4th July 2012

Air-sea interaction in the Gulf of Guinea at intraseasonal time-scale

Wind bursts and coastal precipitation during boreal spring

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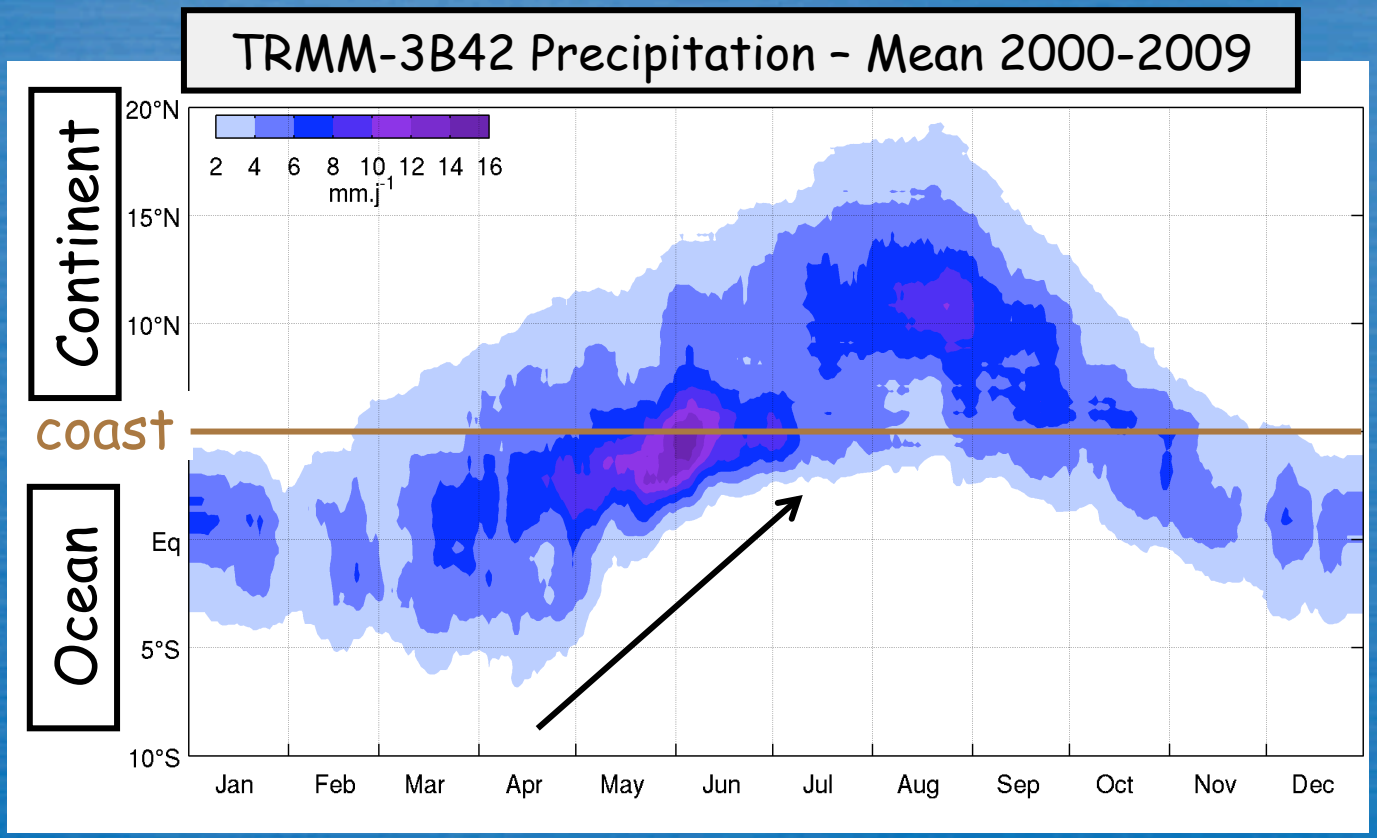
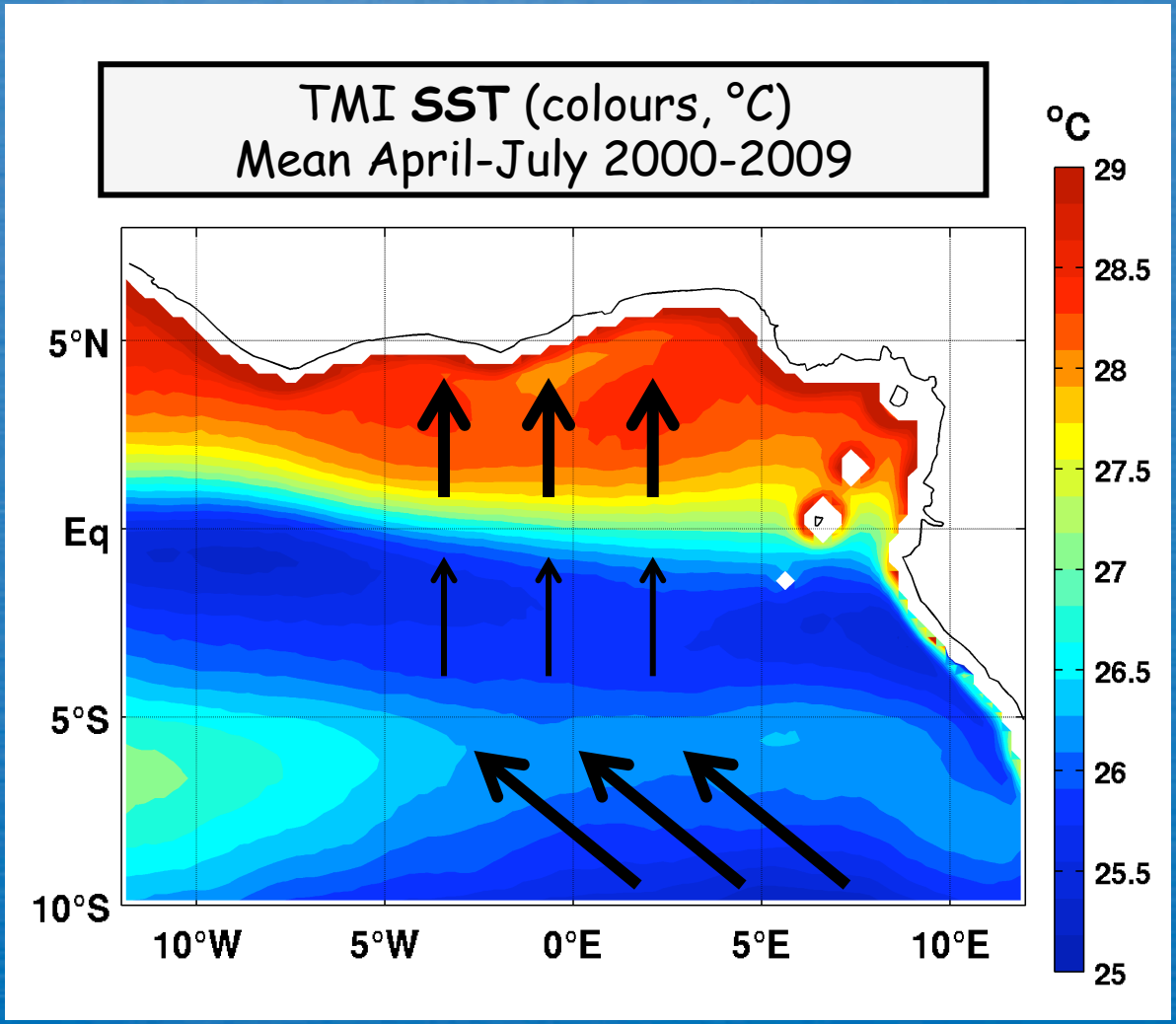
Context



Seasonal evolution of precipitation from ocean to coast between April to July

=> Role of the air-sea interactions ?

Air-sea interactions in Gulf of Guinea: Surface



Southeasterly wind burst

↓ *Marin et al., 2009*

SST cooling south of the equator

↓

Intensification of the SST front

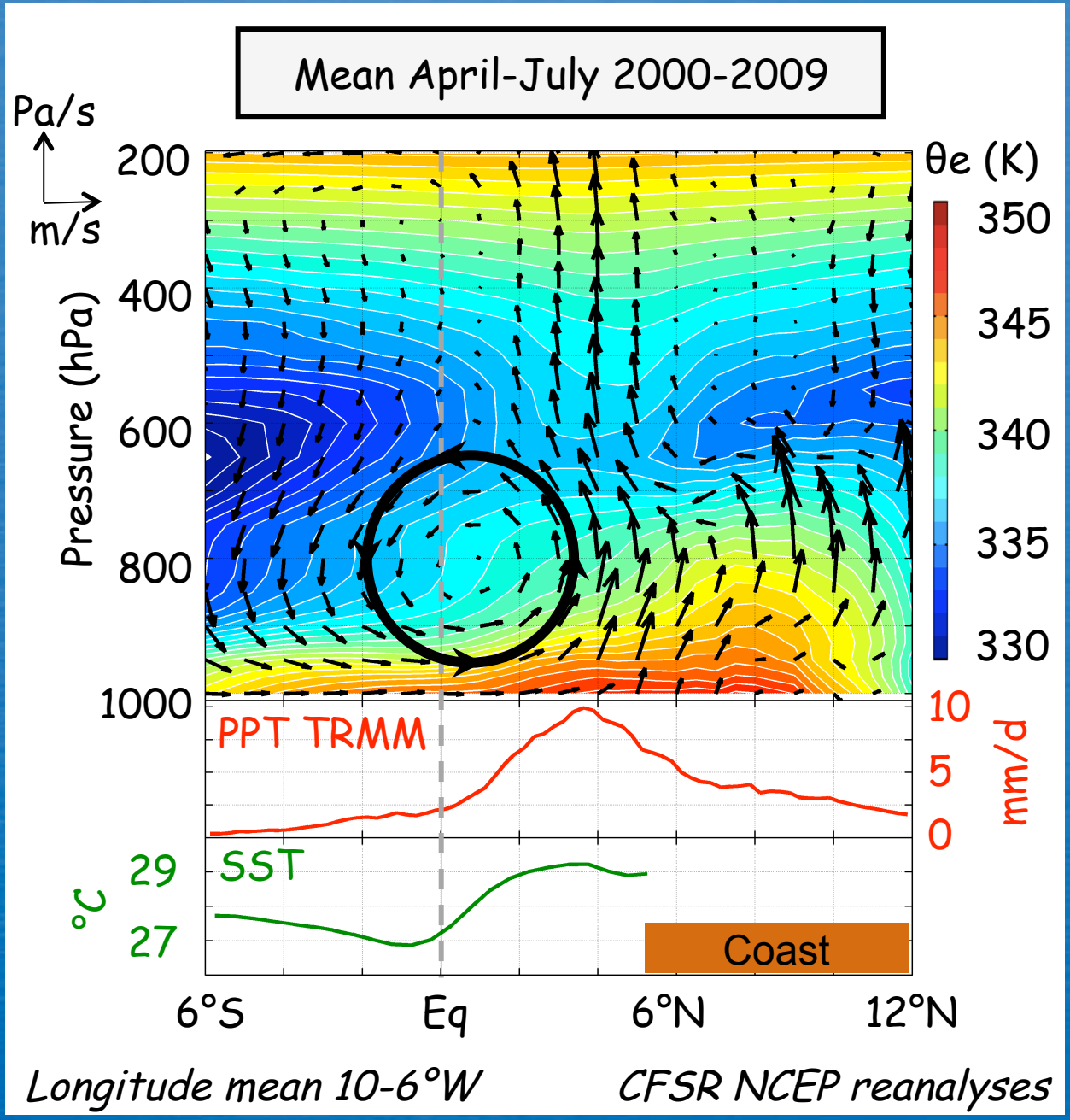
↓ *De Coëtlogon et al., 2010*

Decrease in surface wind above colder SST

+

Increase in surface wind above warmer SST

Air-sea interactions in Gulf of Guinea: Atmospheric circulation

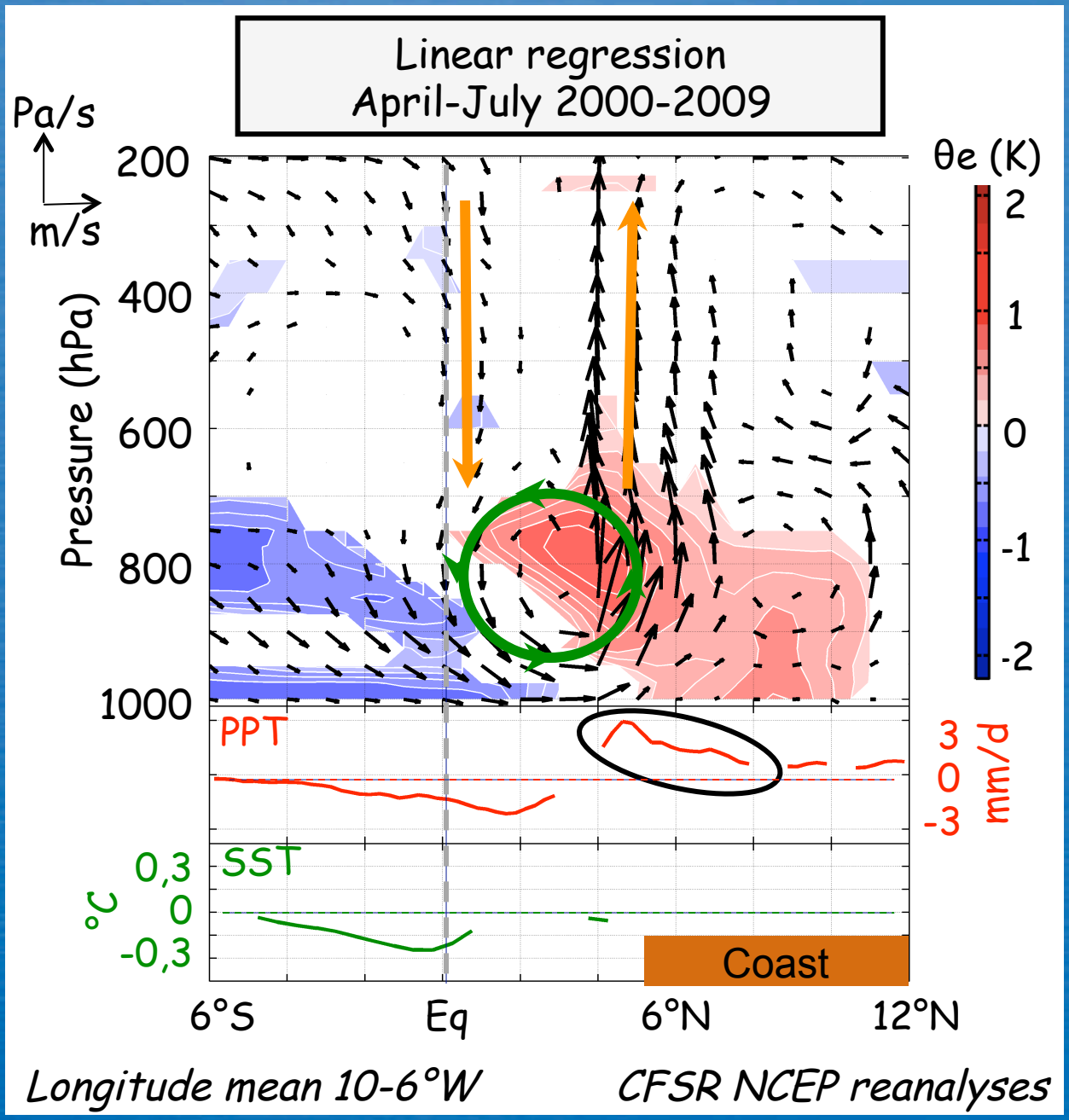


Above cold SST :
- Subsidence
- dry and cold air
- No precipitation

Above warm SST :
- Convection
- wet and warm air
- Coastal precipitation

Low atmospheric circulation

Air-sea interactions in Gulf of Guinea: Atmospheric circulation



SST cooling south of the equator
+
Intensification of the SST front

↓

Increase in surface wind divergence and subsidence in the low atmosphere

↓

Intensification of the low atmospheric circulation

↓

facilities the transport of humidity towards the coast

↓

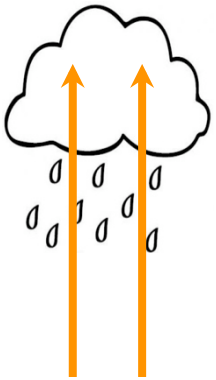
more convection

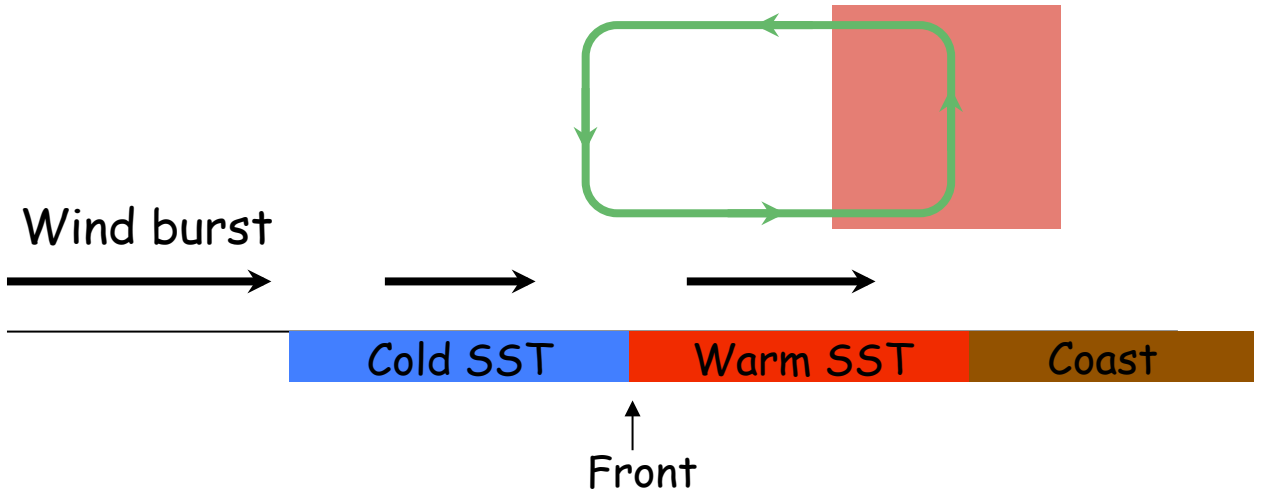
↓

the coastal precipitation increases

An intraseasonal event…

=> a wind burst creates an increase in precipitation in the coastal region, through the SST cooling which intensifies the low atmospheric circulation





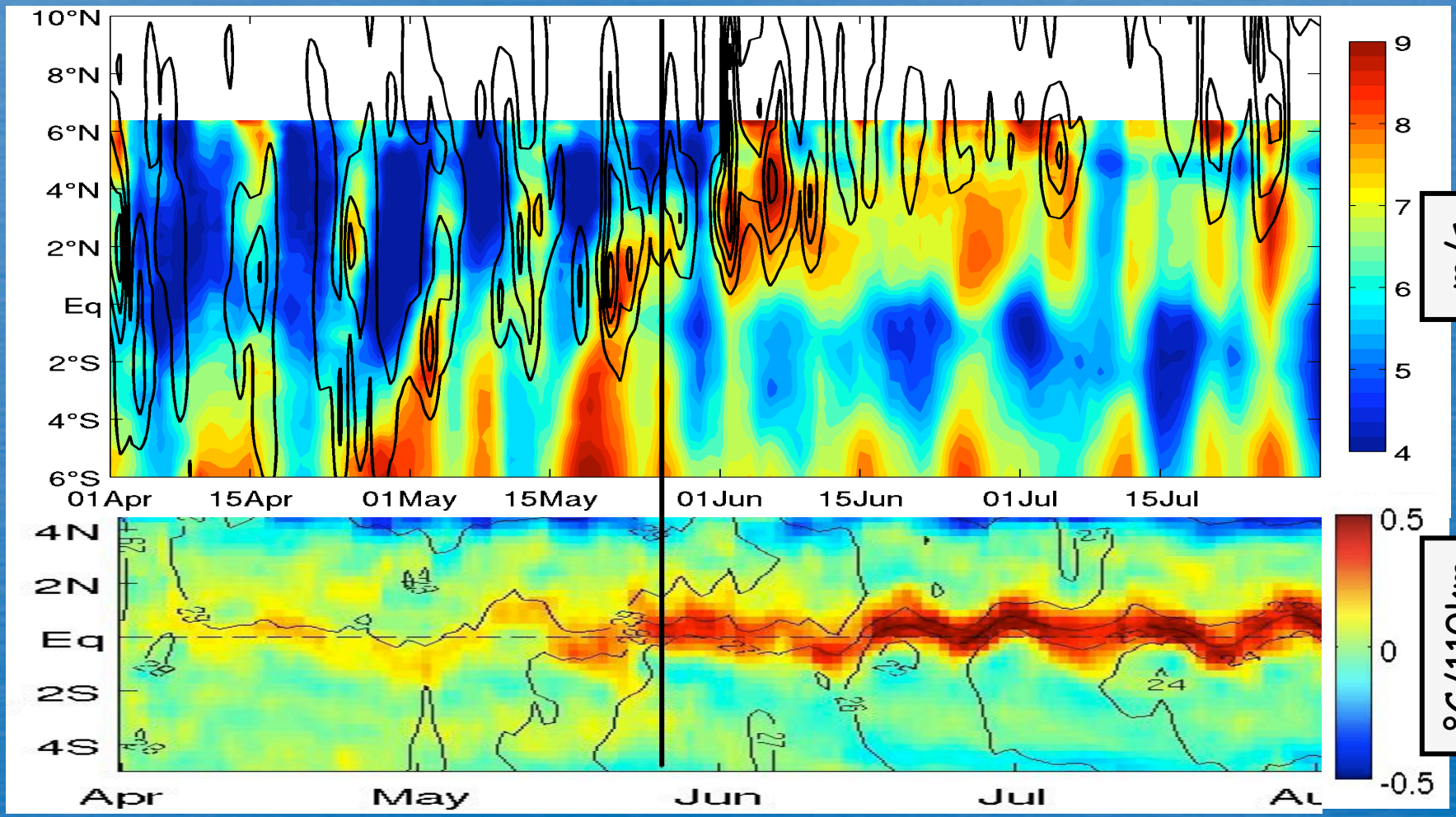
Leduc-Leballeur et al., 2012

… repeated along the boreal spring and summer

2007

QuikScat surface wind (colours)
TRMM 3B42 precipitation (contours)

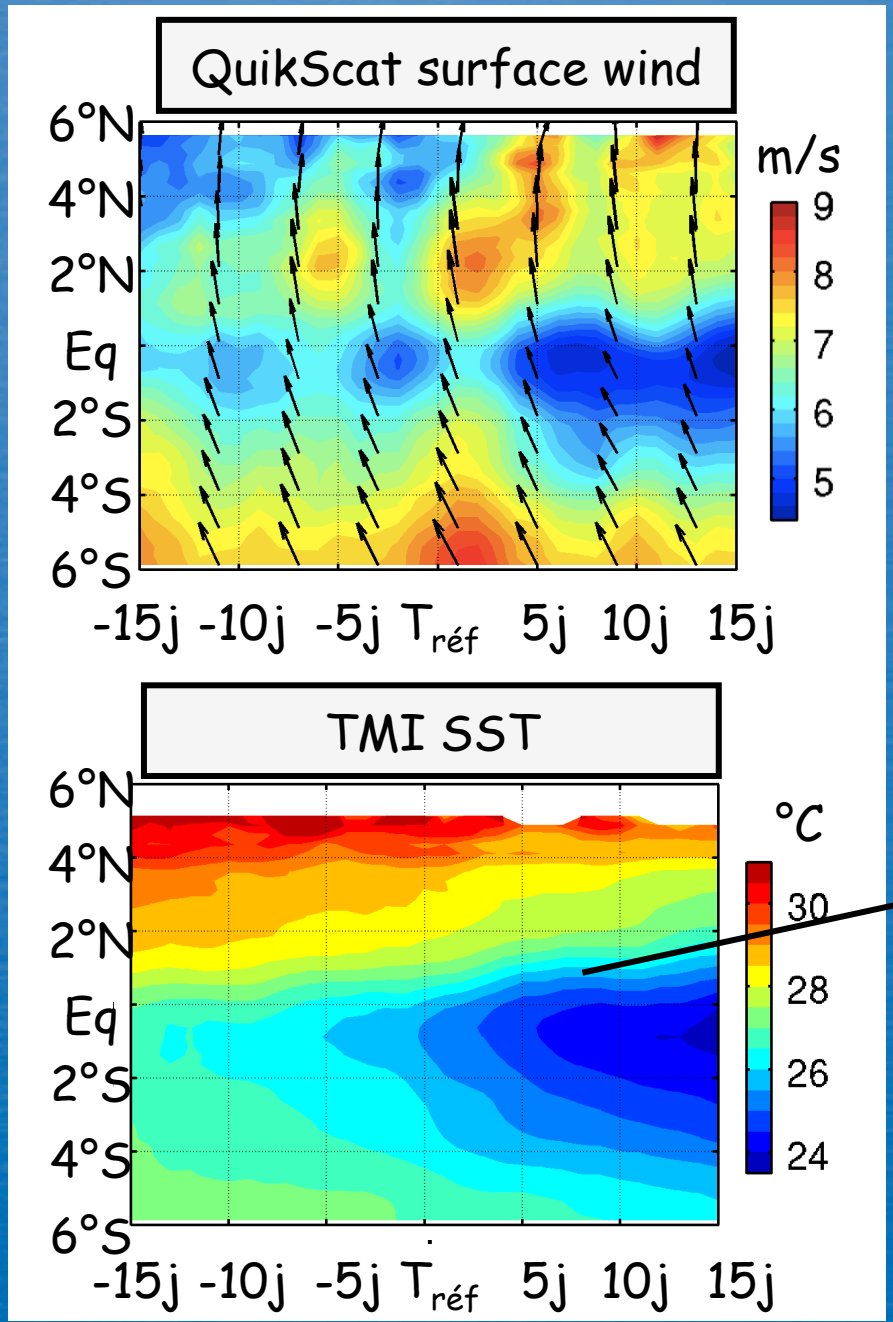
Reynolds dSST/dy



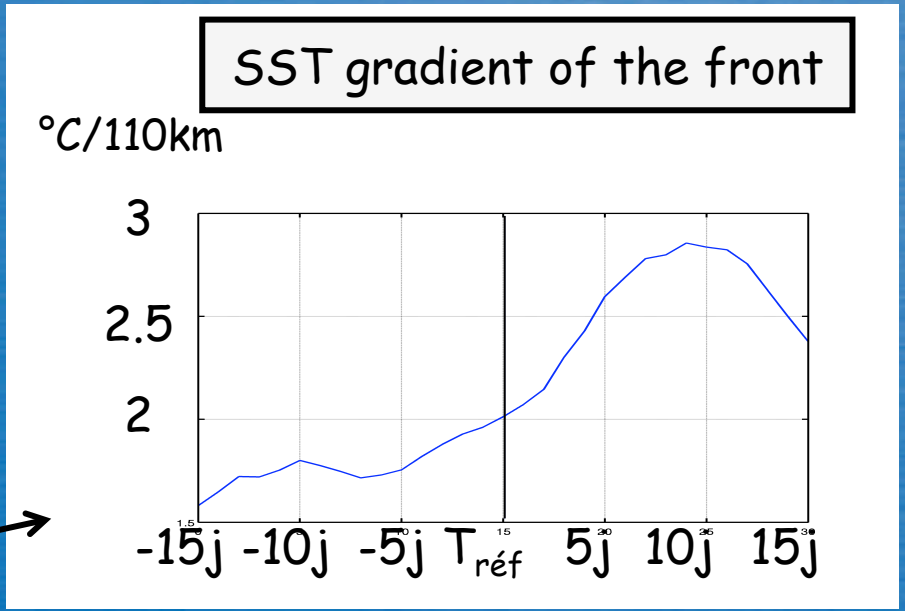
Tref = day when wind(North Area) > wind (Upwelling Area)

In average between 2000 and 2009 : 31st May

Composites 2000-2009



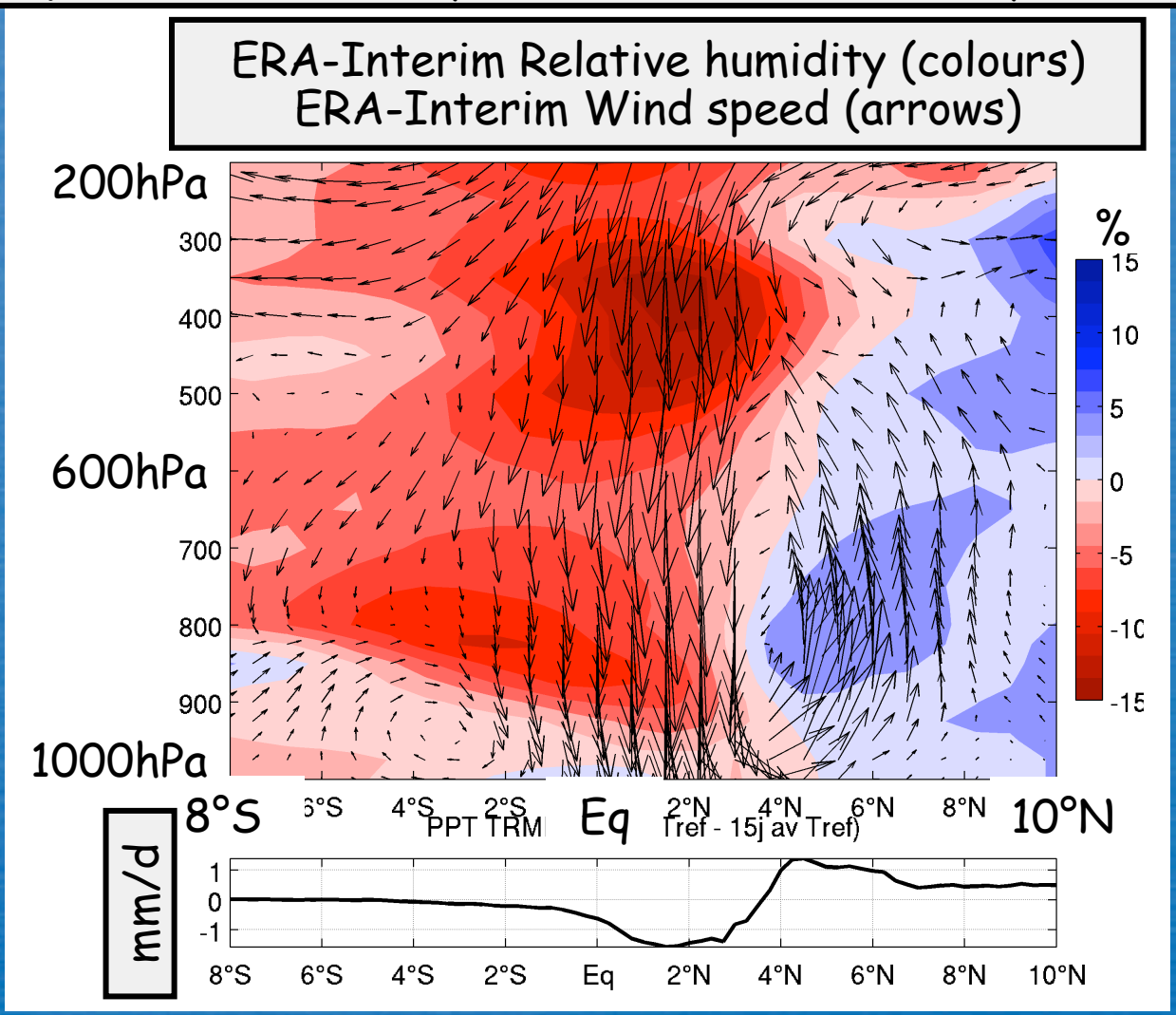
Transition linked to a wind burst event



Strong intensification of the SST front

Atmospheric circulation

Composite of the 15 days after Tref, minus 15 days before:



Above the ocean:

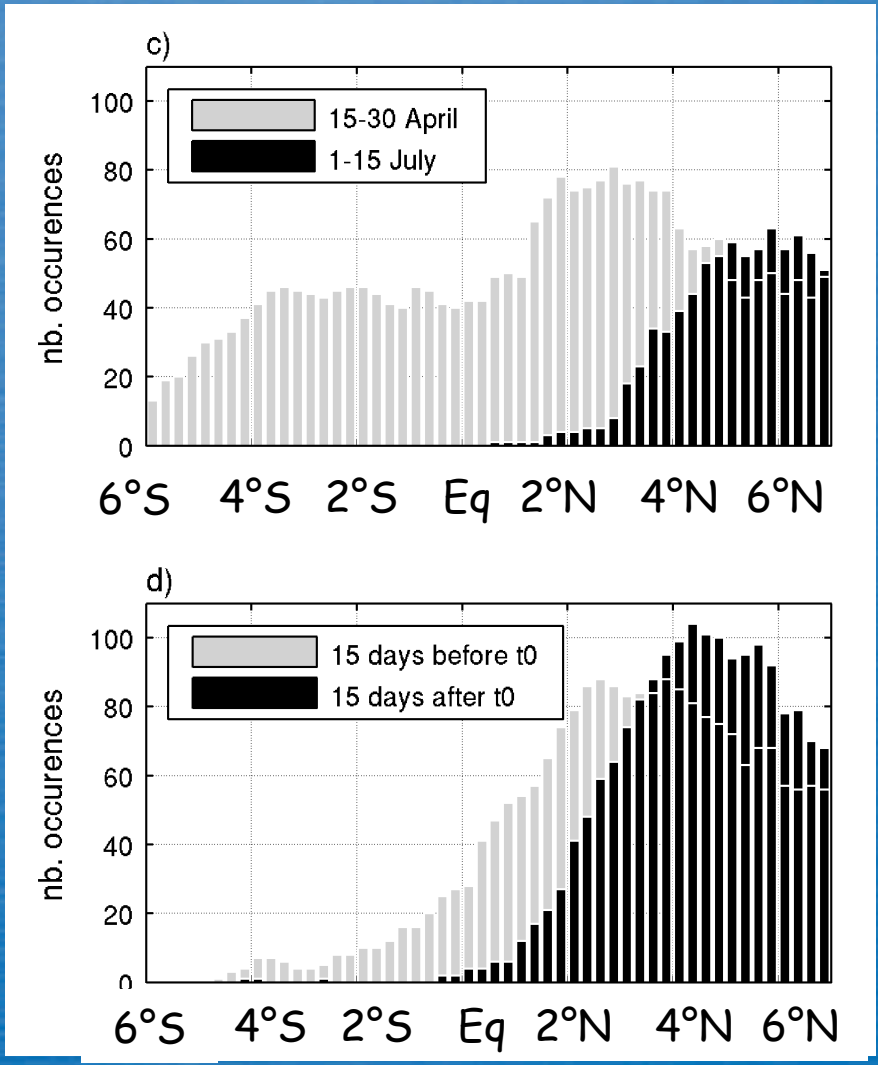
- drier,
- increased subsidence,
- less precipitation.

Above the coast:

- wetter,
- increased convection,
- more precipitation.

Moving of the low atmospheric circulation between the equator and the coast

Comparison with seasonal evolution



*** End of April:**
significant precipitation above the ocean + maximum between 2°N and 4°N

*** Beginning of July:**
maximum around 6°N

*** 15 days before transition:**
maximum at the same place than April

*** 15 days after transition:**
Maximum between 4°N and 6°N

Transition = migration about 2° of precipitation band to the north

Conclusion

- A succession of wind bursts install the SST front north of the equator

- **At the intraseasonal time-scale:** intensification of the low atmospheric circulation = favours precipitations along the coast

- **At the seasonal time-scale:** concentrates the low atmospheric circulation between equator and the coast = stop precipitation above the ocean and concentrate along coast

=> role of the SST front in the displacement of the precipitation from ocean to the coast during the boreal spring.