



UNALM

FOG IN THE CITY OF AREQUIPA – PERU Case: February 10, 2015

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INTRODUCTION

- Reducing the horizontal visibility at the occurrence of fog affects many activities , being the most outstanding in transport.
- The Arequipa airport is sensitive to fog events during the rainy season (jan – mar), and sometimes during unexpected times of the diurnal cycle.
- **Objective:** identify the synoptic conditions that lead to the occurrence of fog on February 10, 2015 in the city of Arequipa

Geographic Location

Lat: 16.32° S
Lon: 71.55° W
Alt: 2325 msnm





Pallca

Chachani

Pampa de Arrieros

Misti

Yura Viejo
Yura

Aeropuerto

Yanahuara

Arequipa

Paucarpata

Uchumayo

Sabandía

Socabaya

Characato

Mollebaya

Yumbura

Background

TEMAS DEL DÍA

Todo Sur

Martes, 10 de febrero de 2015 | 10:00 am

Otra vez vuelos afectados por neblina

Me gusta Compartir 0 Twittear 0 g+1 0



09 de Febrero del 2015

Neblina causa perjuicios en aeropuerto y carreteras



TVT Arequipa compartió la publicación de Municipalidad Distrital de Yura.

10 de febrero ·

ALERTAN SOBRE DENSA NEBLINA EN VÍA DE SALIDA HACIA PUNO.
Fuente: Municipalidad de Yura.



CLIMATOLOGY

- Highest cases : January , February and March
- Local term : “Camanchaca”

Materials and tools

- GFS data 09 , 10 and February 11, 2015
- CPTeC Satellite images
- Wingrids
- Metar data

Analyzed variables

- Humidity: Mixing ratio , precipitable water and relative humidity
- Temperature : Temperature Potential
- Wind: Flow in low and high levels , means
- Convergence and Divergence
- Stability : GDI

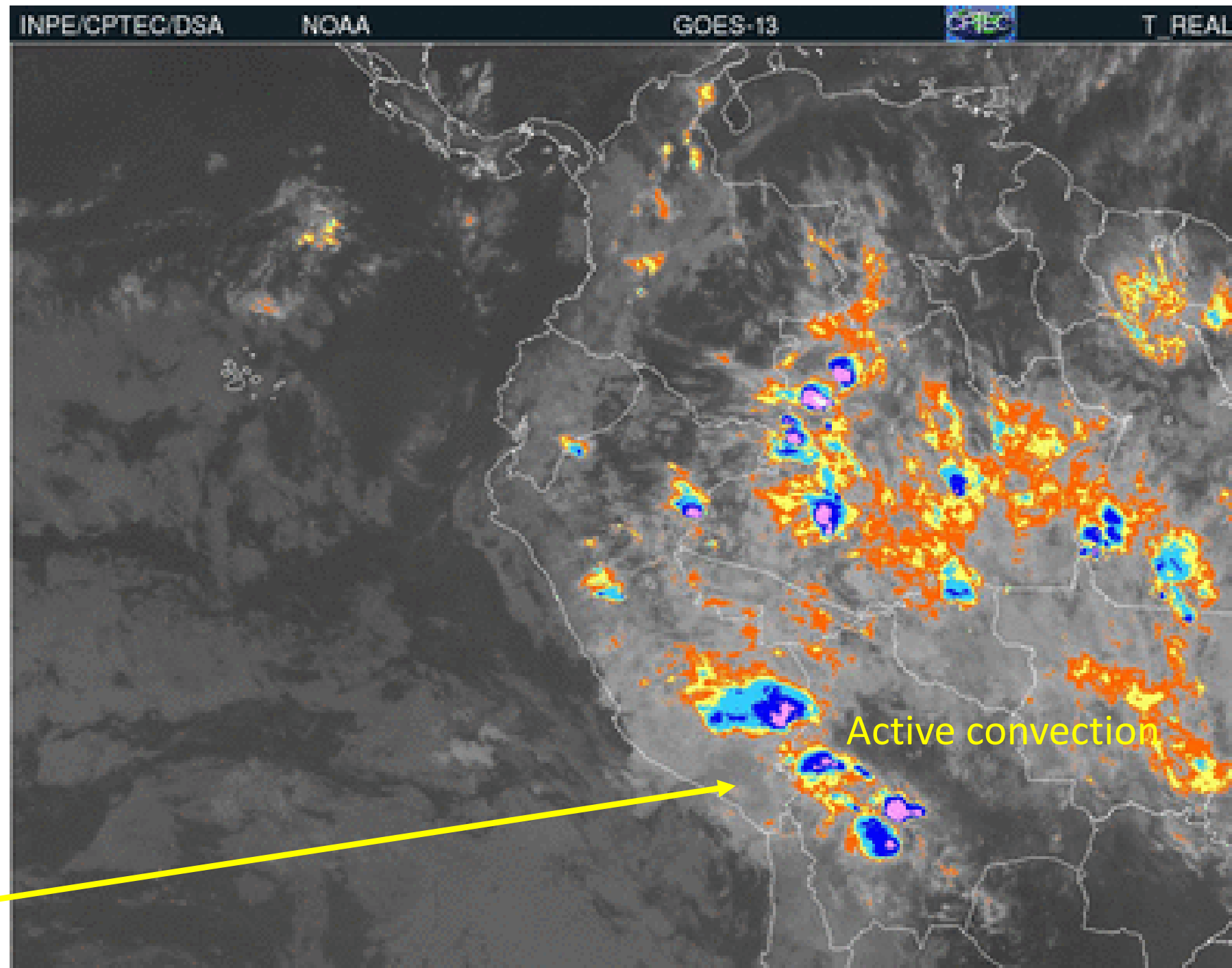
Limitations

- Model resolution
- Orography

RESULTS

IR4 09 and February 10,
2015

Abundant cloudiness



Active convection

Metar – February 2015

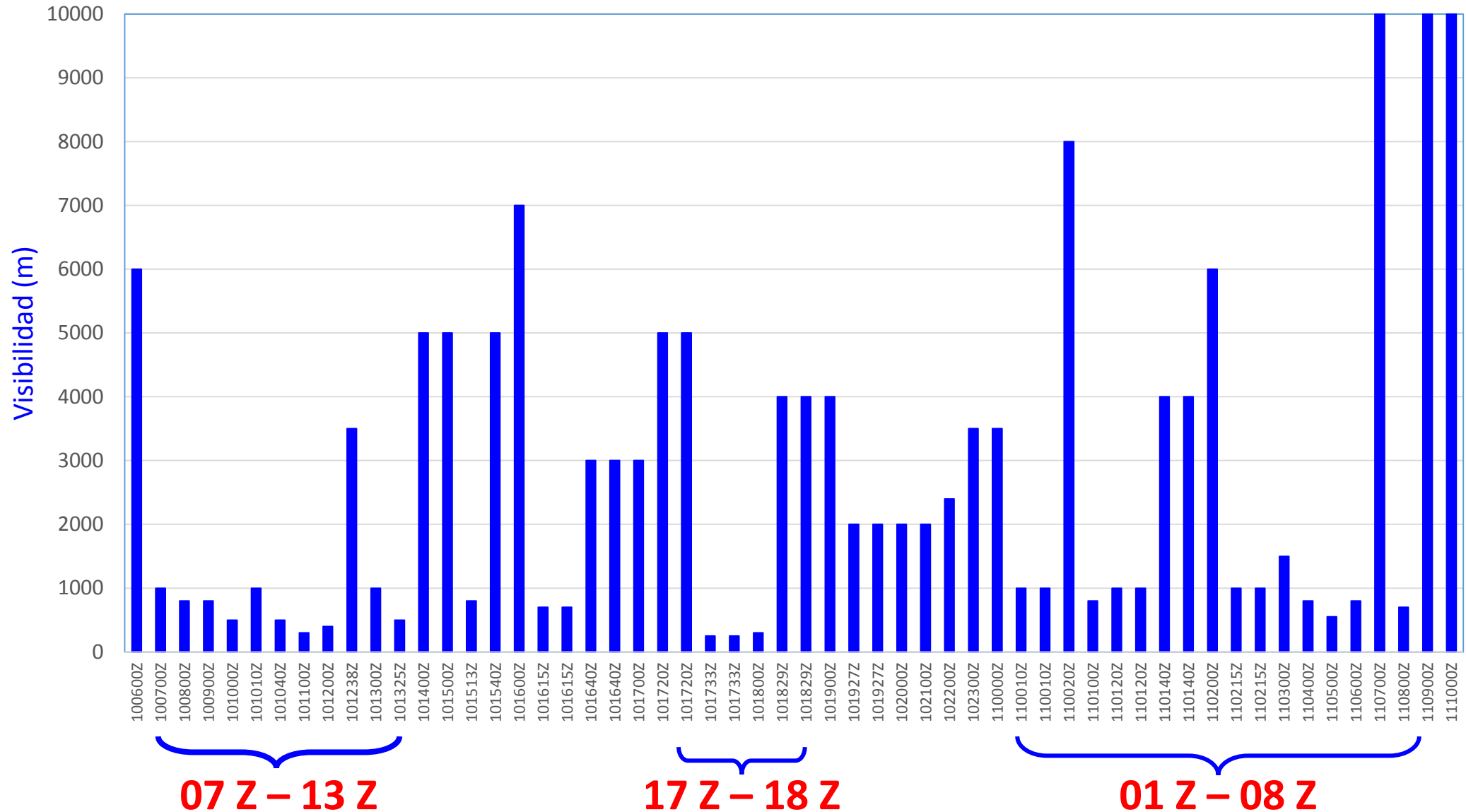
201502100600 METAR SPQU 100600Z 27003KT 6000 SCT002 BKN003 10/10 Q1026 RMK PP000=
201502100700 METAR SPQU 100700Z 23003KT 1000 R10/0750VP1500D FG OVC002 10/10 Q1026 RMK PP000=
201502100800 METAR SPQU 100800Z 23003KT 0800 R10/0750V1000N -RAFG OVC002 10/10 Q1026 RMK PP008=
201502100900 METAR SPQU 100900Z VRB03KT 0800 R10/0800N -RAFG OVC002 10/10 Q1025 RMK PP006=
201502101000 METAR SPQU 101000Z 23003KT 0500 R10/0500VP1500U -RAFG OVC002 10/10 Q1025 RMK PP005=
201502101010 SPECI SPQU 101010Z VRB03KT 1000 -DZFG SCT002 BKN003 10/10 Q1026 RMK VIS VRB=
201502101040 SPECI SPQU 101040Z VRB03KT 0500 R10/0350N DZFG OVC002 10/10 Q1026 RMK VIS VRB=
201502101100 METAR SPQU 101100Z VRB03KT 0300 R10/0300N -RA FG OVC002 10/10 Q1026 RMK PP007=
201502101200 METAR SPQU 101200Z 23004KT 200V260 0400 R10/0500N FG OVC001 10/10 Q1026 NOSIG RMK
PPTRZ=
201502101238 SPECI SPQU 101238Z VRB02KT 3500 BR OVC002 10/10 Q1027=
201502101300 METAR SPQU 101300Z 27004KT 230V300 1000 BR R10/P1500U OVC003 10/10 Q1027 BECMG 5000 BR
RMK PP000=
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201502101500 METAR SPQU 101500Z 22006KT 190V270 5000 BR OVC003 11/11 Q1027 NOSIG RMK PP000=
201502101513 SPECI SPQU 101513Z 23007KT 200V270 0800 R10/P1500D BCFG OVC001 11/11 Q1027=
201502101540 SPECI SPQU 101540Z 27005KT 220V290 5000 BR OVC002 11/11 Q1027=
201502101600 METAR SPQU 101600Z 26004KT 220V300 7000 OVC004 12/11 Q1027 BECMG OVC008 RMK PP000=
201502101615 SPECI SPQU 101615Z 26007KT 0700 R10/0550VP1500D FG OVC001 11/11 Q1027=
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201502101640 SPECI SPQU 101640Z 26006KT 220V290 3000 BR OVC002 11/11 Q1027=
201502101640 METAR SPQU 101640Z 26006KT 220V290 3000 BR OVC002 11/11 Q1027=
201502101700 METAR SPQU 101700Z 26006KT 220V280 3000 BR OVC002 11/11 Q1027 NOSIG RMK PP000=
201502101720 SPECI SPQU 101720Z 25006KT 210V280 5000 SCT002 SCT004 12/11 Q1026=
201502101720 METAR SPQU 101720Z 25006KT 210V280 5000 SCT002 SCT004 12/11 Q1026=
201502101733 SPECI SPQU 101733Z 26007KT 0250 R10/0275N FG OVC001 11/11 Q1026=
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PPTRZ=
201502101829 SPECI SPQU 101829Z 27007KT 4000 OVC002 11/11 Q1026 TEMPO 1000 BCFG OVC002=
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- RAFG

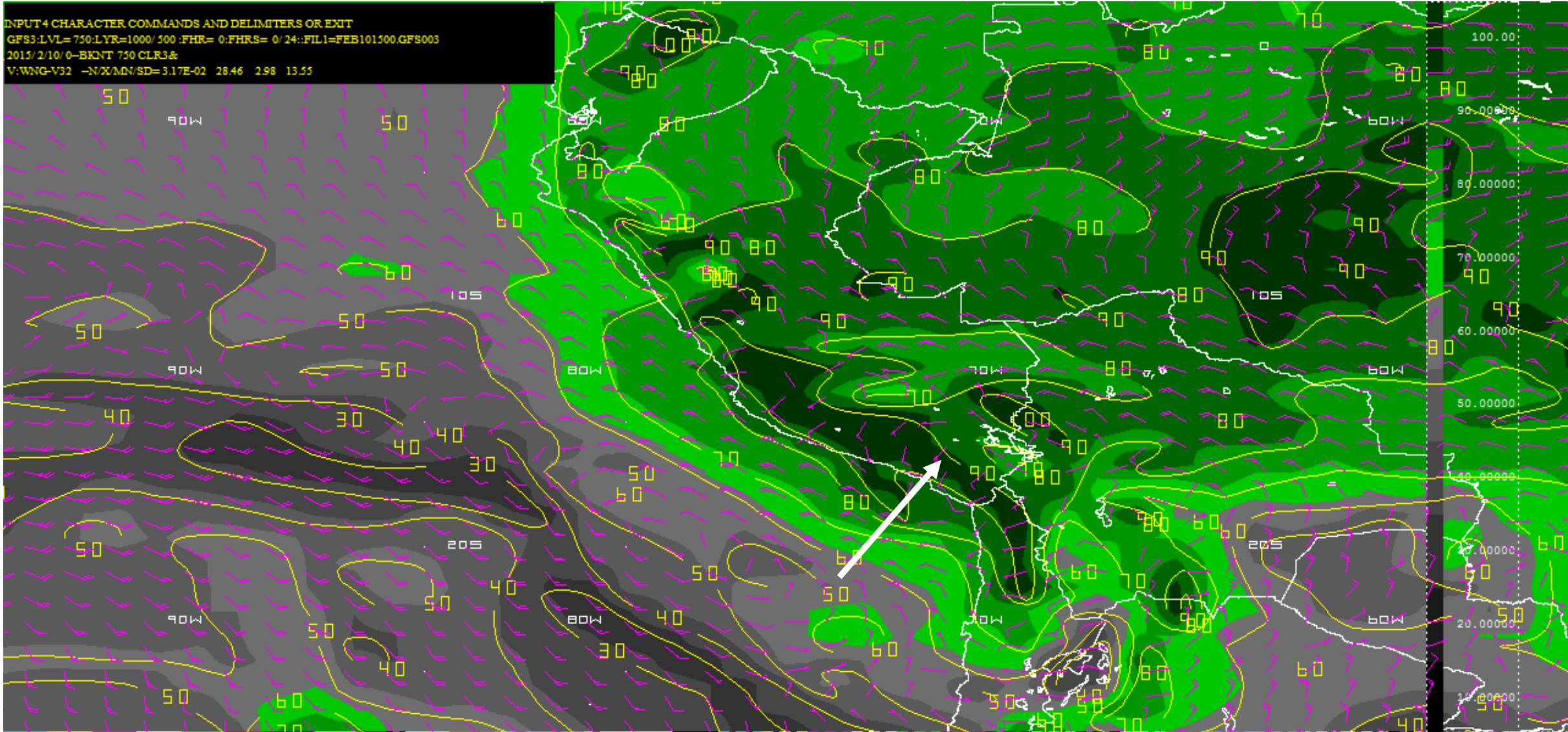
FG

FG

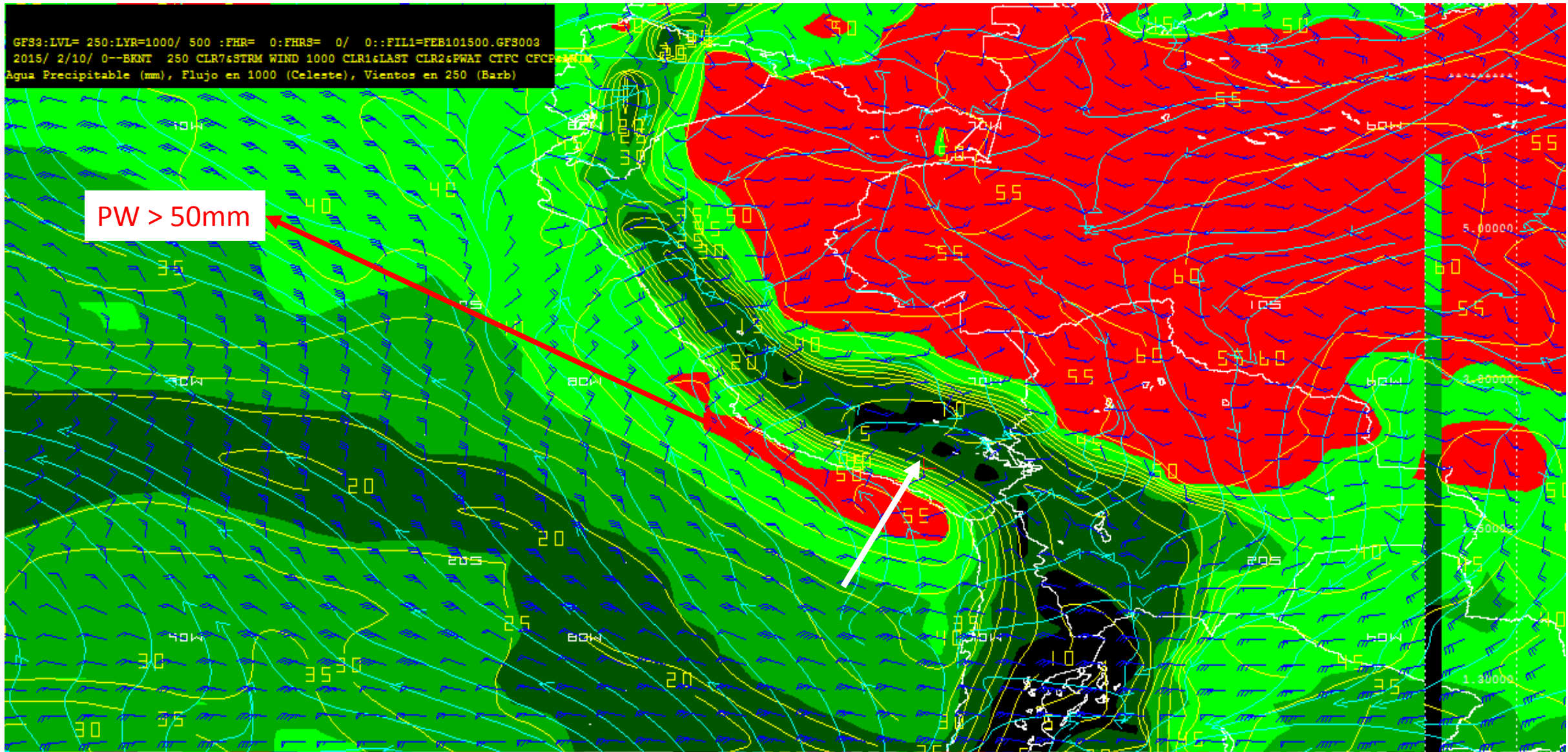
HORIZONTAL VISIBILITY - AREQUIPA AIRPORT (SPQU) 10 and 11 FEBRUARY 2015



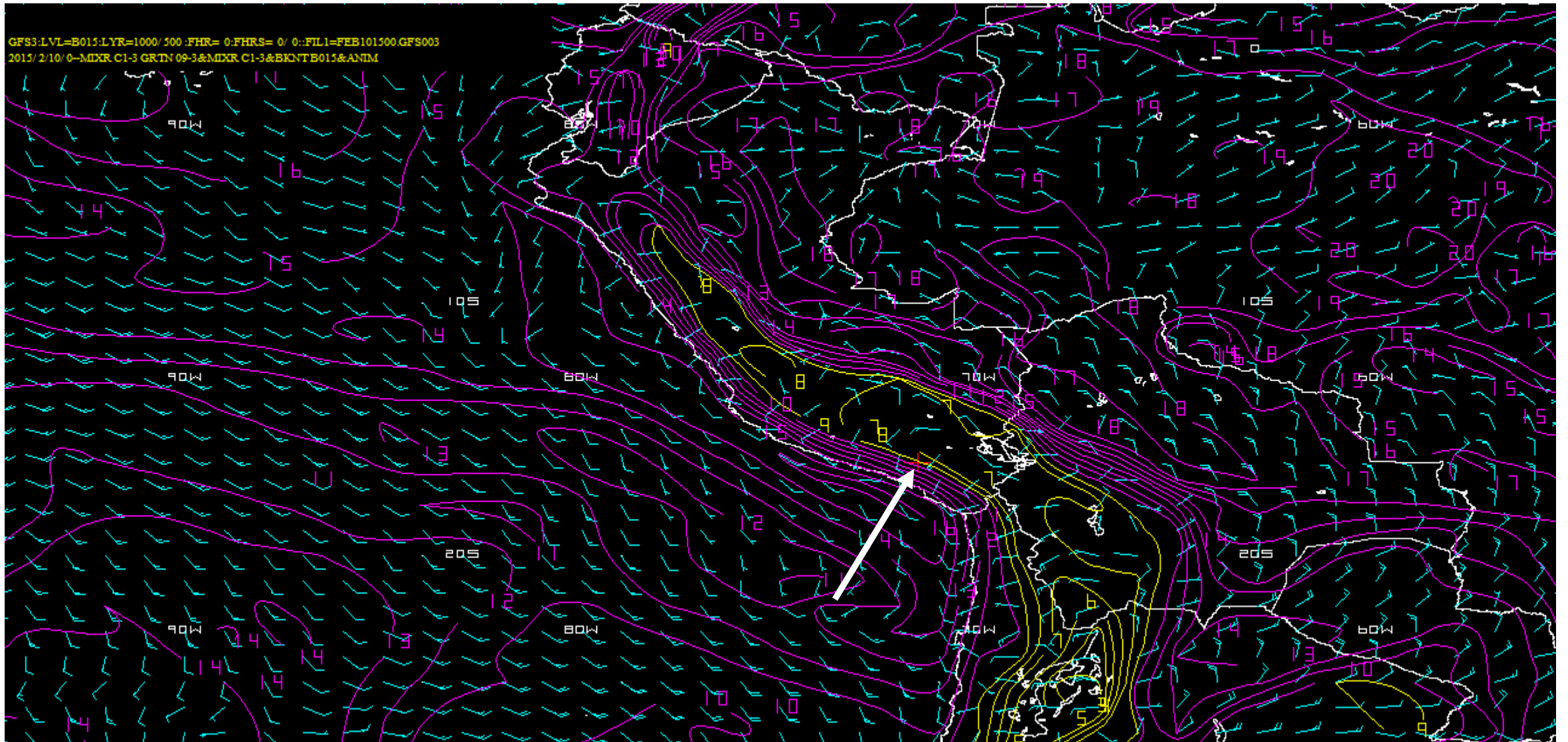
Relative humidity (%) Wind (kt) at 750 hPa



Precipitable water(mm), flow at 1000 hPa and wind at 250 hPa



Mixing ratio (g / kg) and wind (kt) in the boundary layer



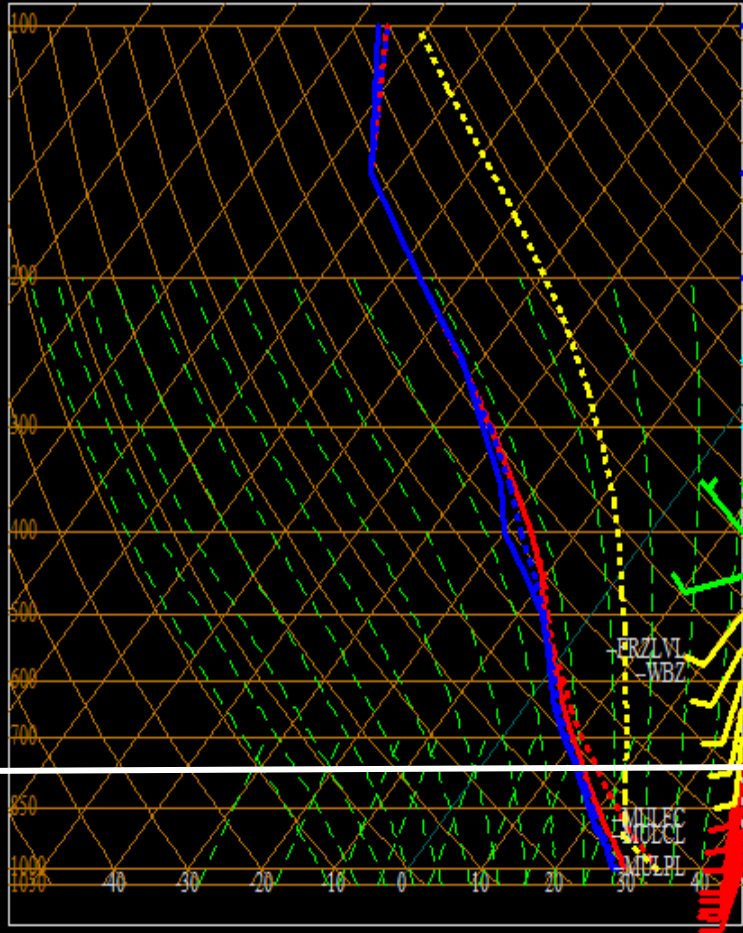
Sounding GFS

MODEL DATA GFS3 00 UTC TUE 10 FEB 2015

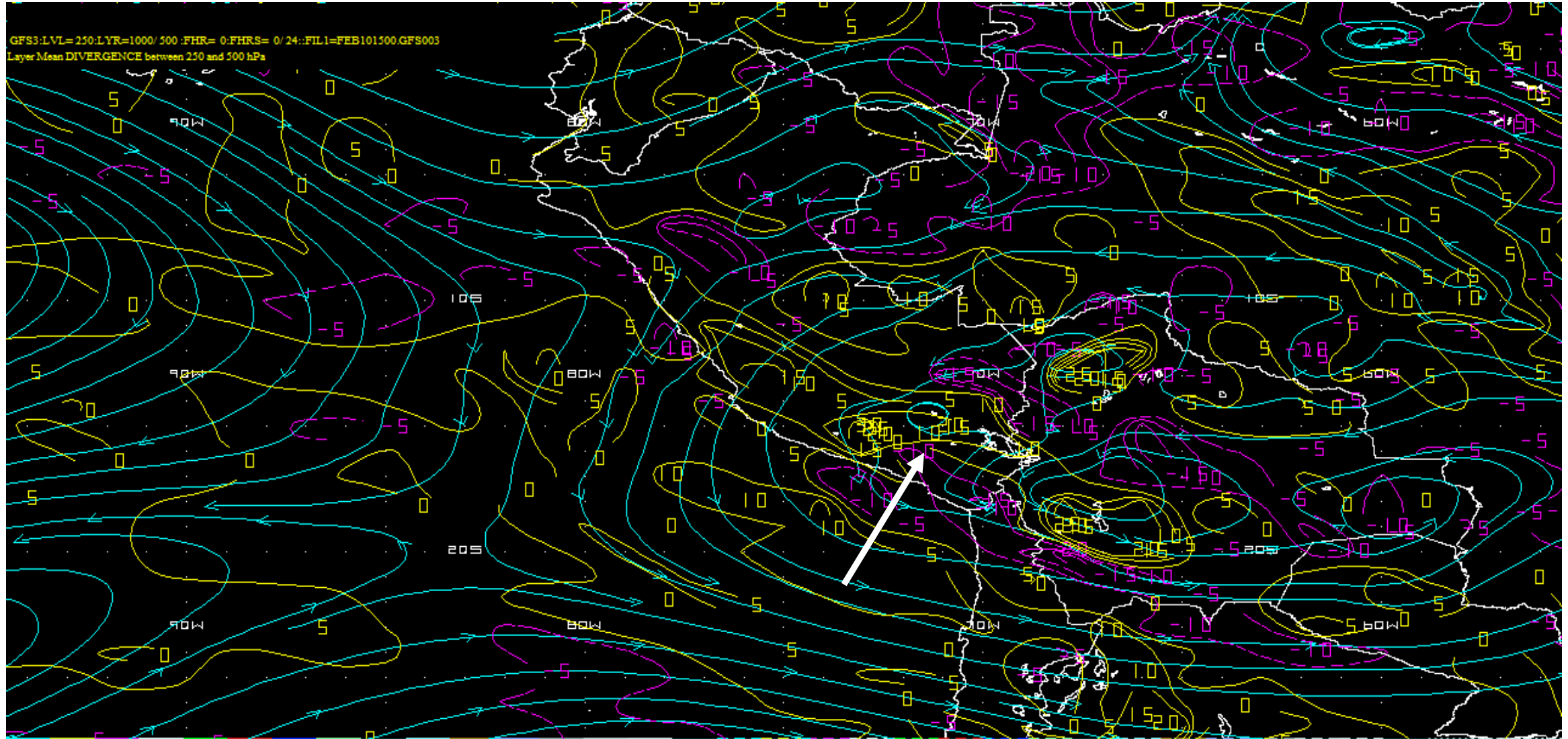
STATION ID : KPQU /84752 - AREQUIPA/RODRIGUEZ
LAT/LON : -16.32 / -71.55
GRDX/GRDY 289 / 74

FRZLVL: 4905.41	PRECIP TYPE: RAIN
PWATER: 7.34	1000-500 THKNS: 5716.90
CONVT: 33.94	1000-700 THKNS: 2995.59
HSIZE: 0.47	1000-850 THKNS: 1375.72
DENBUOY: 8.46	700-500 THKNS: 2721.31
- PARCEL -	850-500 THKNS: 4341.18
CAPE: 7416.49	850-700 THKNS: 1619.87
CIN: -19.75	
LIFTED: -12.85	
KINDEX: 44.22	
TOTAL: 50.91	
CRSTOT: 23.58	
VERTOT: 27.34	
SHWLTR: -6.69	
SWEATX: 287.49	
VVMAX: 9.96	
- WIND -	
AVG DIR: 207.16	
AVG SPD: 1.49	
BRSHEAR: 15.49	
STORM MOTION (DIR/SPD): 155.41 / 11.95	
STORM REL HELICITY: -591.17	
STORM REL HOLICITY: 1455.80	
- OTHER -	
BRN: 478.68	
EHI: -27.40	
VGP: 177.70	
SCP: -16.98	
STP: 4.95	

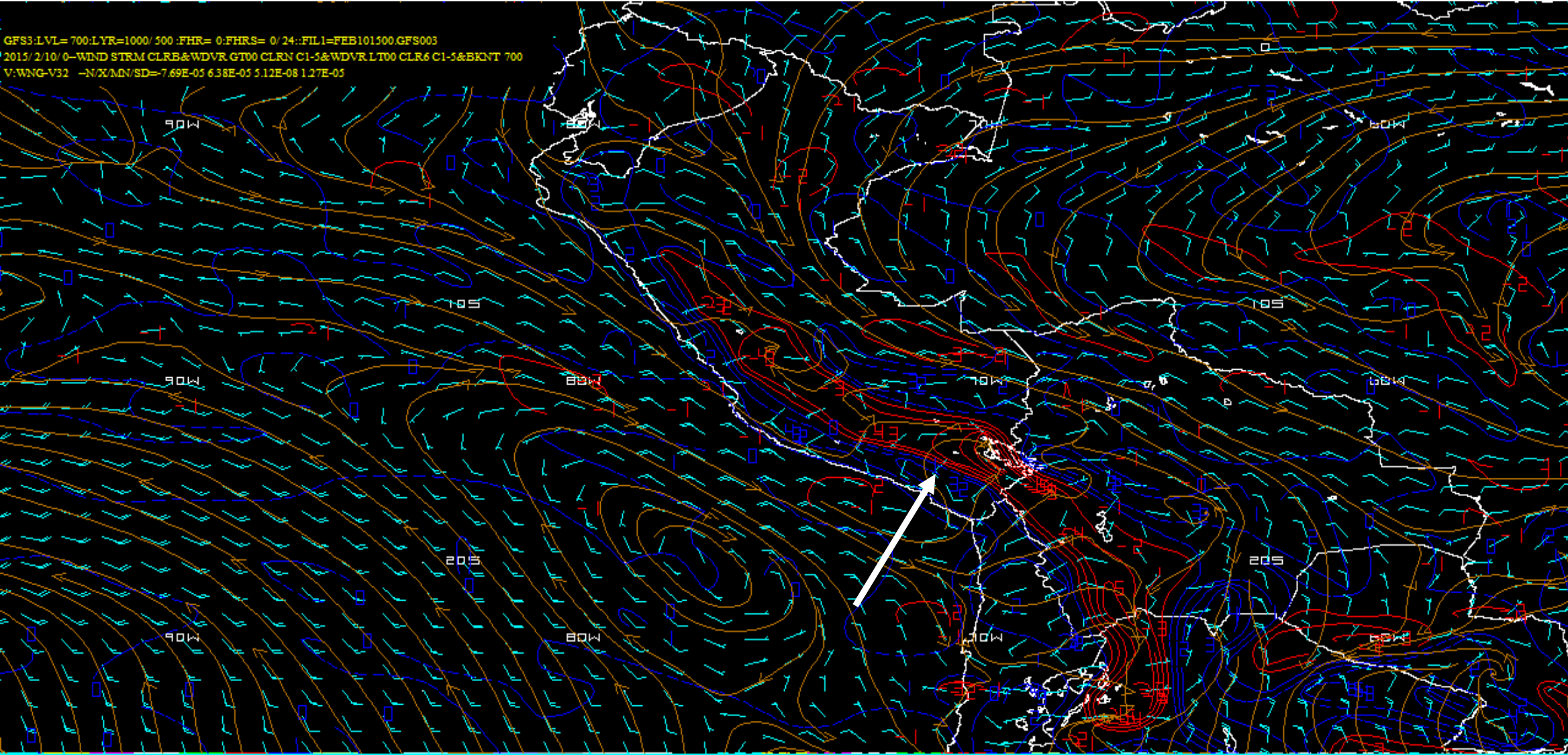
Temperature: red
Dew point: blue



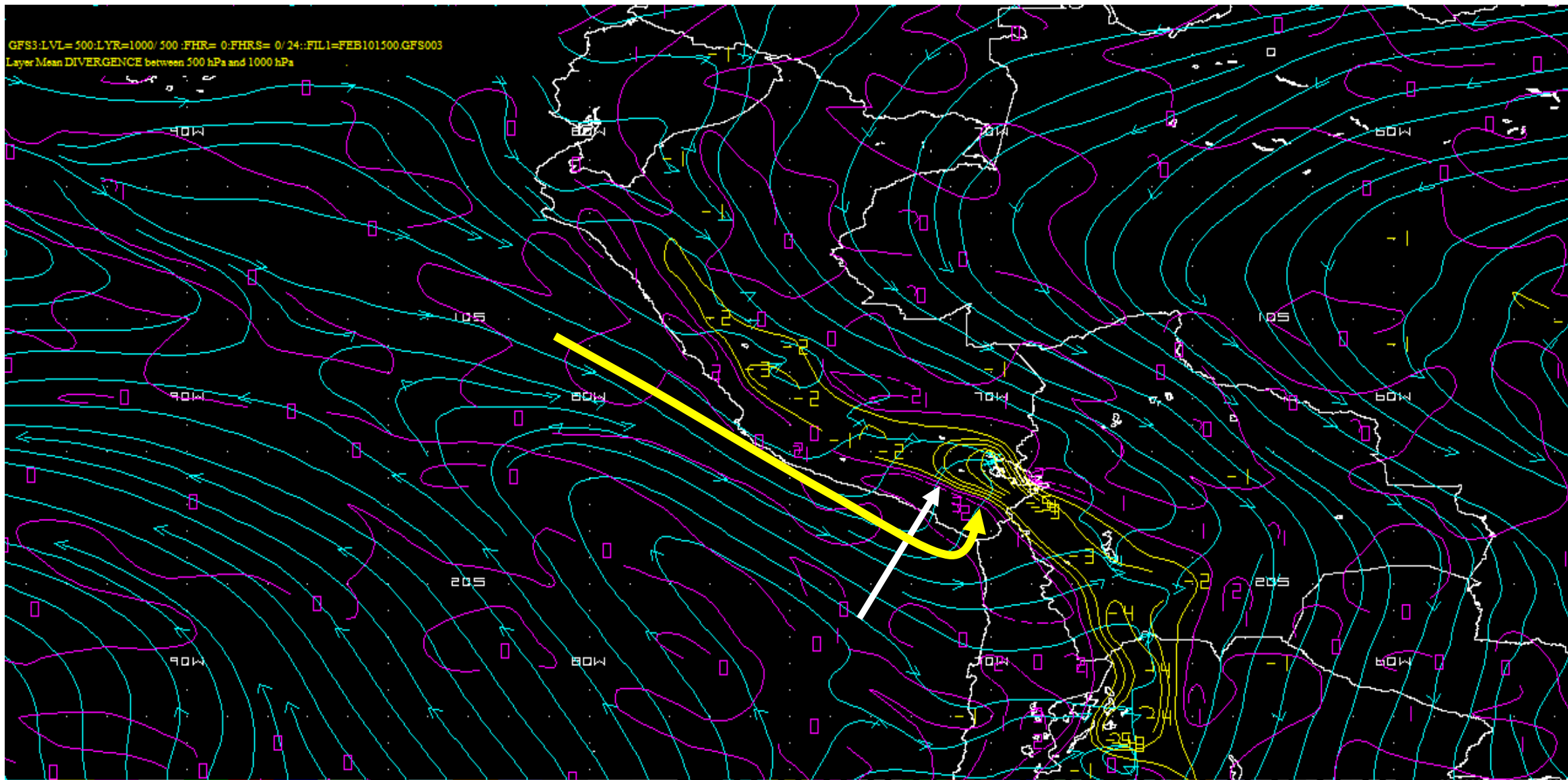
Convergence (magenta) y Divergence (yellow) ($\times 10^5 \text{ s}^{-1}$) layer 500-250 hPa



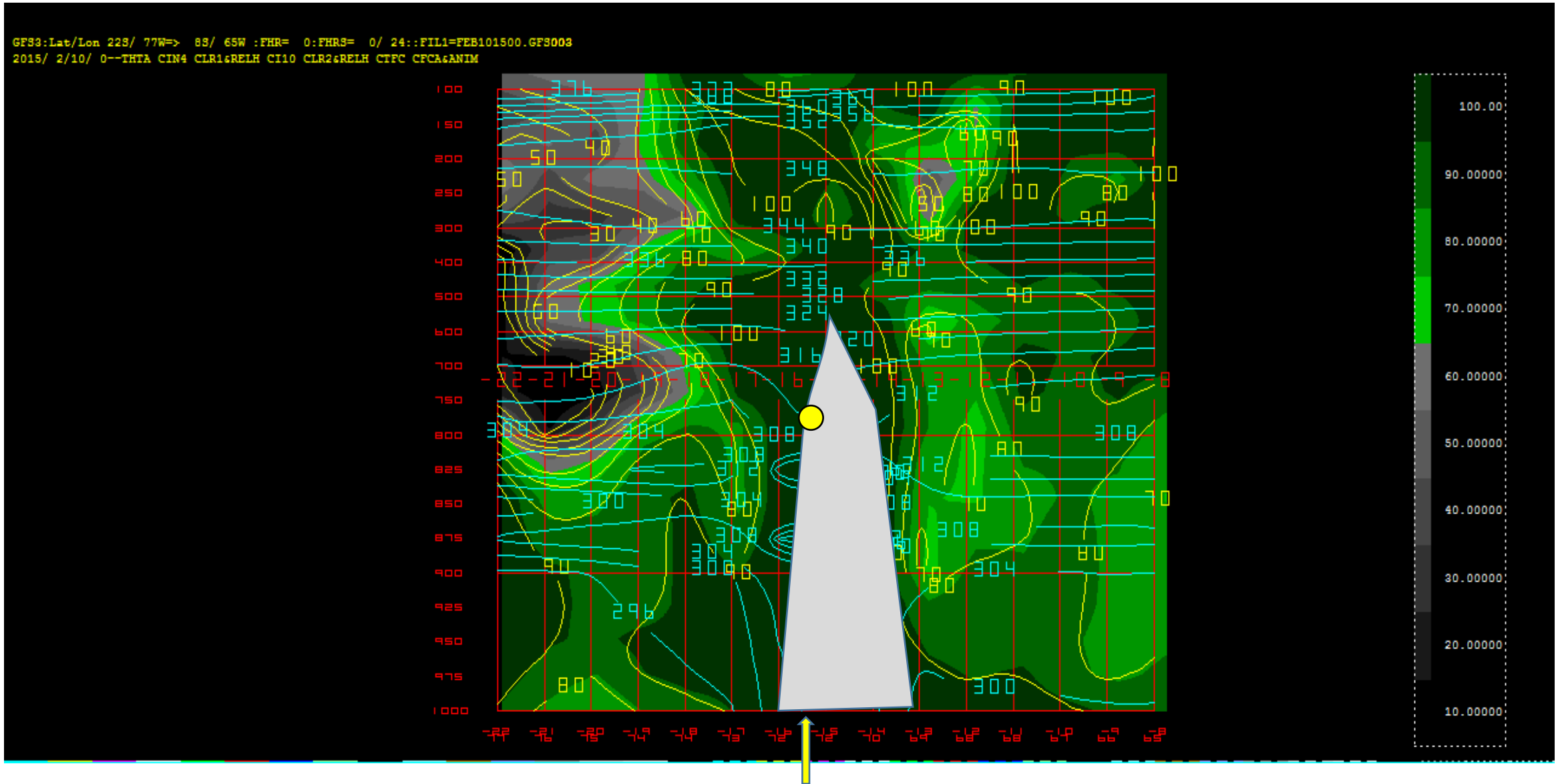
Convergence (red) y Divergence(blue) ($\times 10^5 \text{ s}^{-1}$) at 700 hPa



Convergence (yellow) y Divergence (magenta) ($\times 10^5 \text{ s}^{-1}$)
layer 1000 – 500 hPa



Potencial Temperatura (K) and relative humidity(%)

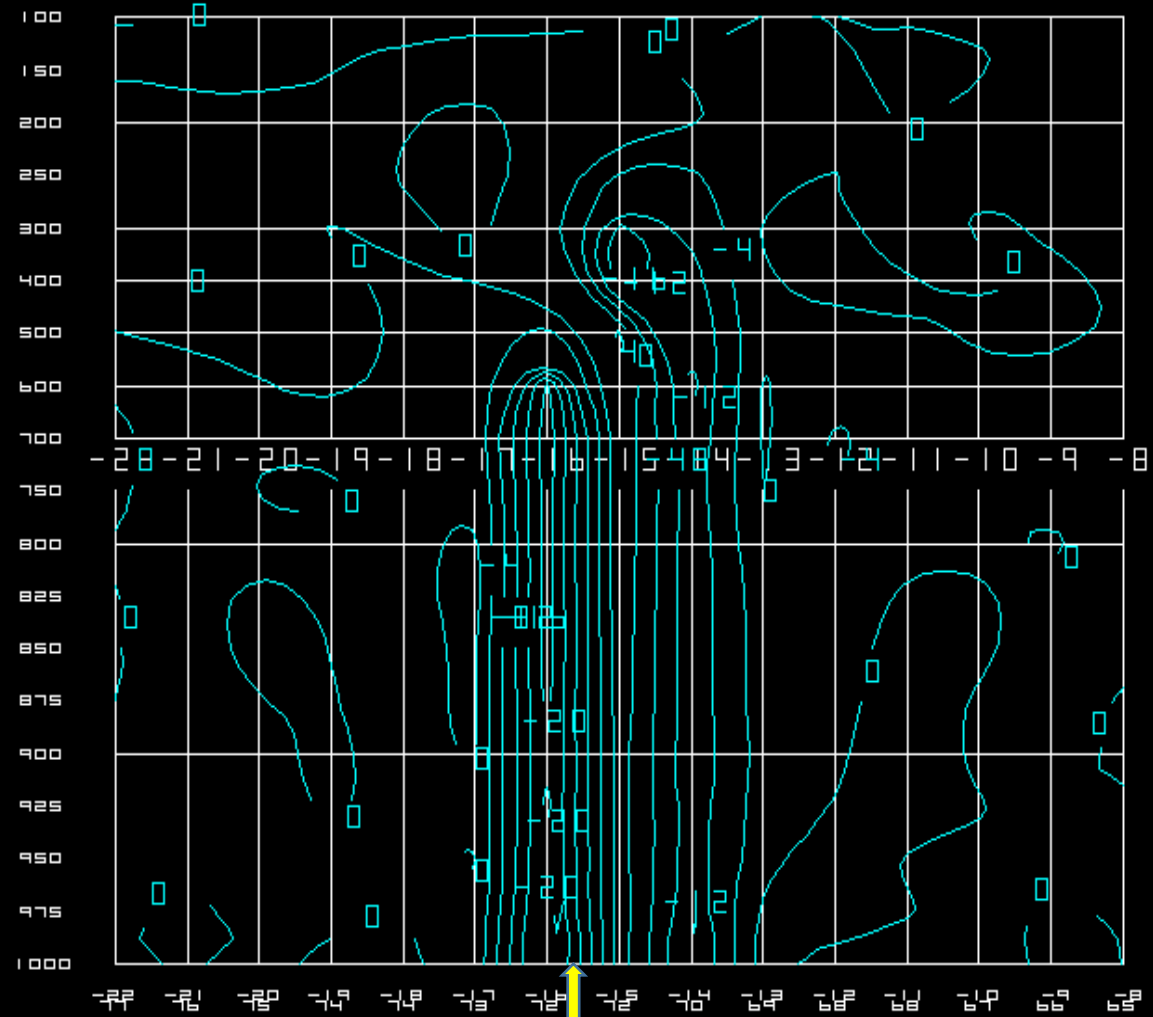


Vertical speed (hPa/s)

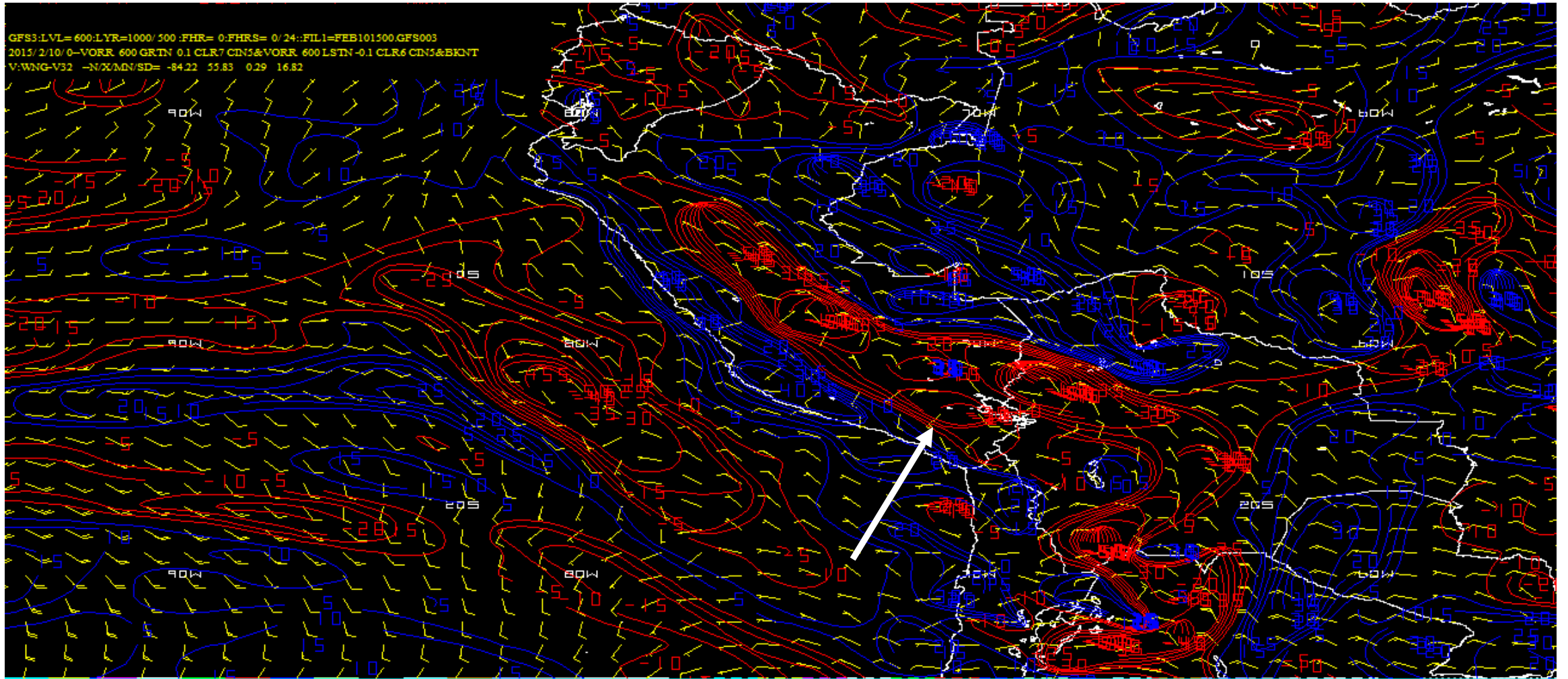
INPUT 4 CHARACTER COMMANDS AND DELIMITERS OR EXIT

GFS3:Lat/Lon 22S/77W=> 8S/ 65W:FHR= 6:FHRS= 0/24::FIL1=FEF101500.GFS003

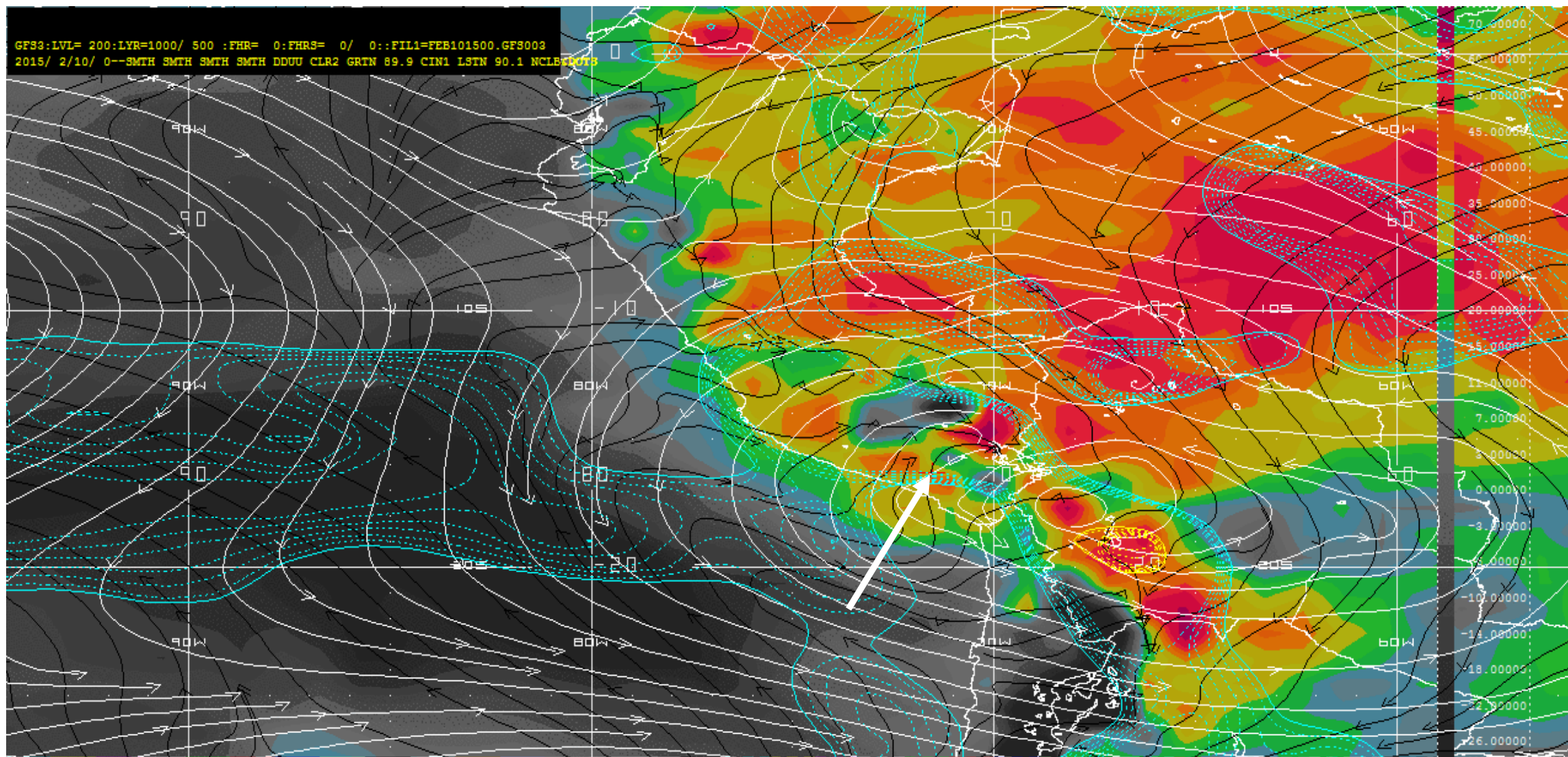
2015/2/10/0-VVEL.DPOS F06



Vorticity ($\times 10^6 \text{ s}^{-1}$) y wind at 600 hPa



Index GDI



CONCLUSIONS

Factors identified for the occurrence of fog

- Nearly saturated layer
- The coastal trof , causing southerly (onshore) flow west to the highlands of Arequipa
- Subsidence in the layer of 600-400 hPa
- Divergence in 700 hPa and average divergence between 1000-500 hPa (indirect assessment of stratification)
- Topography (airport in small valley)



Muchas Gracias!

Thank you!