CHOCO-JEX: A Research Programme Focused on the CHOCO Low-level Jet over the Far Eastern Pacific and Western Colombia – Initial Results

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Content

1. Objectives
2. Background
3. Preliminary Results IOP No. 1: Ocean
4. Preliminary Results IOP No. 2: Land
5. Initial Conclusions

Objectives

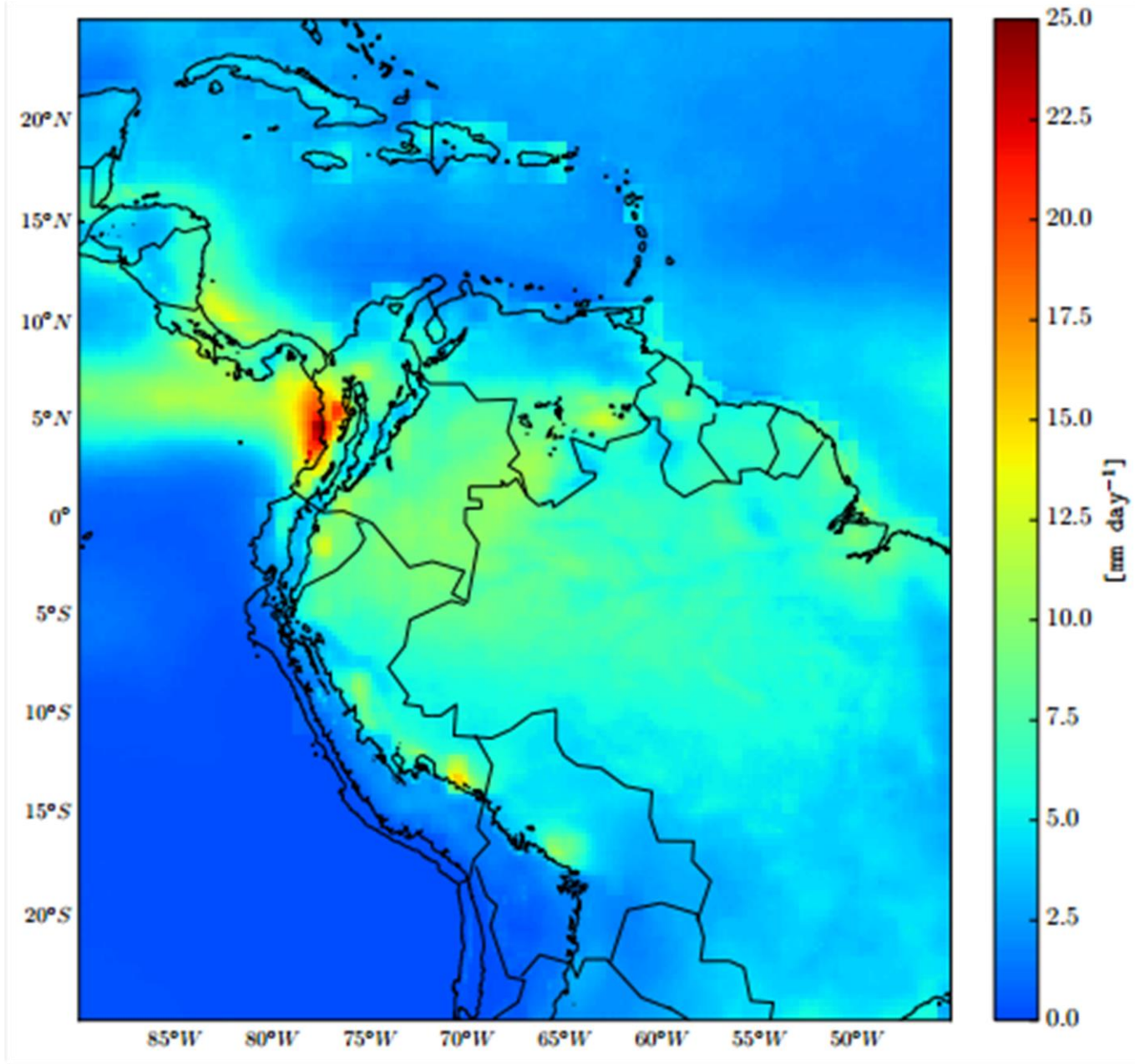
- To implement four field campaigns of the atmosphere over the Colombian Pacific (Ocean and Land) at diurnal, seasonal and interannual scales.

- To measure the dynamics of the Choco Low-Level Jet on the land-ocean interface at the same timescales.

- To evaluate different climatic reanalysis products over the Colombian Pacific upper atmosphere environment.

Study Region: Far Eastern Pacific

- One of the rainiest regions on Earth (Snow, 1976; Eslava, 1994; Poveda & Mesa, 2000): Non-existent in-situ upper air measurements!
- Ocean-atmospheric-land processes (López & Howell, 1967; Poveda & Mesa, 2000; Amador et al., 2006; Kessler, 2006)



TRMM 3B42: Jaramillo *et* al. (2016), Submitted.

Why is this one of the rainiest regions on Earth?

Low-level westerly CHOCO JET, Easterlies at higher levels, and orographic lifting (Emmanuel, 1994; Poveda & Mesa, 2000)

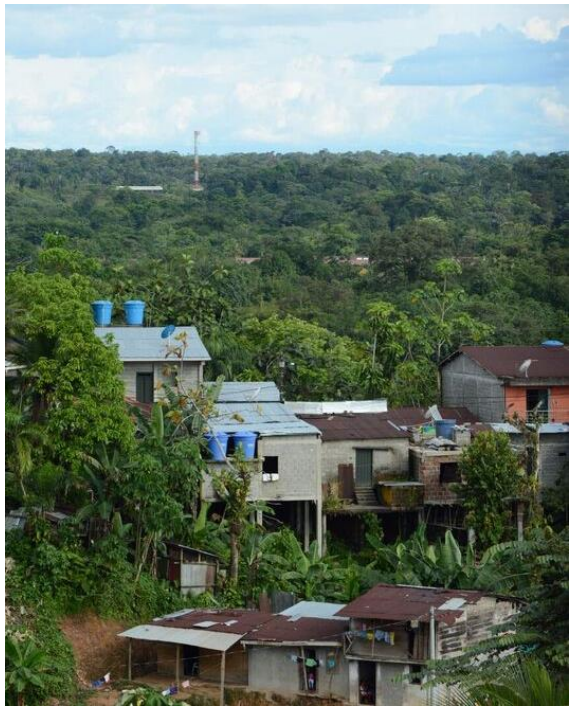
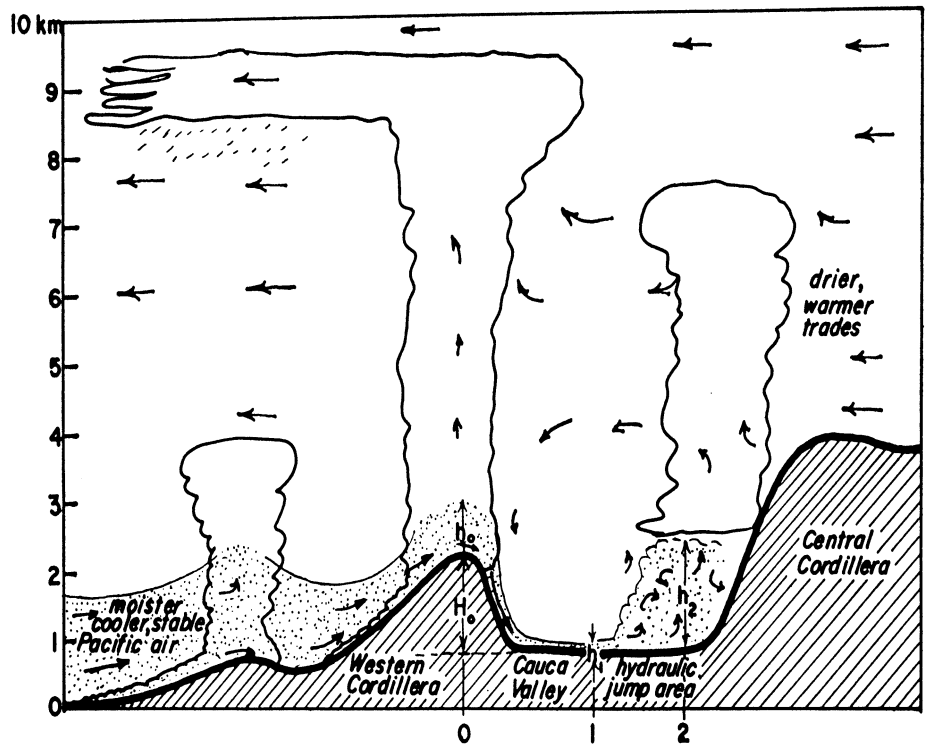


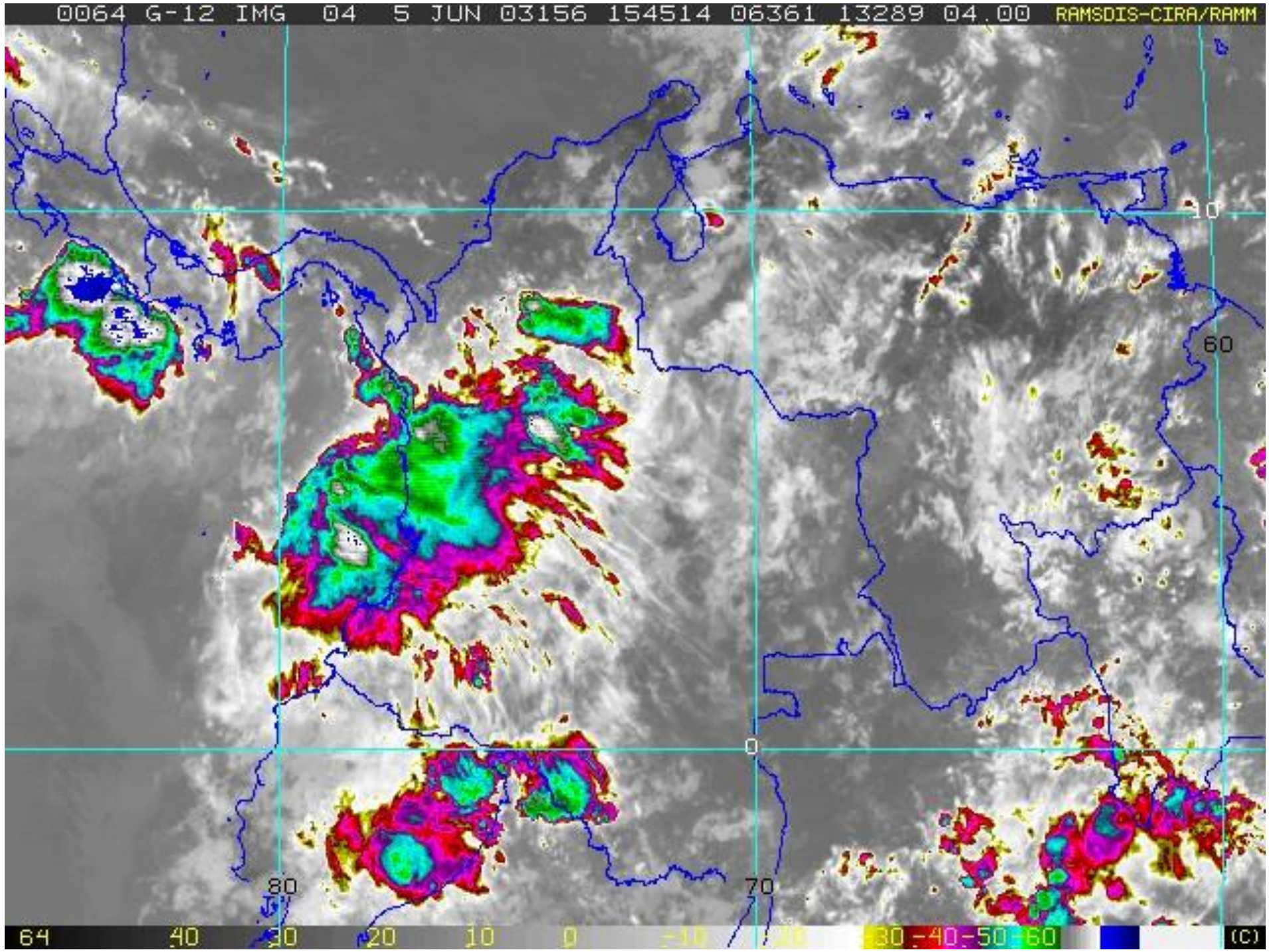
Photo by Jaime Toro



López & Howell (1967)

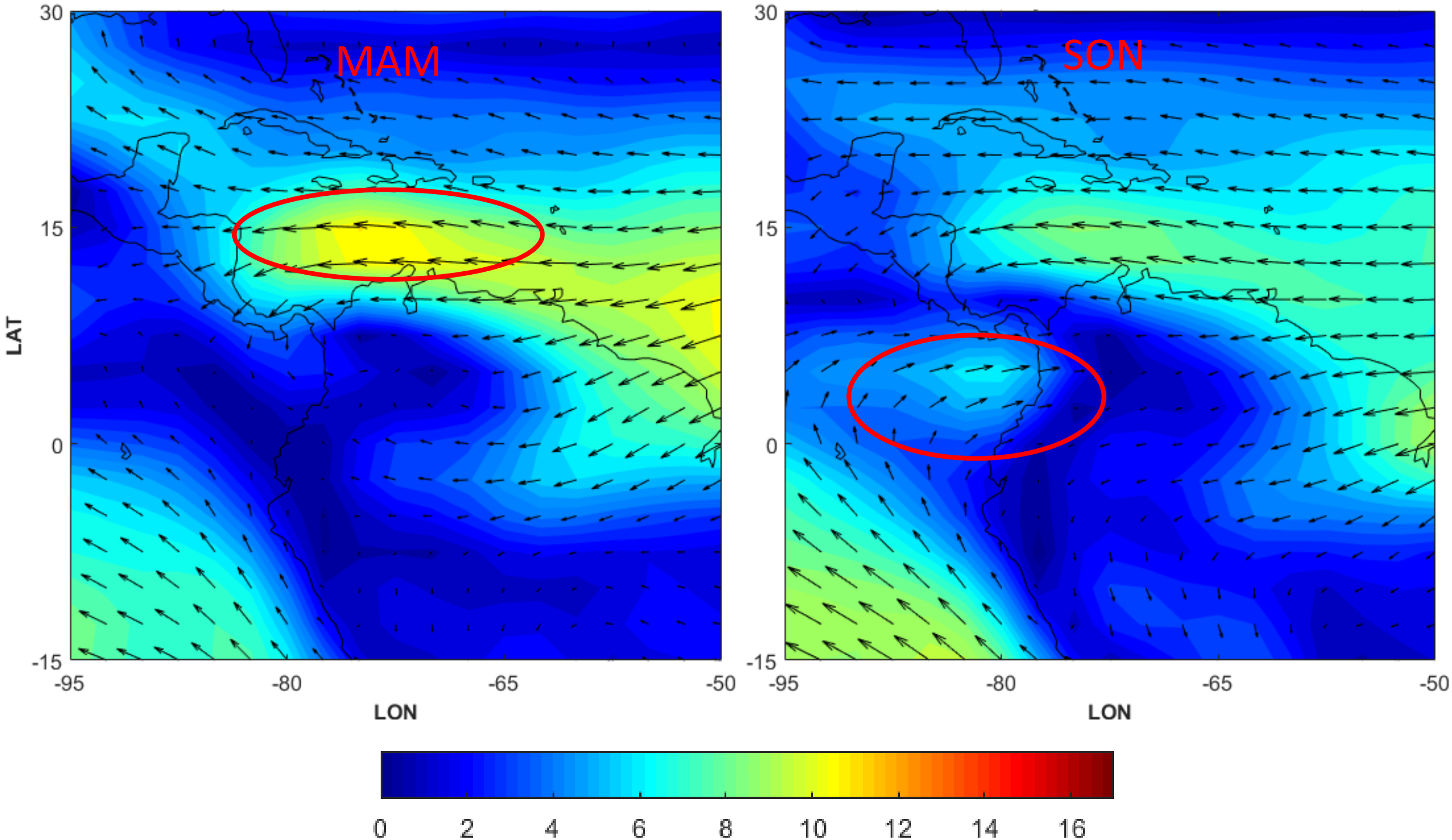
Photo by John F. Mejía

Mesoescale Convective Systems



Choco & Caribbean Low-Level Jets: Seasonal Cycle
Winds (m/s) at 925 hPa (NCEP/NCAR)

Maximum wind velocities (6-8 m/s - SON) at 925 hPa, Strong ocean-land temperature gradients. Entangled with MSCs (Poveda & Mesa, 2000)

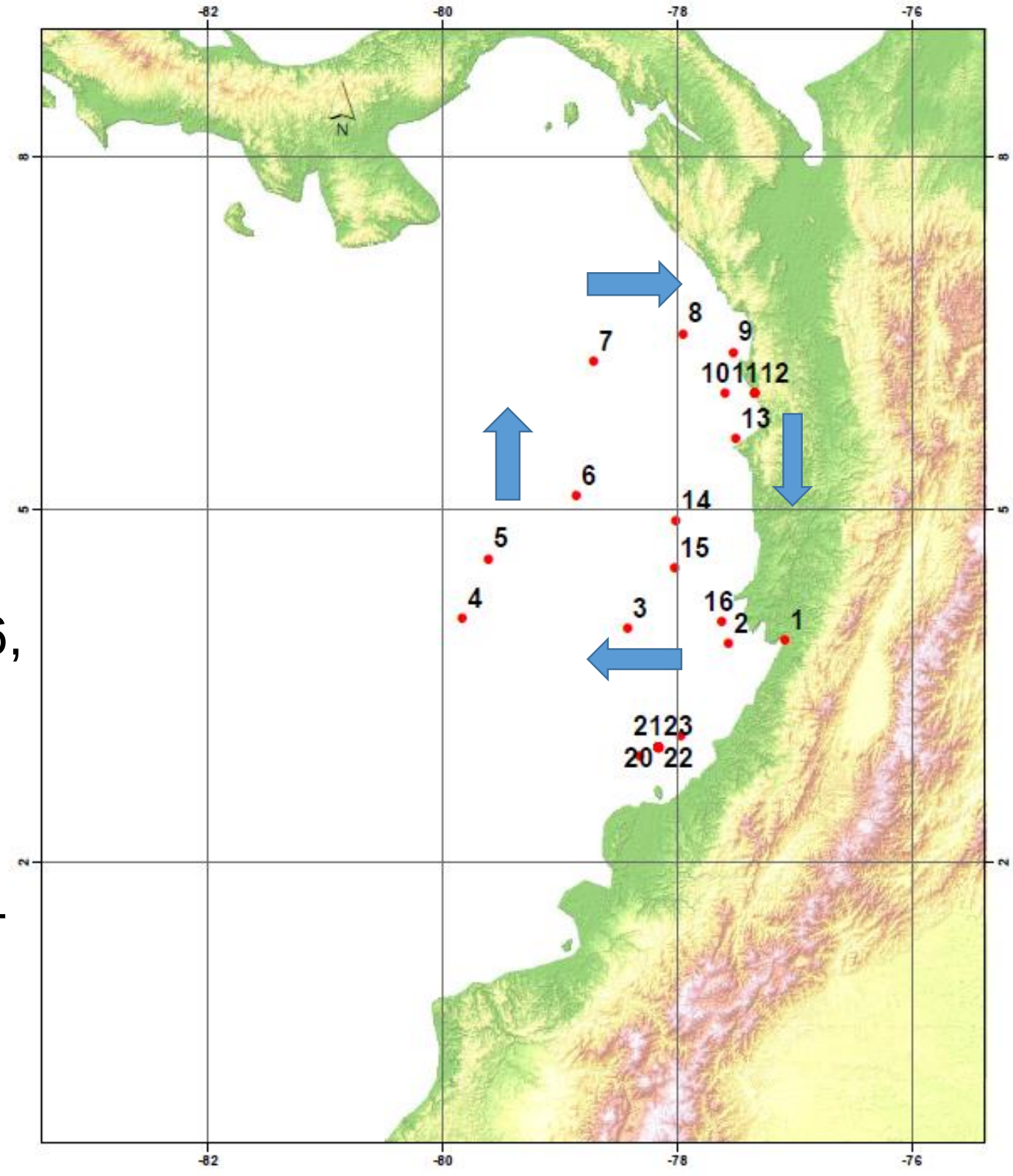


First Intensive Observing Period (IOP)

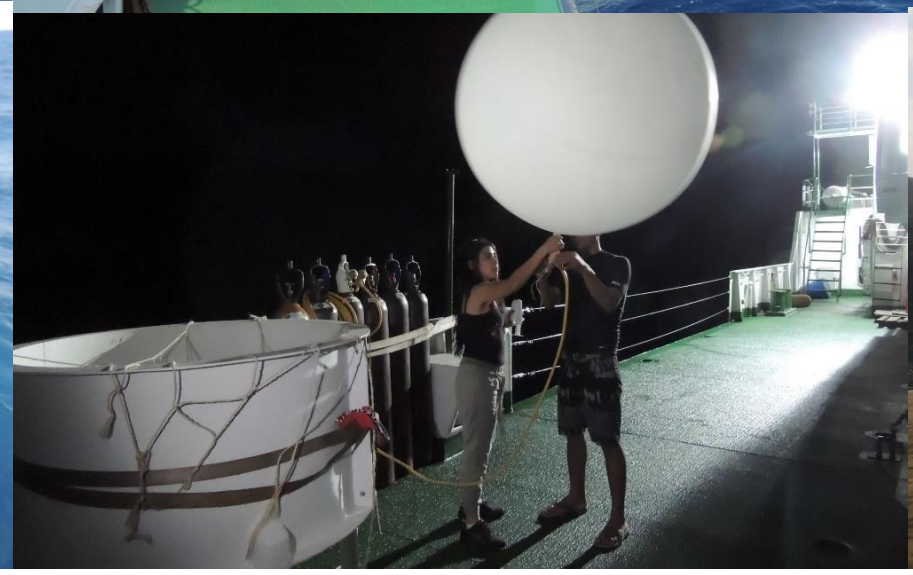
Where?
Off-shore the Colombian Pacific.
On board the ARC Gorgona vessel.

When?
January 15th-22nd, 2016 during the ERFEN Campaign 2015-2016, Strong El Niño.

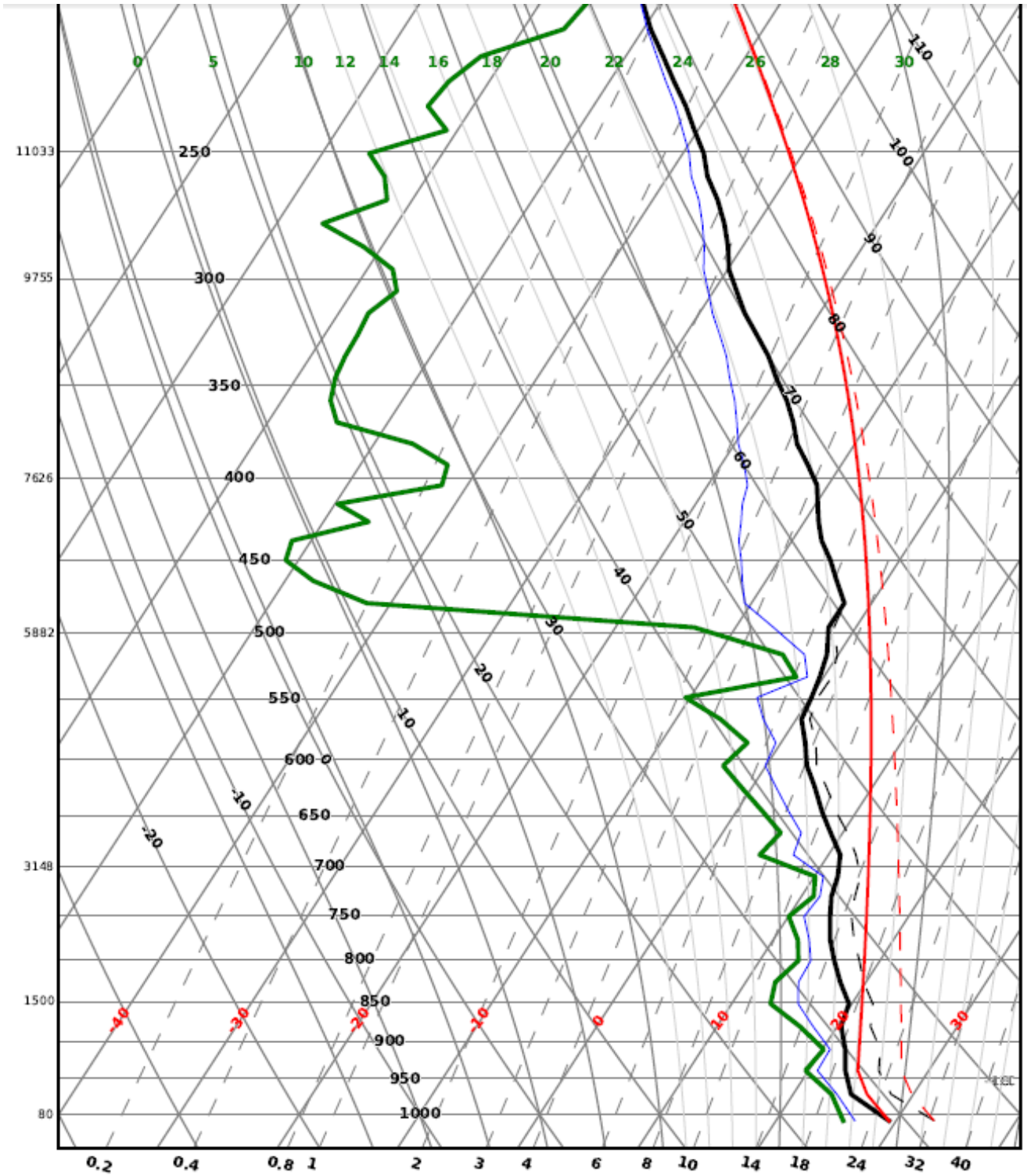
How?
Soundings every 6 h using MW41 Vaisala system

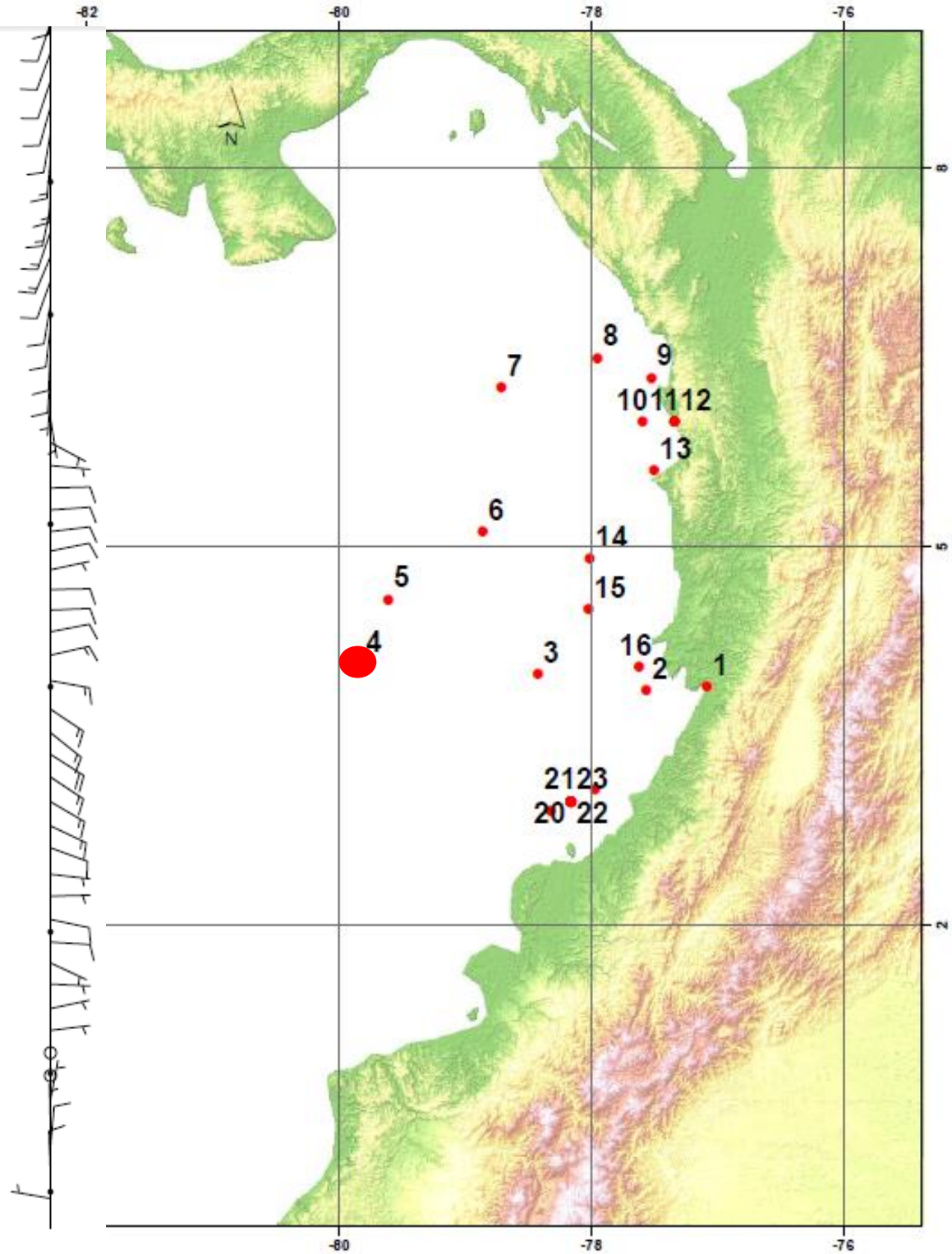


First IOP:
Off-Shore Colombian Pacific,
January 2016 - Strong El Niño!



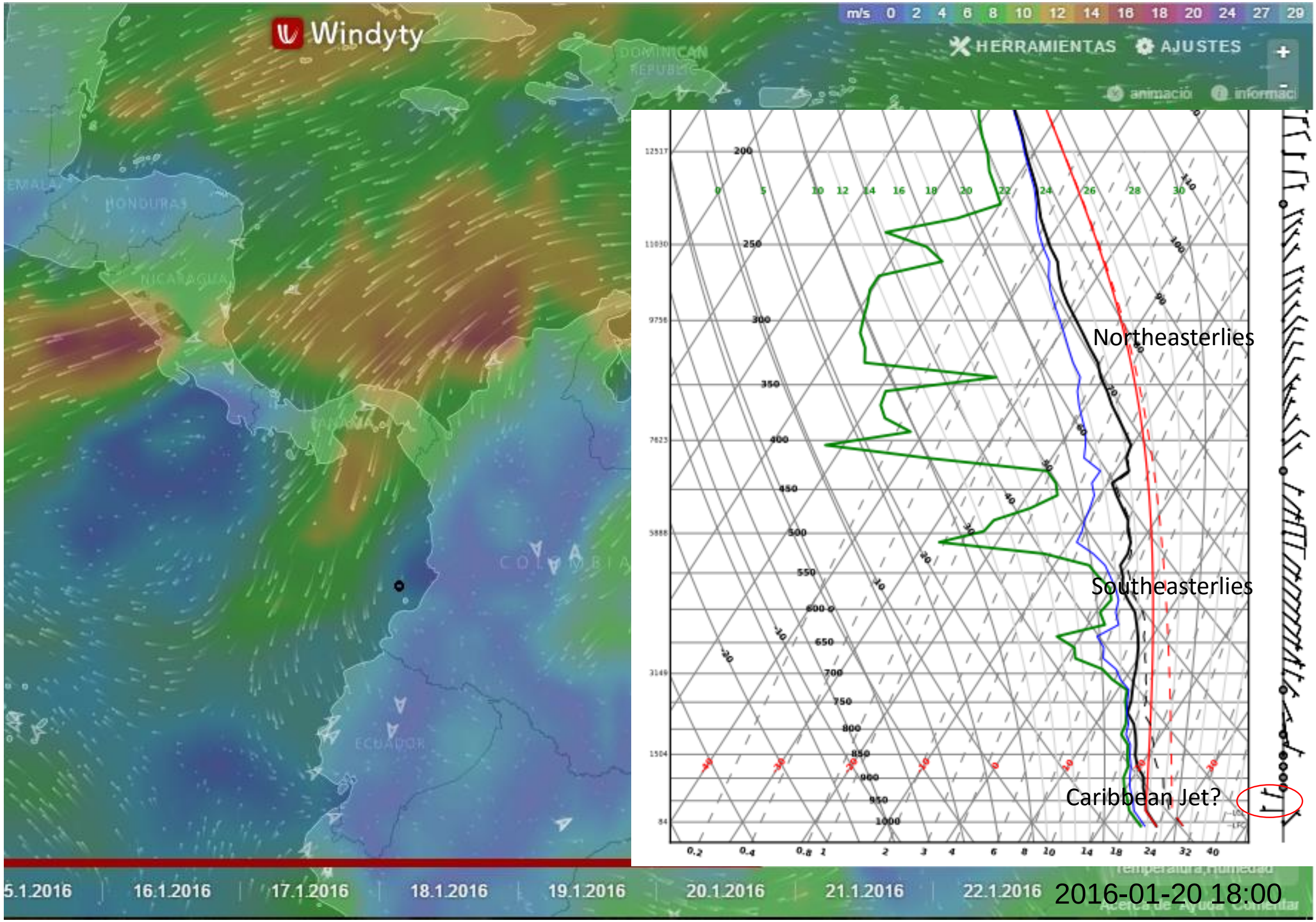
Typical sounding: Dry atmosphere above 500 hPa



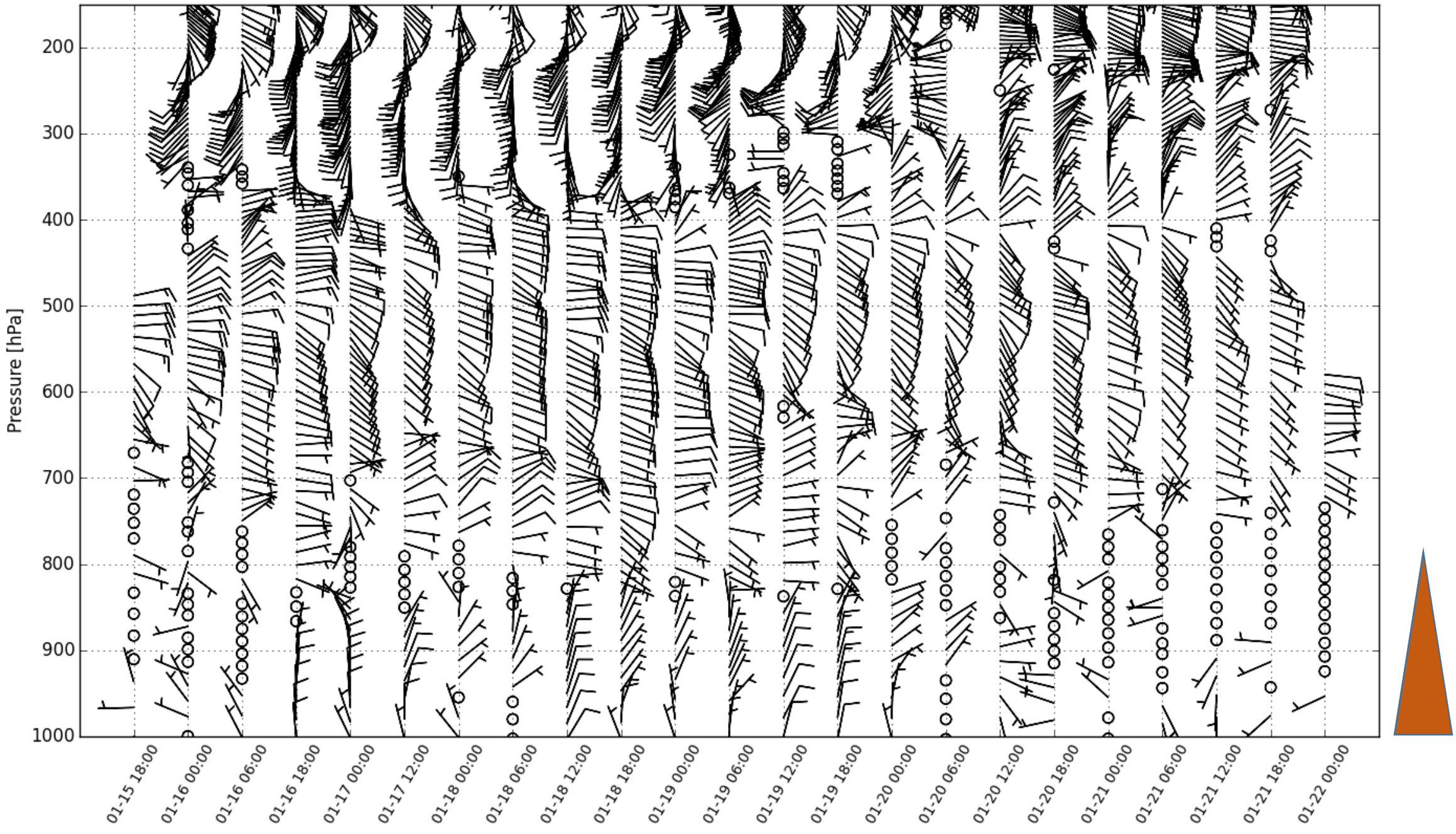


2016-01-16 18:00

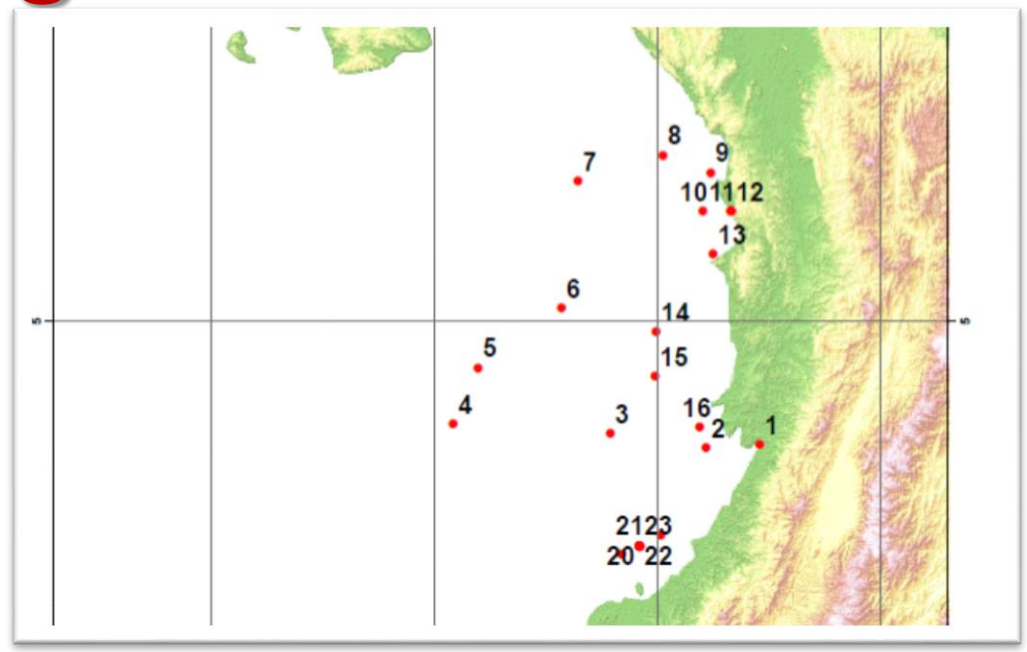
Westerlies from strong branch of the Caribbean Jet

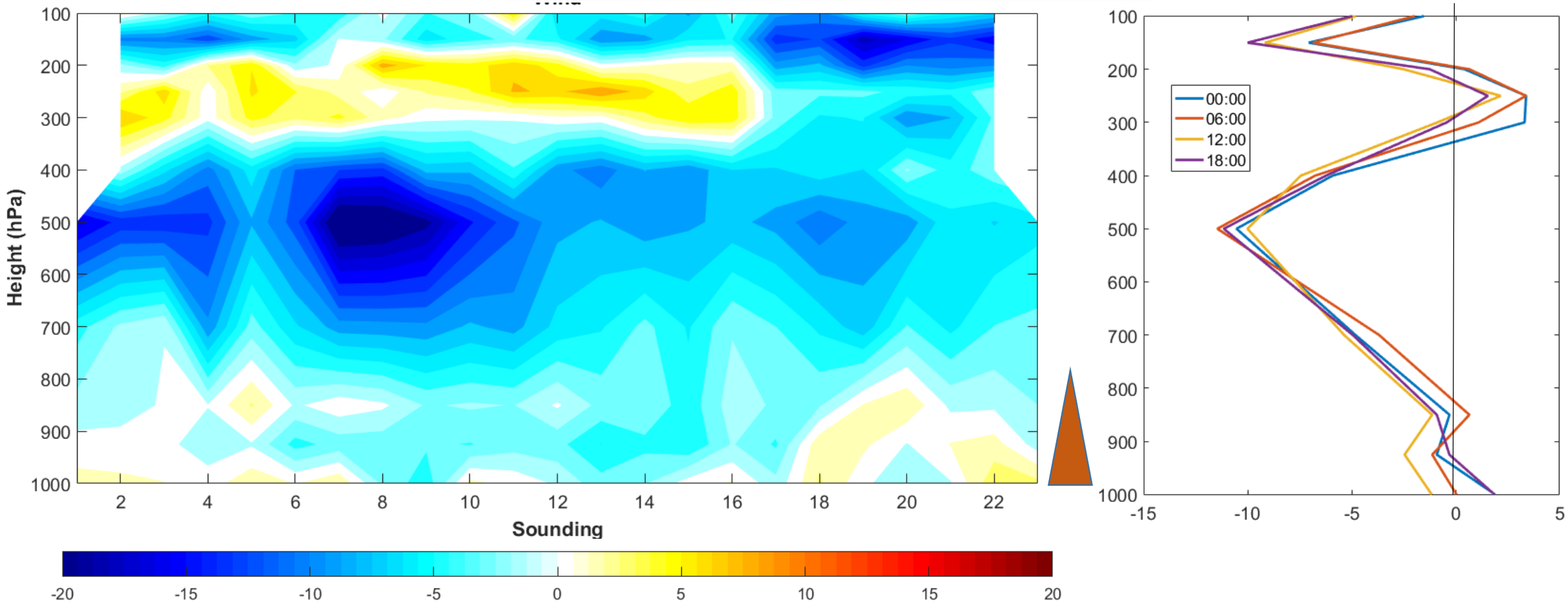


Winds During First IOP - January 2016

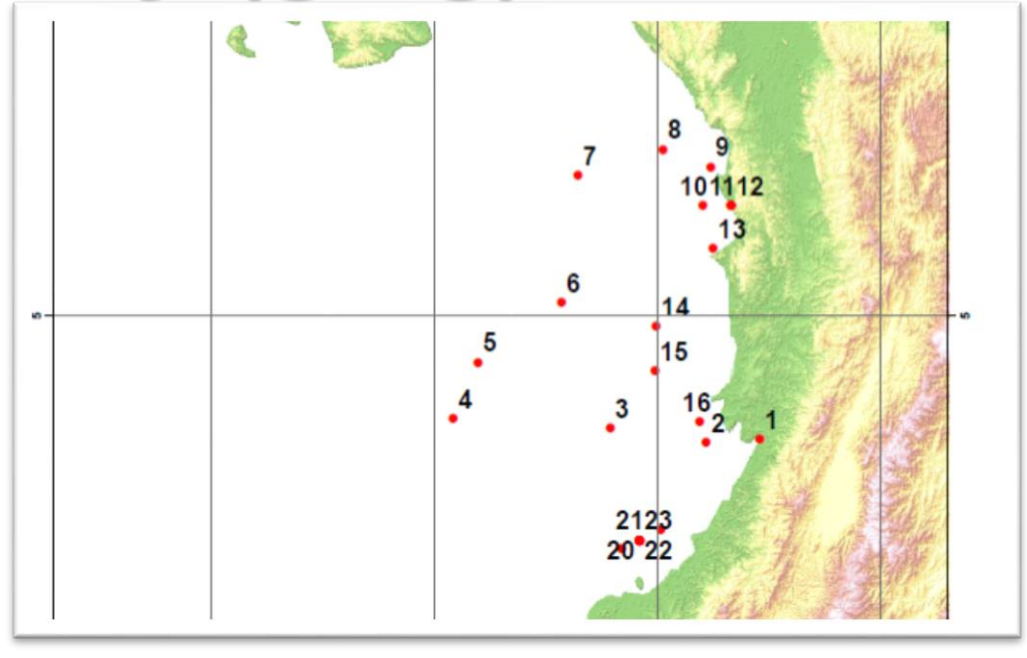


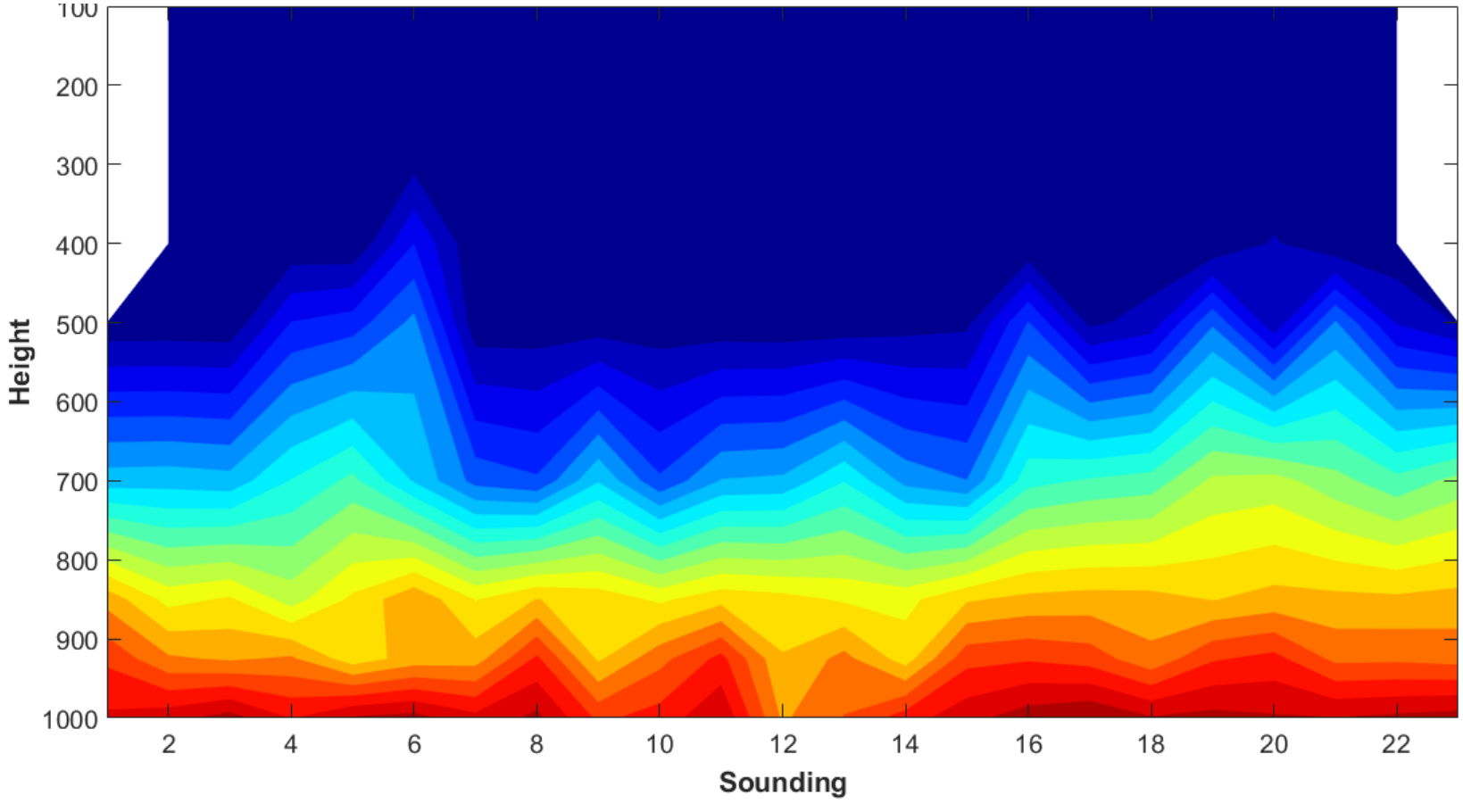
Zonal wind (m/s) Ocean - January 2016
Caveat: Strong El Niño! Reduced Choco LLJ

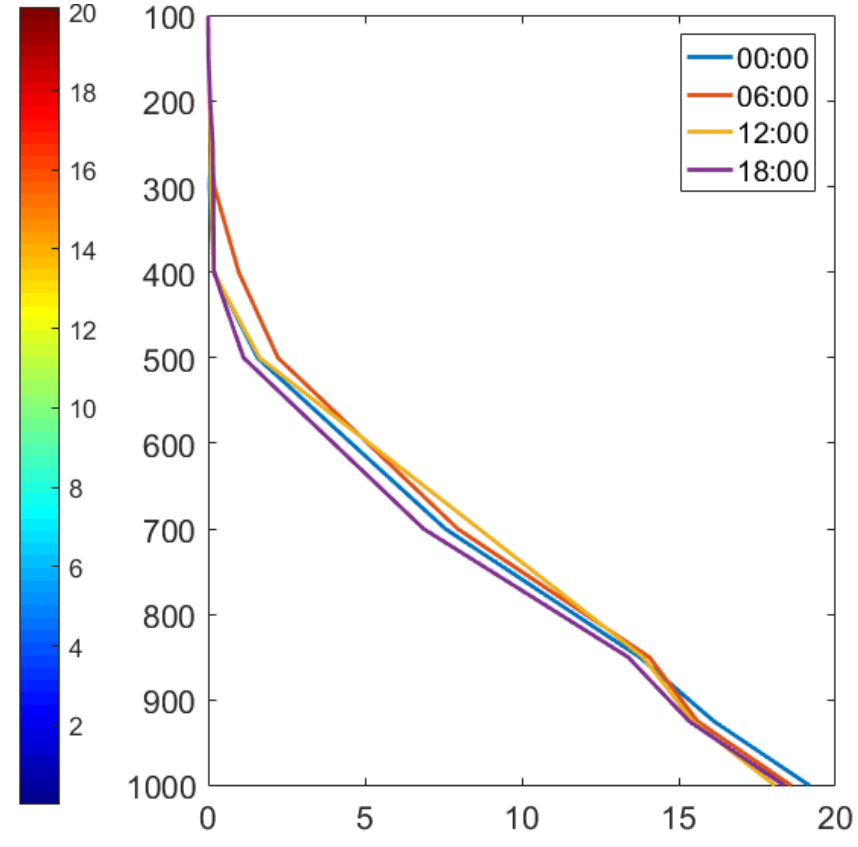




Specific humidity (g/kg) Ocean - January 2016





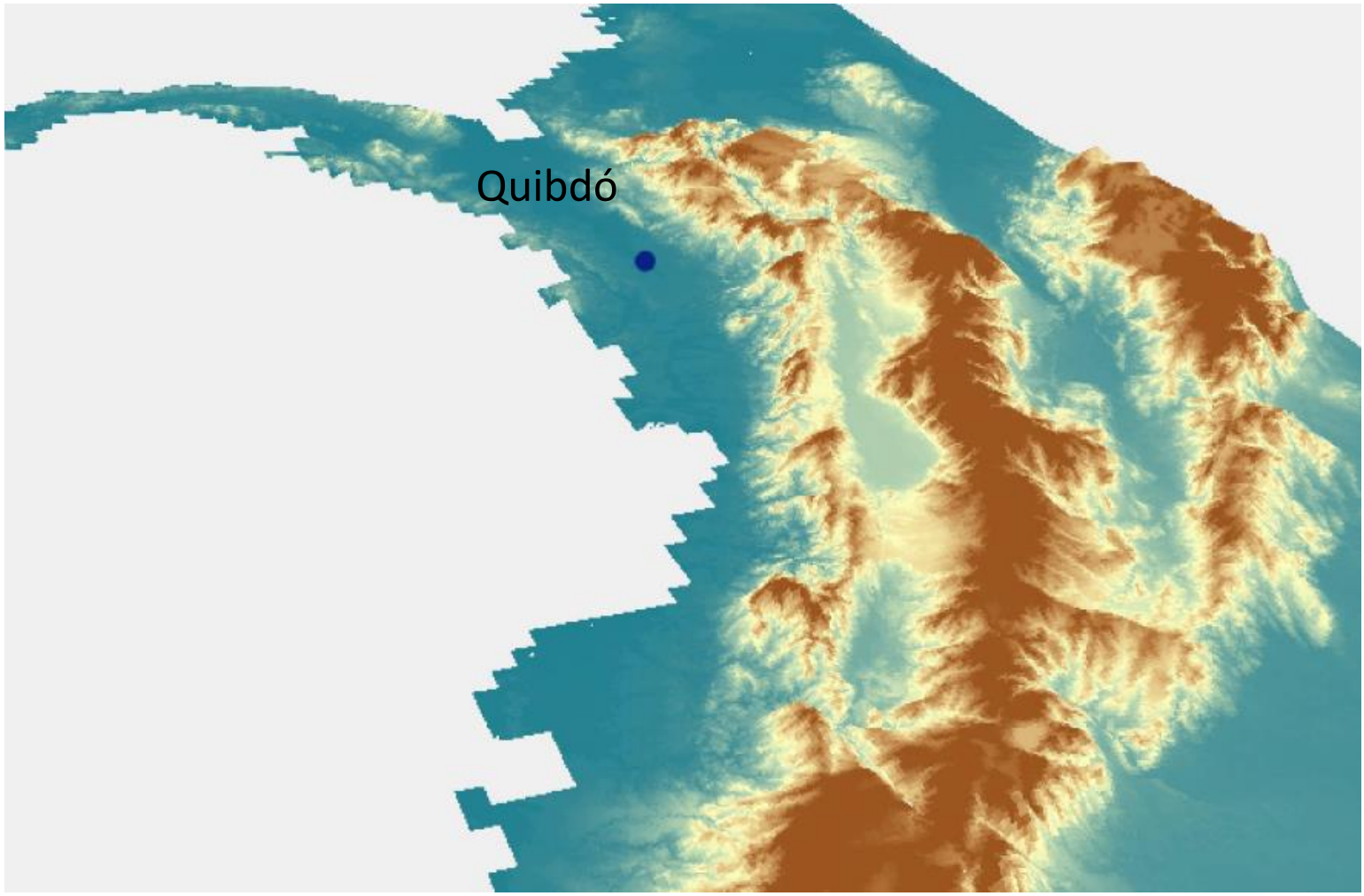


IOP No. 2 Over Land

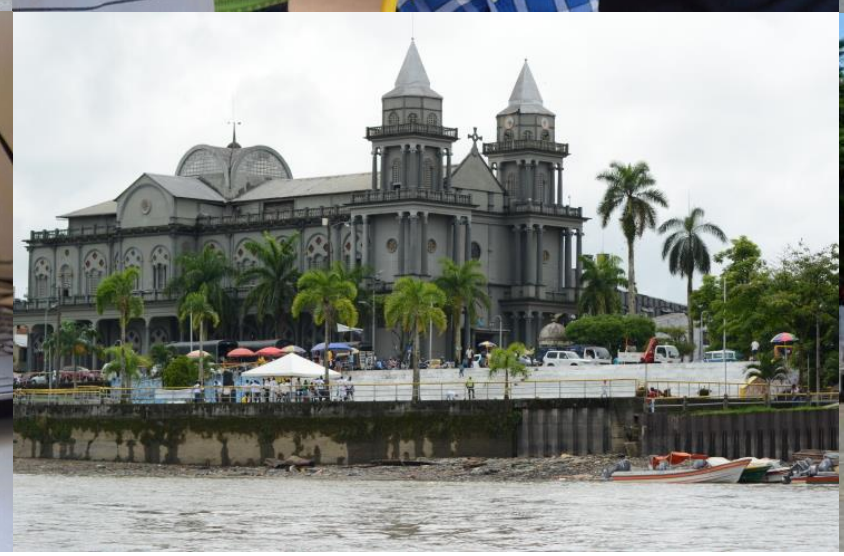
Where?
Quibdó, 5°41′32″N-76°39′29″W

When?
June 25th-July 1st, 2016.

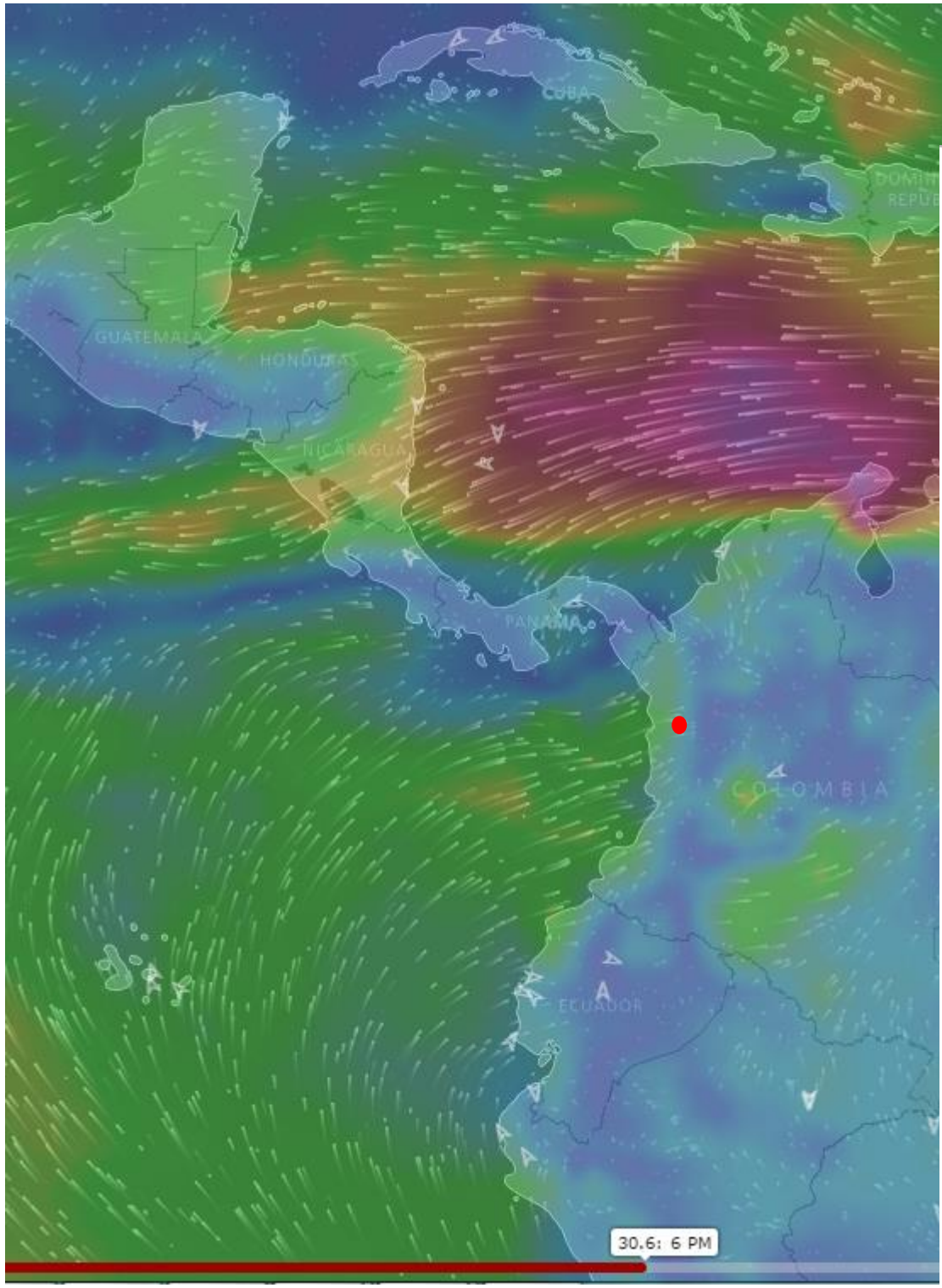
How?
Soundings every 6 h using MW41 Vaisala system

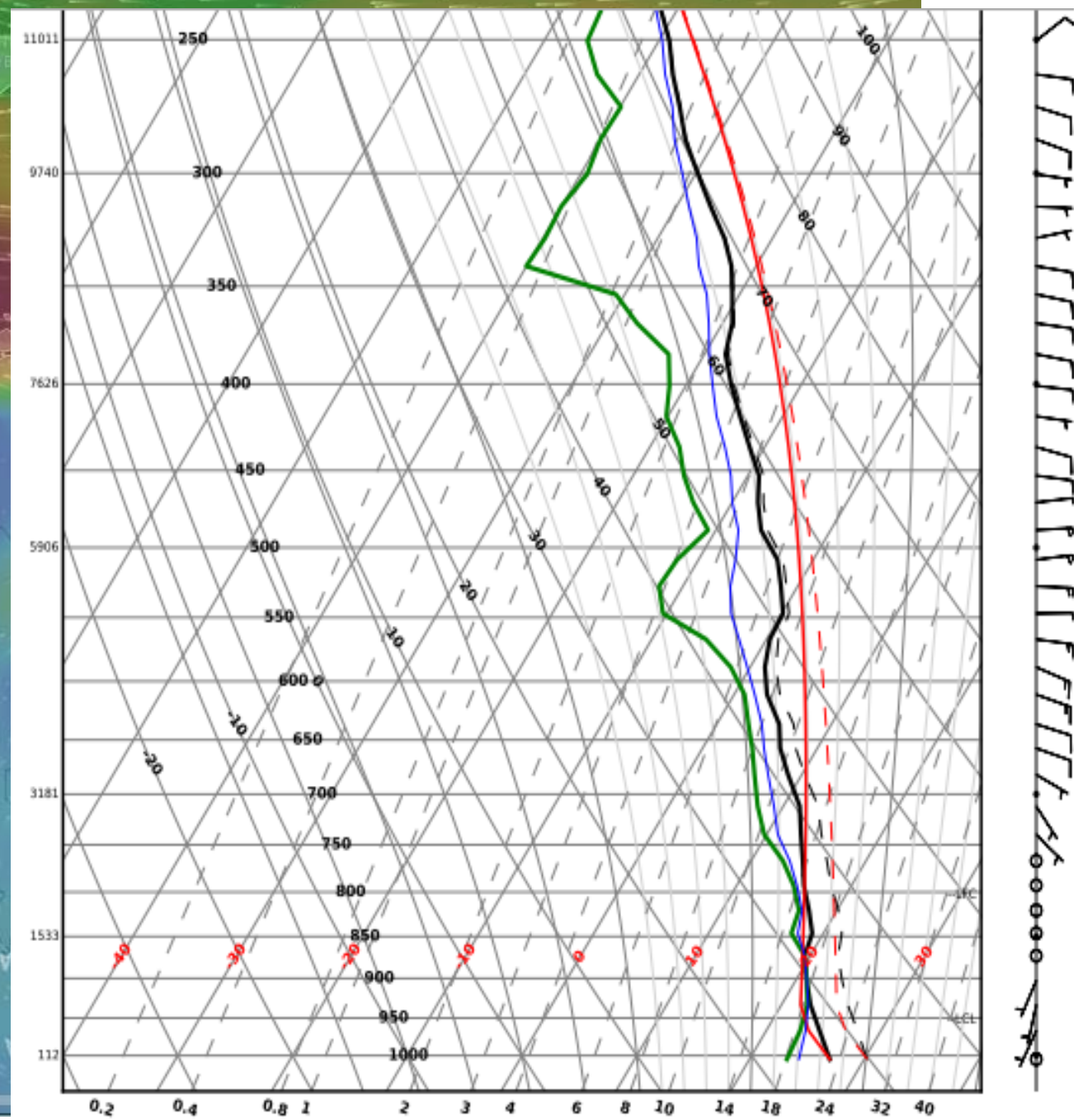


IOP No.2 over Land:
Quibdó, June 2016



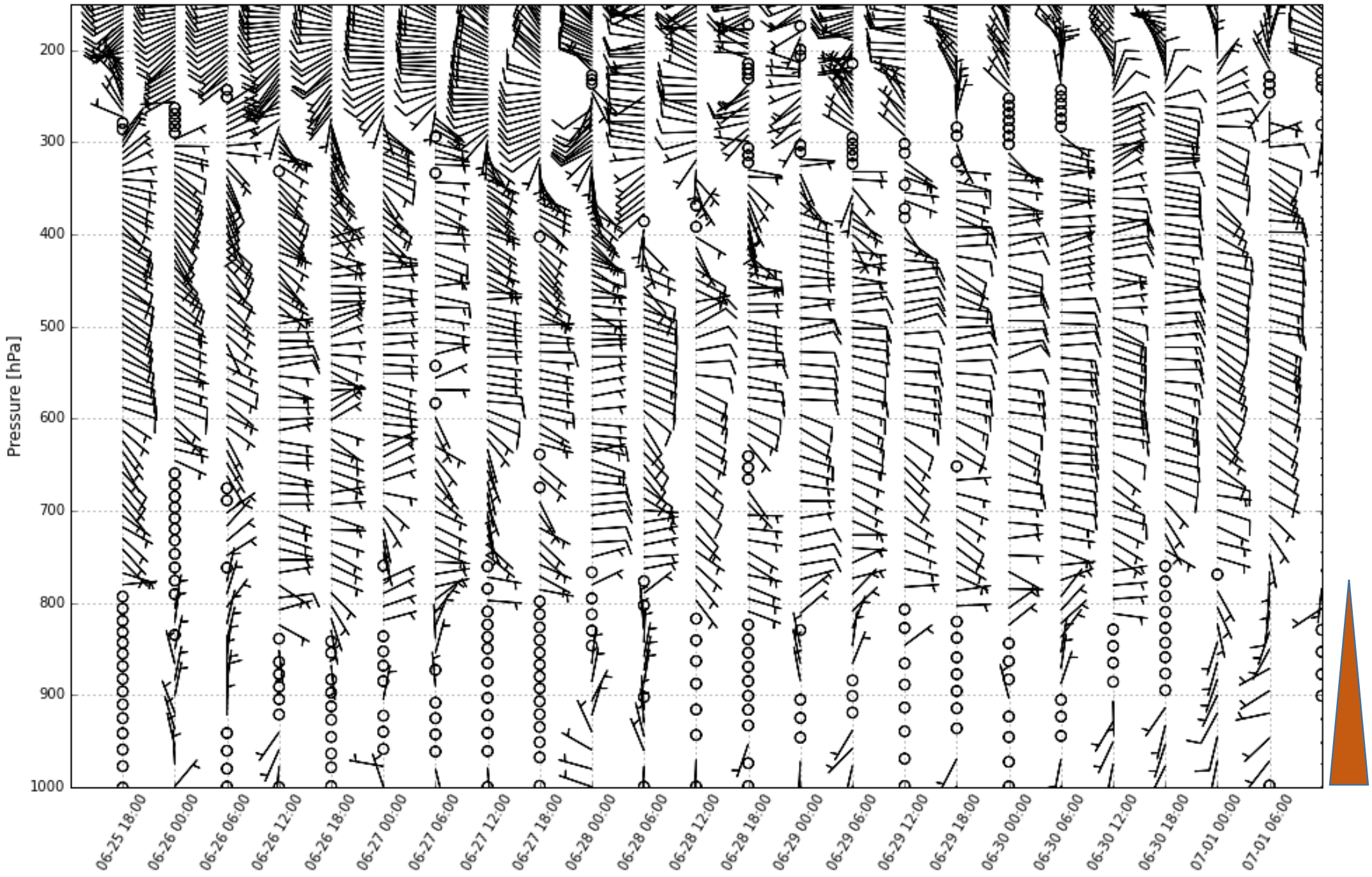
Typical sounding: Wet sounding



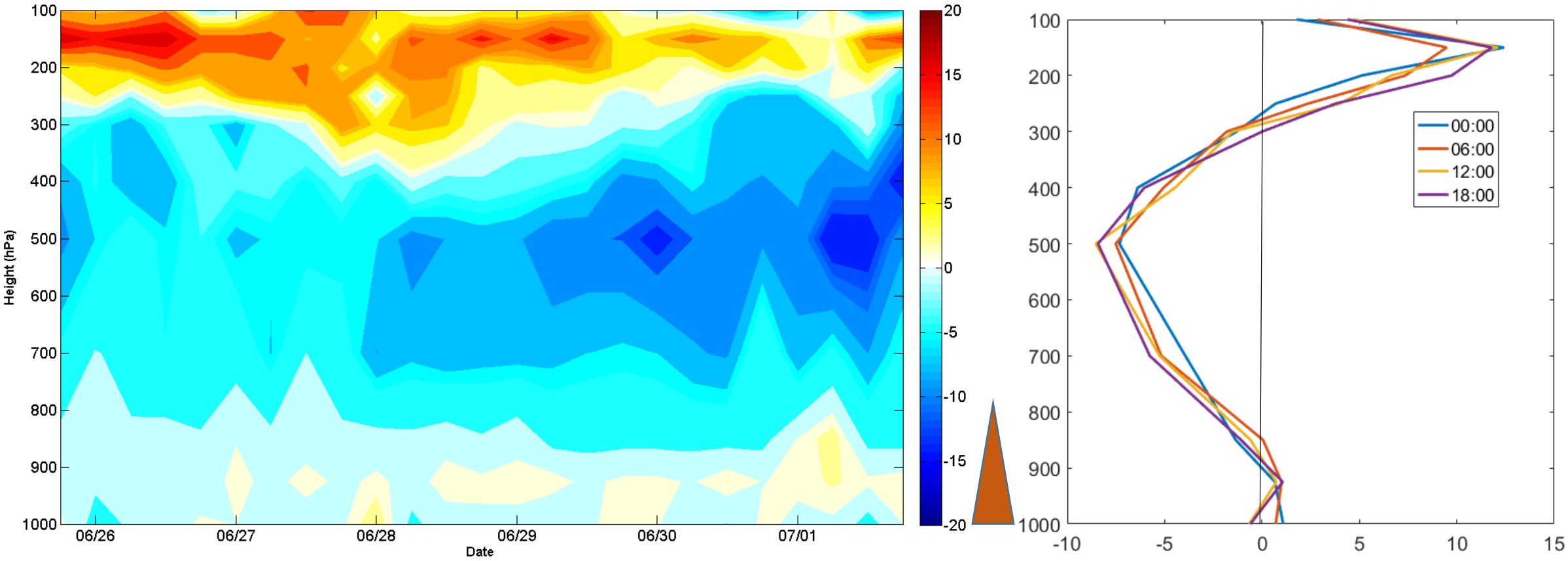


GFS Winds at 925 hPa 2016-06-30 18:00

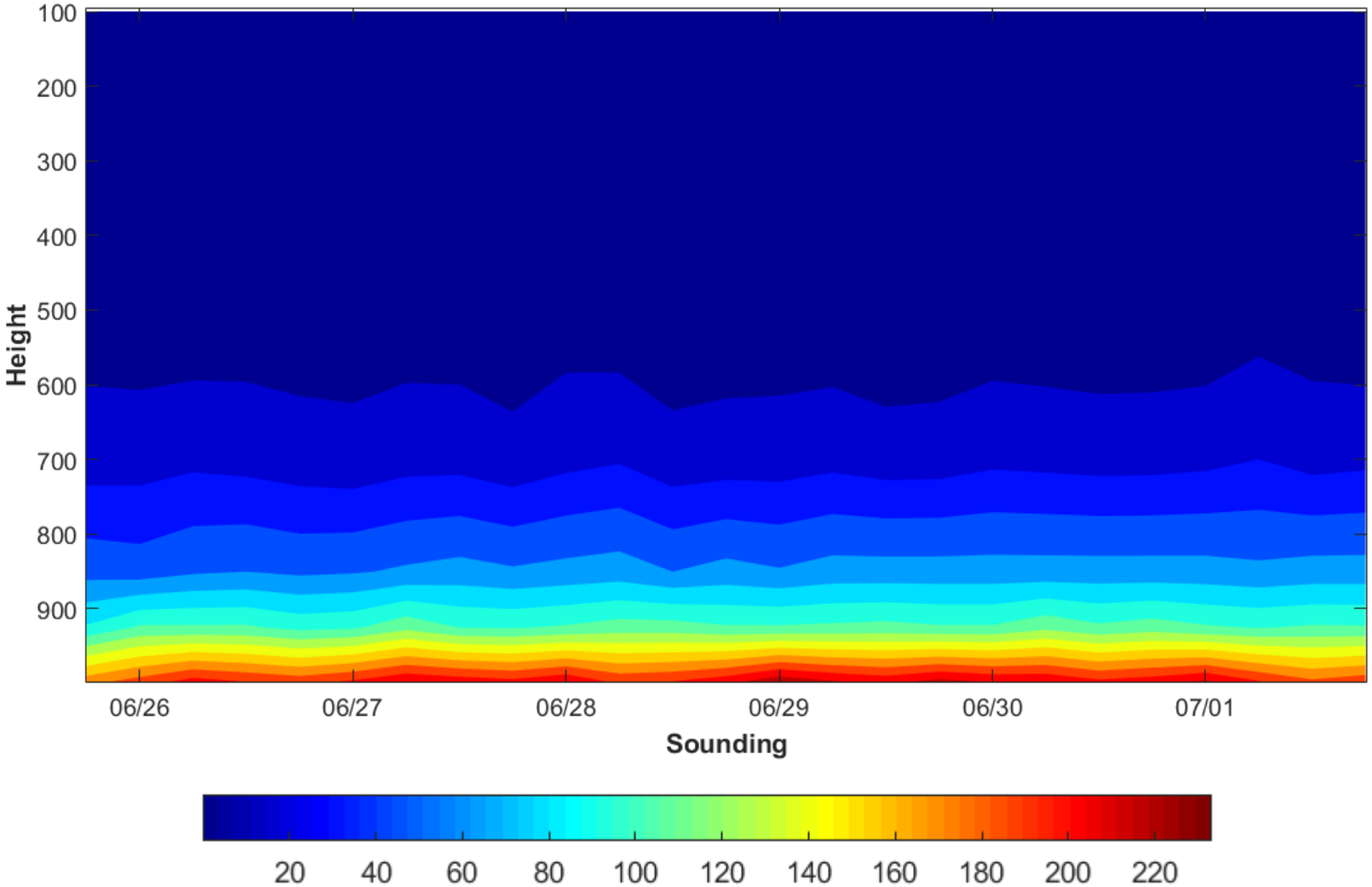
Winds, Quibdó- June 2016

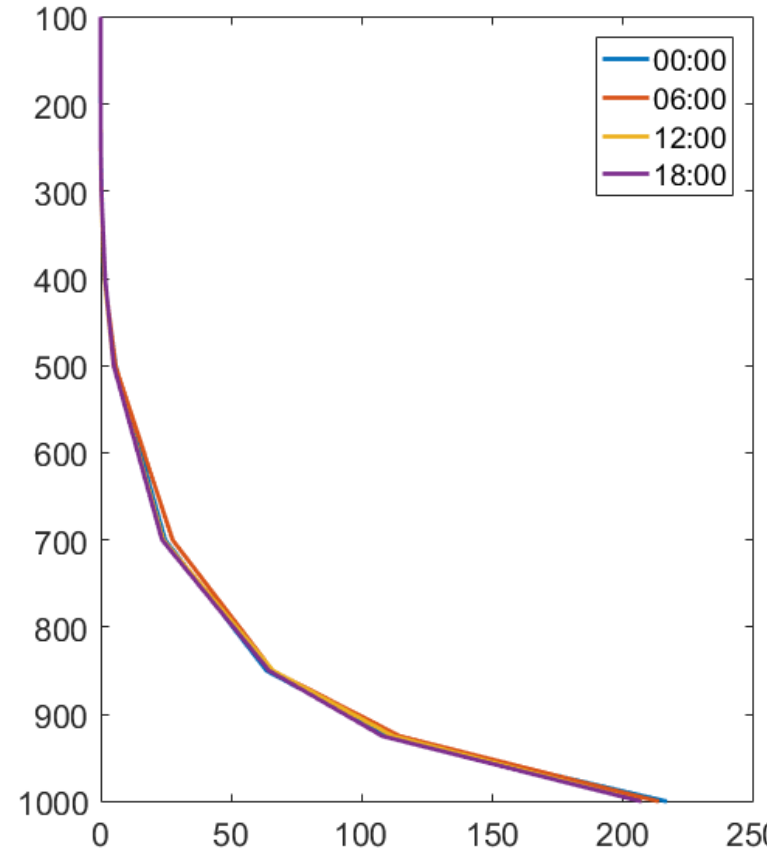


Zonal wind (m/s) Quibdó - June 2016



Specific humidity (g/kg) Quibdó - June 2016





Initial Conclusions

Interinstitutional network

- For the first time Colombian Public Institutions and an American Institution get together to improve the understanding of the far eastern Pacific climate.
- Field campaigns depend on financial and logistic resources within an interinstitutional framework.

First IOP

- Predominance of northeasterlies in superficial levels and easterlies with dry mid-atmosphere over Colombian Pacific Ocean during strong El Niño in January 2016.
- According to GFS model and Poveda & Mesa (1999) and Amador (2006): northwesterlies associated with Caribbean Low Level Jet in January 2016 and southwesterlies from Choco Low Level Jet in June 2016.

Initial Conclusions

- Evidence of easterlies low level flow with relatively strong diurnal variability (enhanced early morning easterly flow) likely related to the influence of the continent.
- Interannual (El Niño) and seasonal (Caribbean Low Level Jet) features probably move southward the southwesterly flow during IOP1 (Douglas *et* al., 2008).

Second IOP

- Wet soundings up to upper levels with predominance of southwesterlies in superficial levels associated with Choco Low Level Jet (Poveda & Mesa, 1999) and easterlies above 800 hPa.
- Remarkable topographic blocking of the air flow (easterlies) in Quibdó during IOP2.
- Strong diurnal variability of the zonal wind and relative humidity in superficial levels with wet easterlies at noon related to the valley breeze.

Acknowledgements

- Team of Renewable Energy from Universidad Tecnológica del Quibdó
- Adminsitrative staff from Unal: Yuly Arboleda and Albanelly Vargas
- Colaborators during IOP's: Leswis Cabeza, Manuela Velasquez, Carlos Forero, Hernan Salas and Mauricio Jimenez