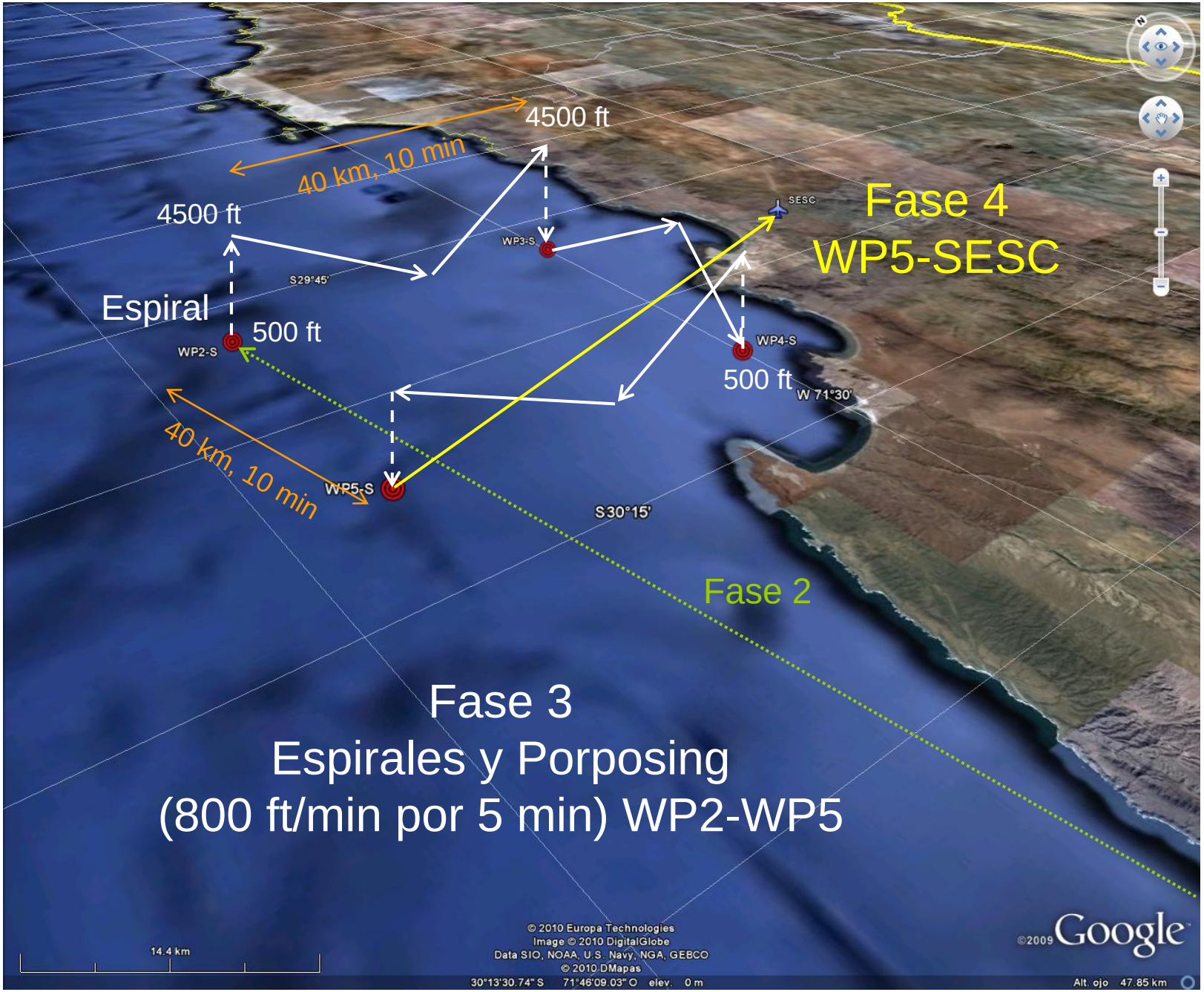
SQ1-Climatological near-coastal wind máxima around 30°S:

Structure? Wind-SST feedback or expansion fan Effect?

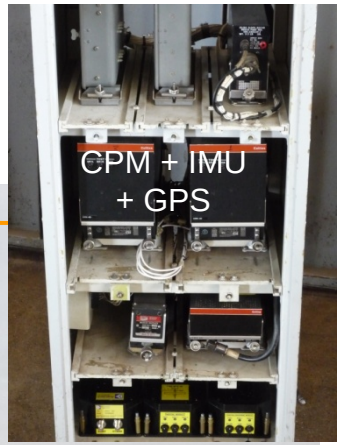
- Aircraft zonal coastal jet missions
- Radiosonde from R/V
- Modeling: control(?) + sens. runs

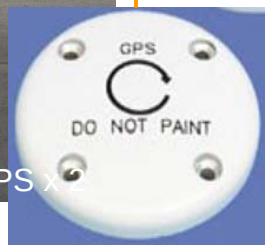
New Conceptual Model for Coastal Jet




4500 ft
40 km, 10 min
4500 ft
WP3-S
SESC
Fase 4
WP5-SESC
S29°45'
Espiral
500 ft
WP2-S
WP4-S
500 ft
W 71°30'
40 km, 10 min
WP5-S
S30°15'
Fase 2
Fase 3
Espirales y Porposing
(800 ft/min por 5 min) WP2-WP5
14.4 km
© 2010 Europa Technologies
Image © 2010 DigitalGlobe
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 DMapas
30°13'30.74" S 71°46'09.03" O elev. 0 m
©2009 Google
Alt. ojo 47.85 km

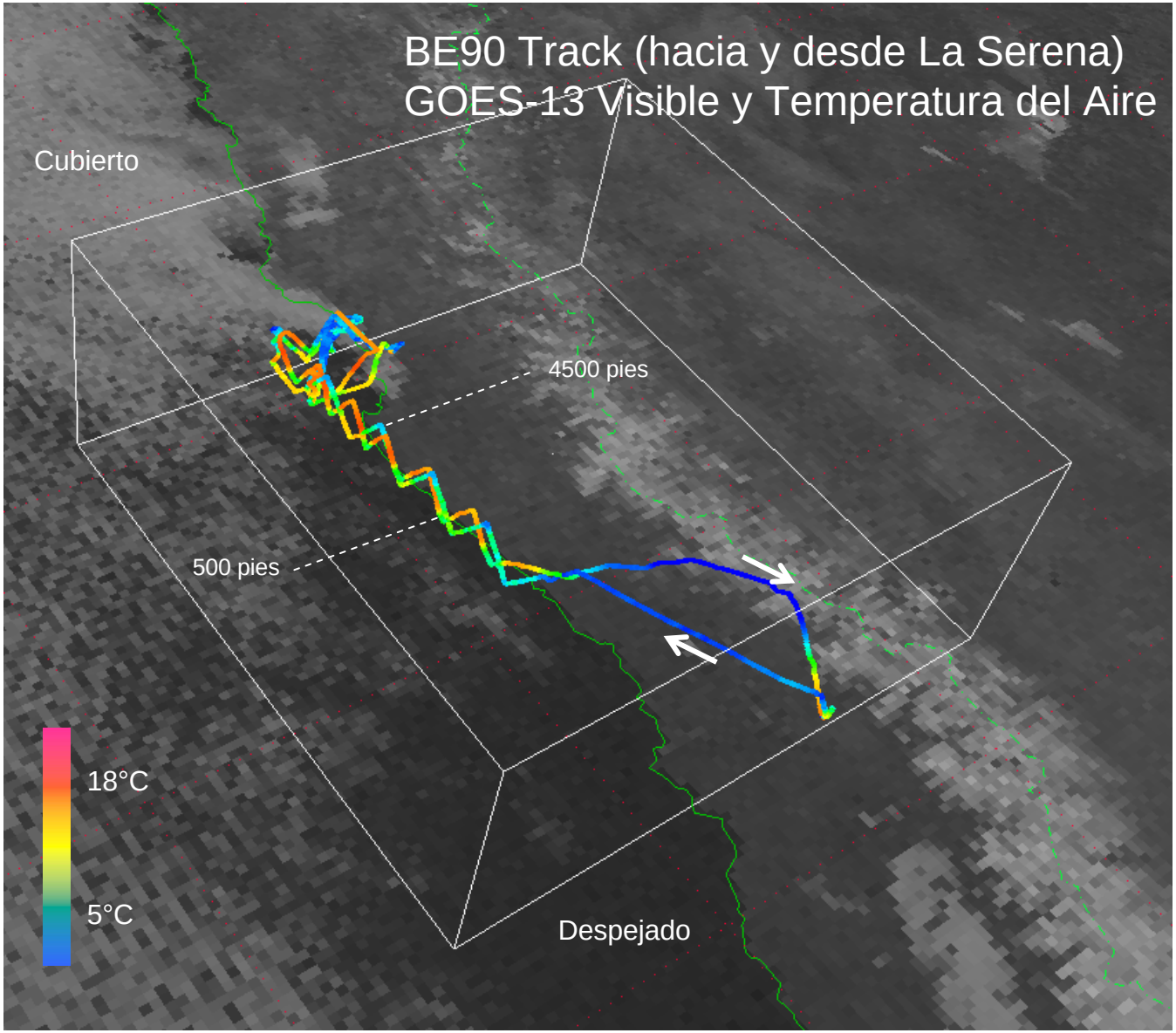
Proyecto AIMMS-20 en BE90



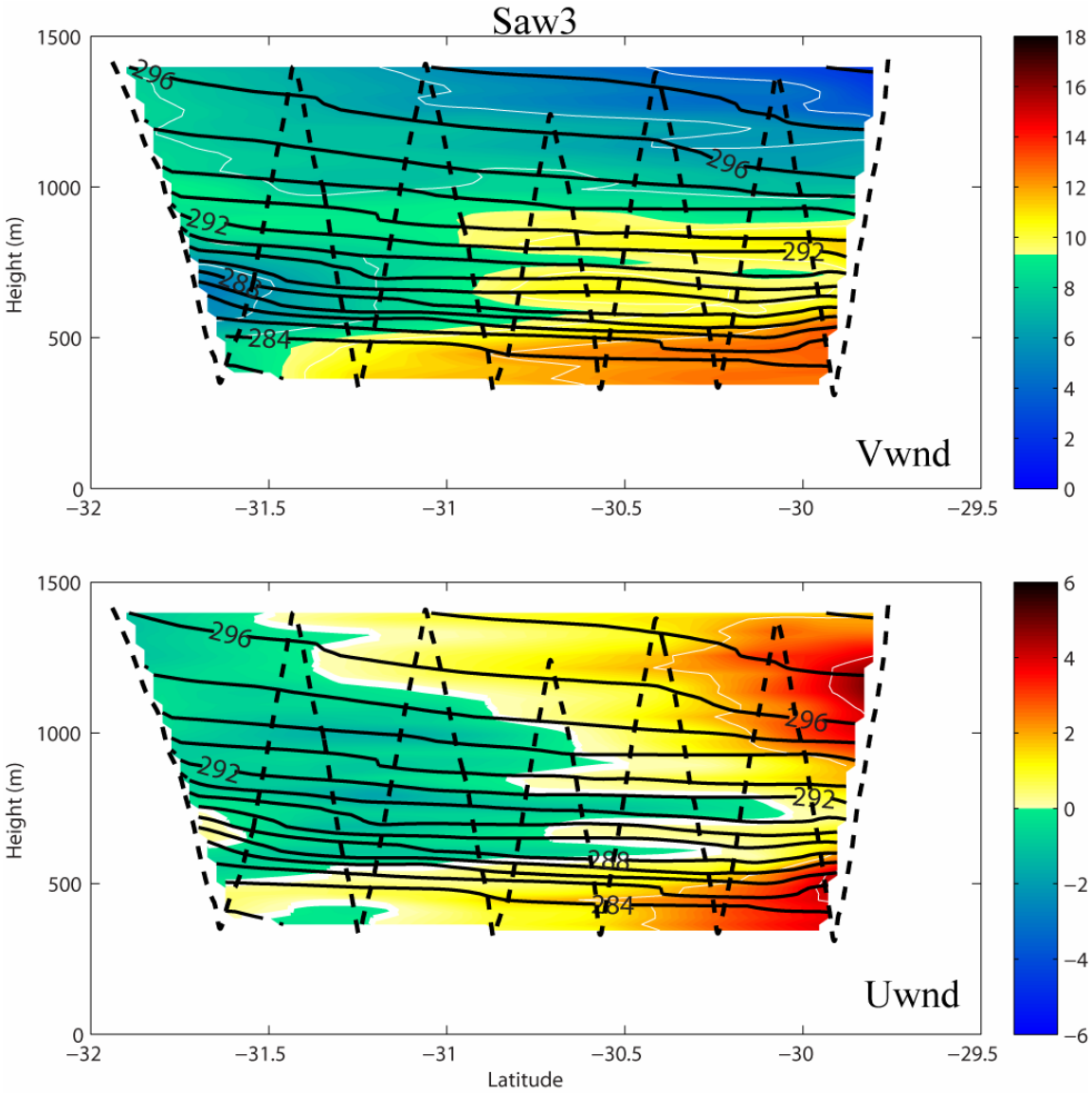


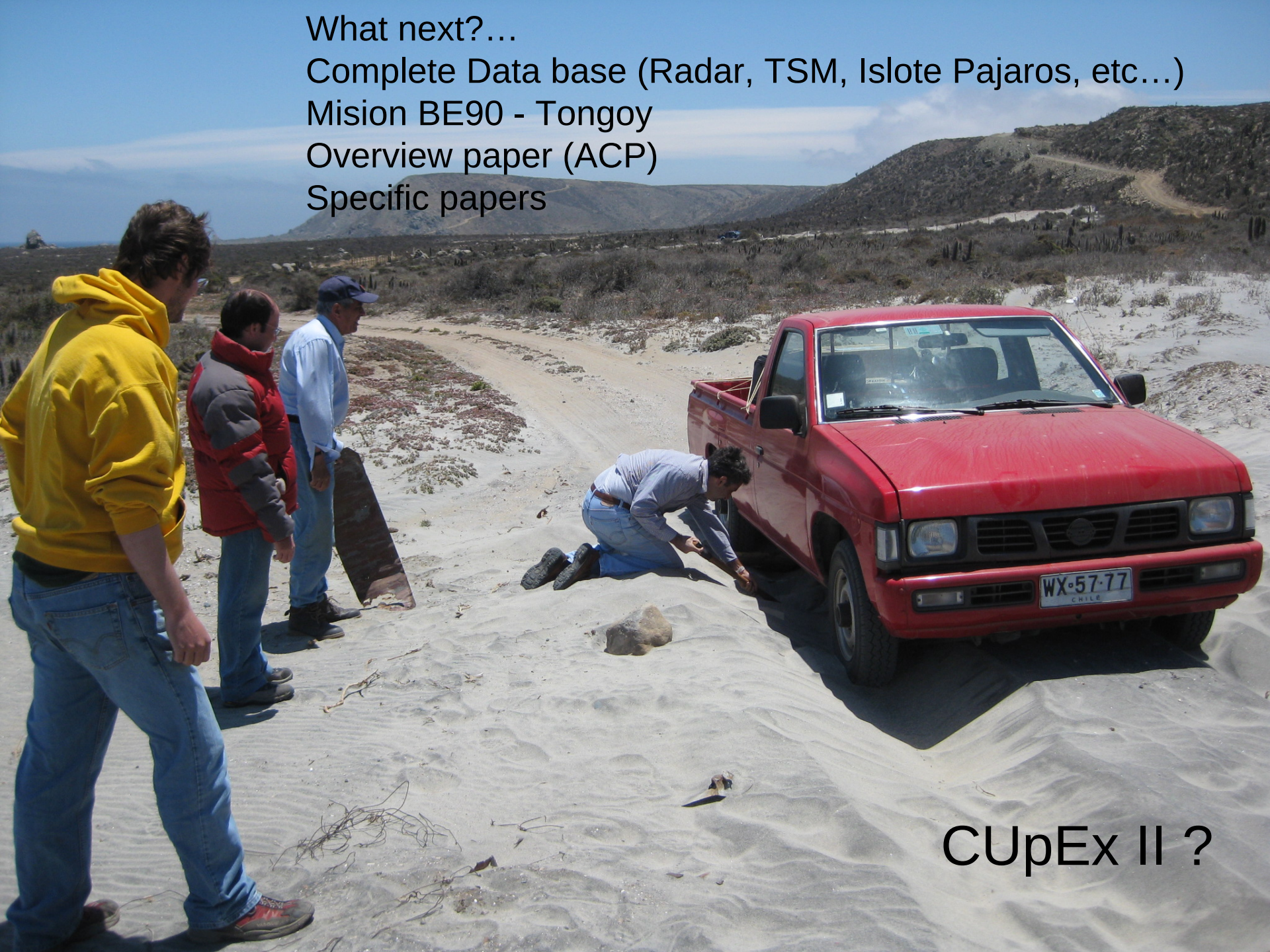
GPS x2

Misión Met-4


BE90 Track (hacia y desde La Serena)
GOES-13 Visible y Temperatura del Aire
Cubierto
4500 pies
500 pies
18°C
5°C
Despejado

Misión Met-4


Saw3
Vwnd
Uwnd
Height (m)
Latitude
1500
1000
500
0
−32
−31.5
−31
−30.5
−30
−29.5
296
292
288
284
18
16
14
12
10
8
6
4
2
0
−2
−4
−6


What next?…
Complete Data base (Radar, TSM, Islote Pajaros, etc…)
Mision BE90 - Tongoy
Overview paper (ACP)
Specific papers
WX·57·77
CHILE
CUpEx II ?