Characteristics of rainfall onset over northern and southern parts of Senegal

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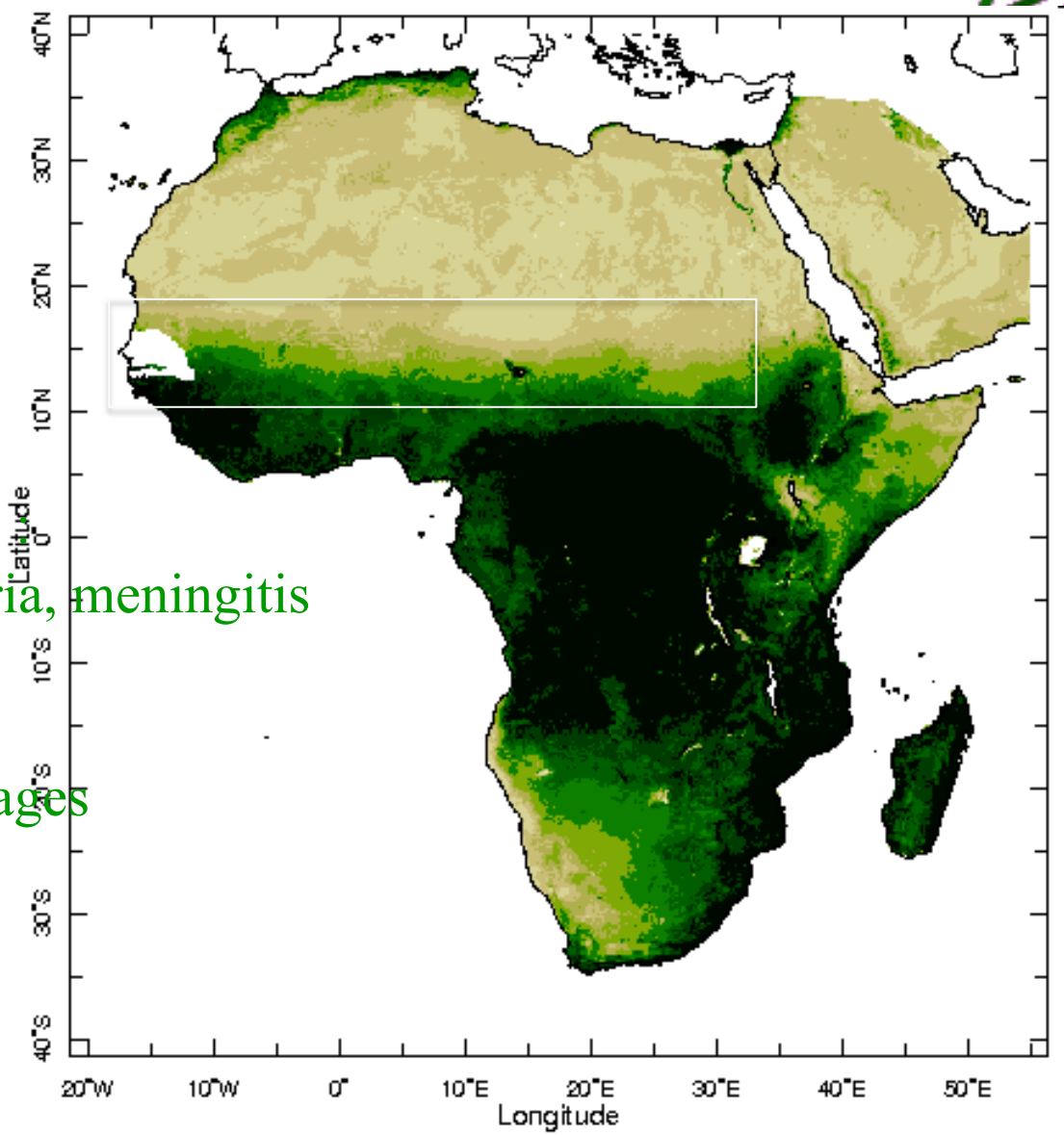
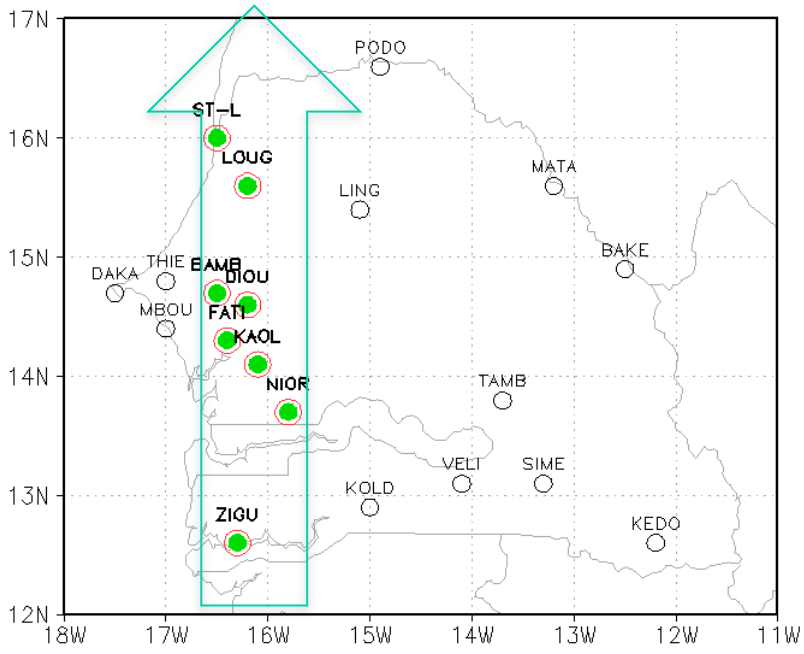
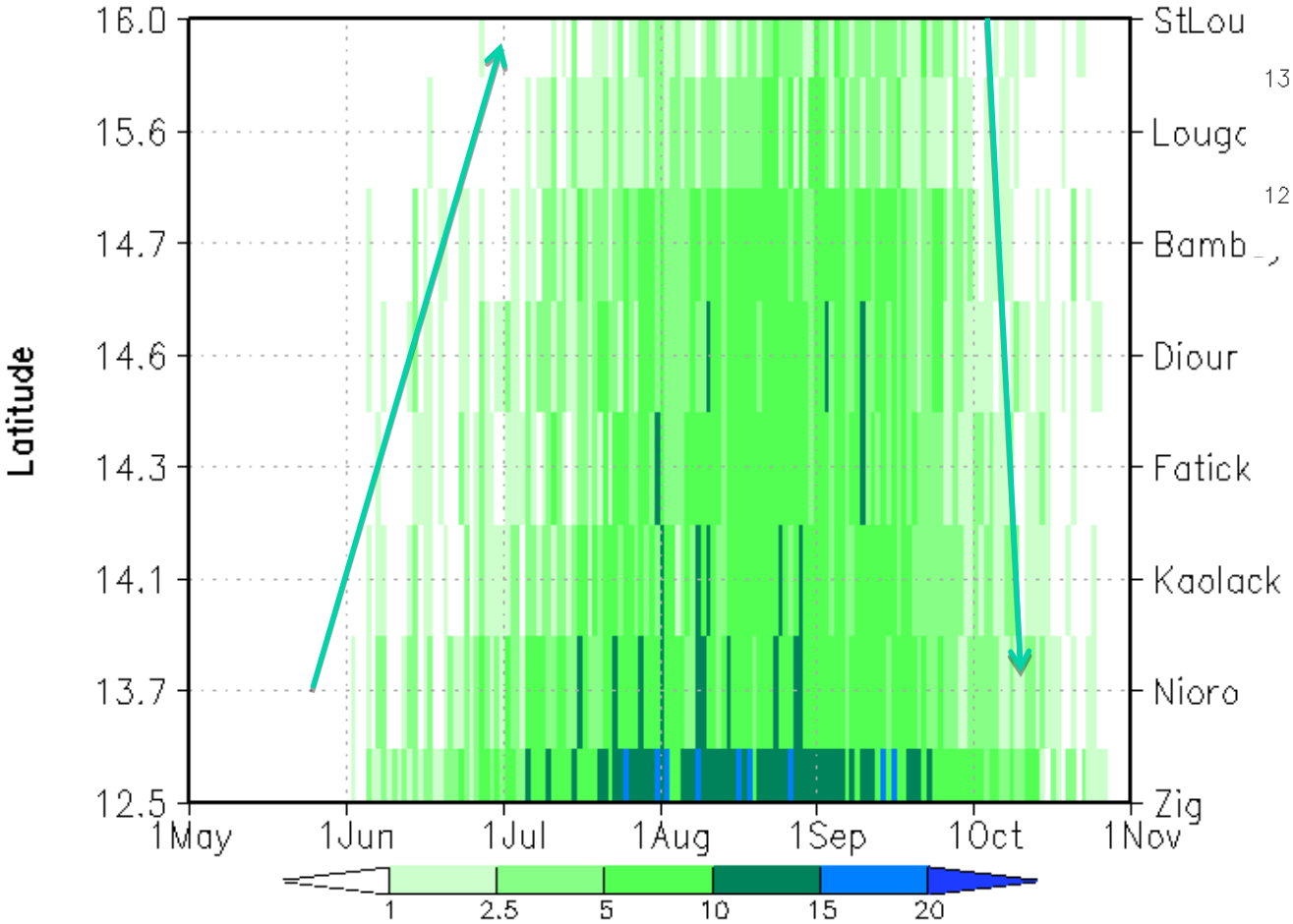
Motivation

- ✓ Short rainy season : 4 months
- ✓ Strong climate variability
- ✓ Huge socio-economical impacts
  - ✓ Health management : malaria, meningitis
  - ✓ Agriculture : rain fed
    - ✓Field preparation
    - ✓Exodus from city to villages
    - ✓Selection of crops
  - ✓ Pastoralism (shepherd)
    - ✓ herd movements
  - ✓ Flooding work in big cities
  - ✓ limited economic resources



Daily rainfall SEASONAL evolution OVER a South to North section.





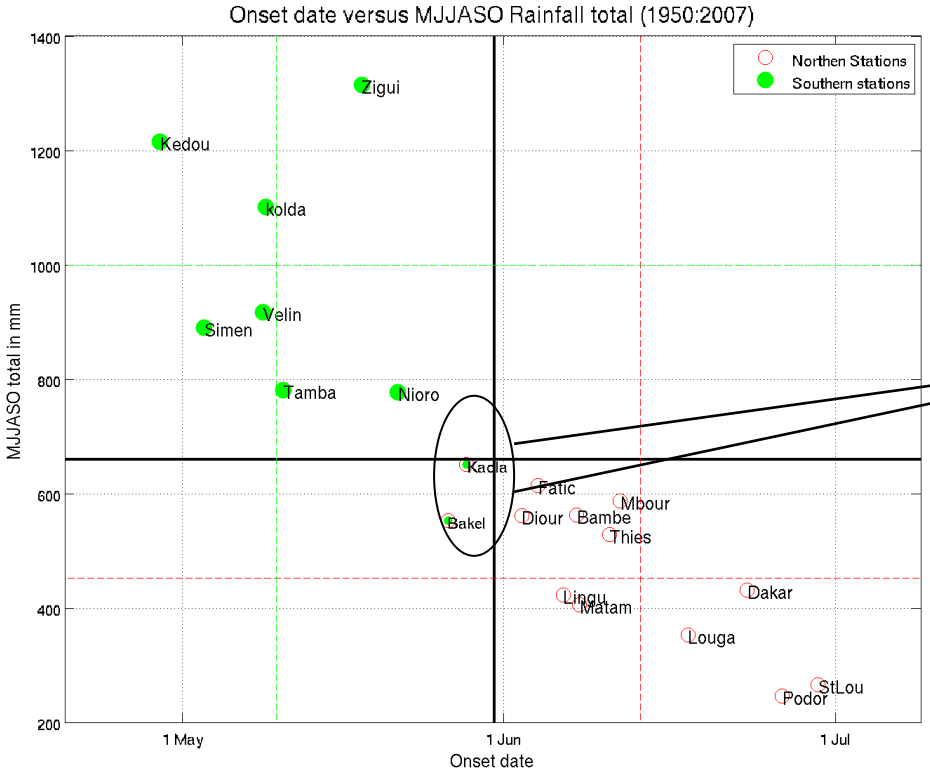
DEFINITION OF RAINFALL ONSET

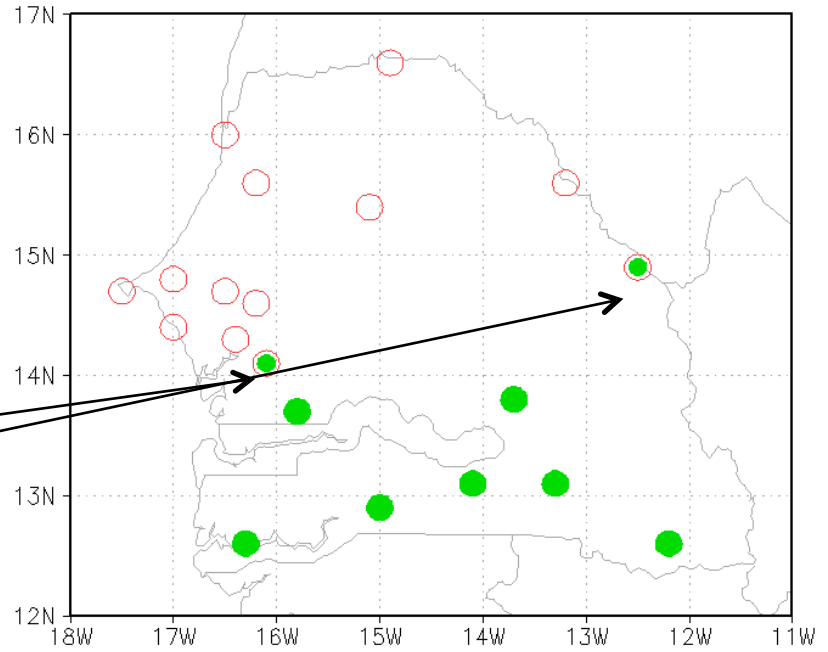
Significant rainfall event : 20mm over less than three-day period

- **First rainfall event** : First onset observed at any station in the region.
- **First large scale rainfall event** : onset observed simultaneously over at least three stations in the region

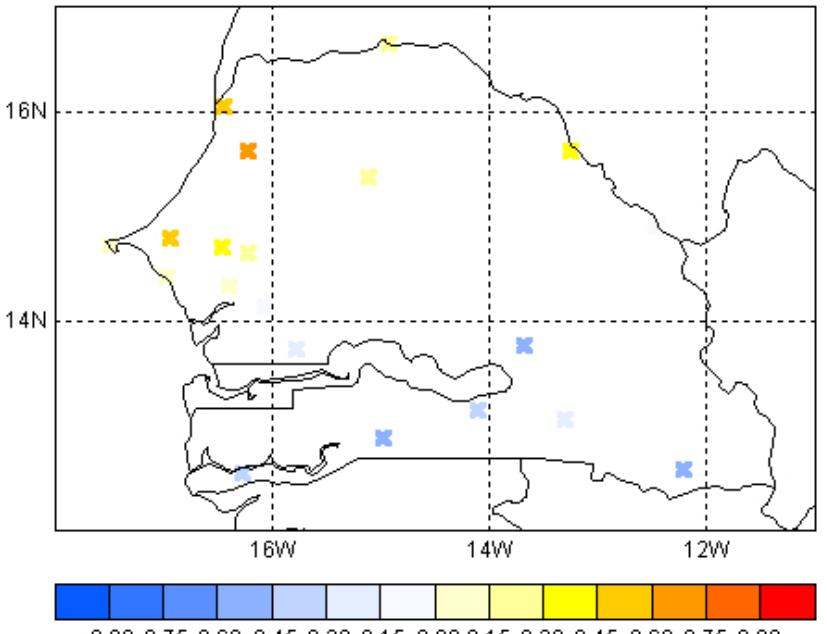
- Separate :
  - **true start** : first event not followed by “severe” dry spell
  - **False start** : followed by “severe” dry spell

Northern and southern regions division in Senegal

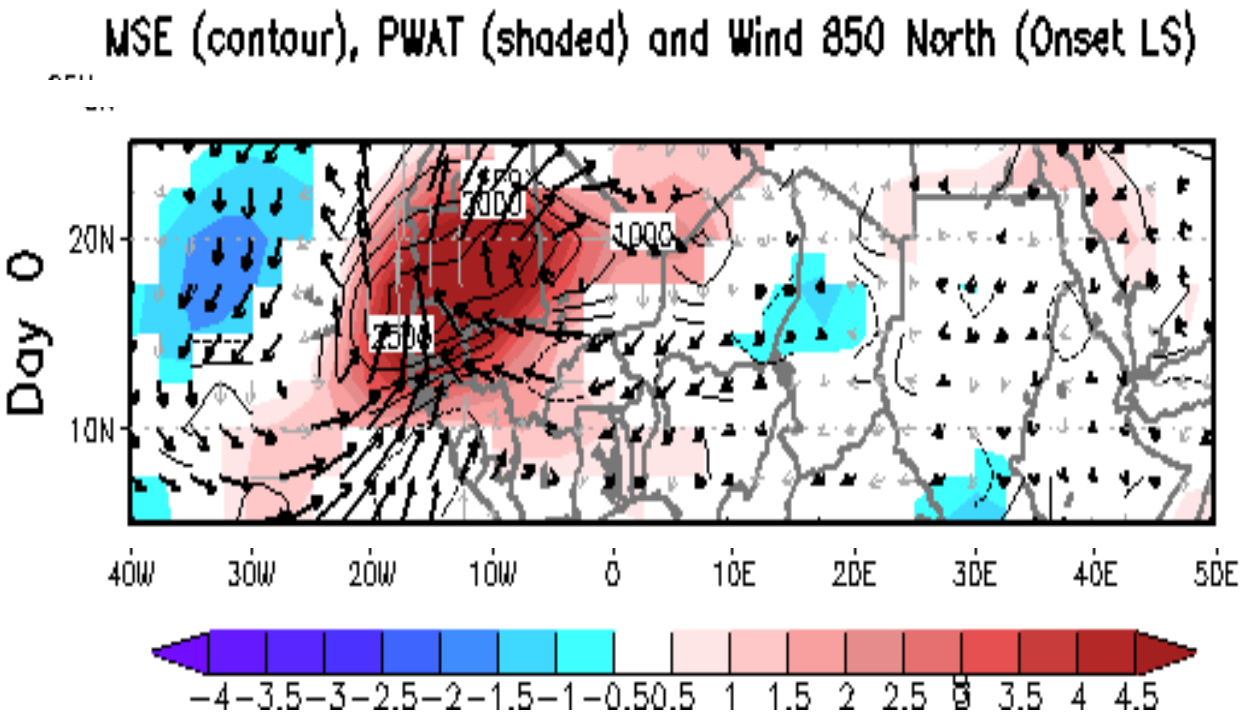




EOF2 (13%) of first onset date 1968-2008

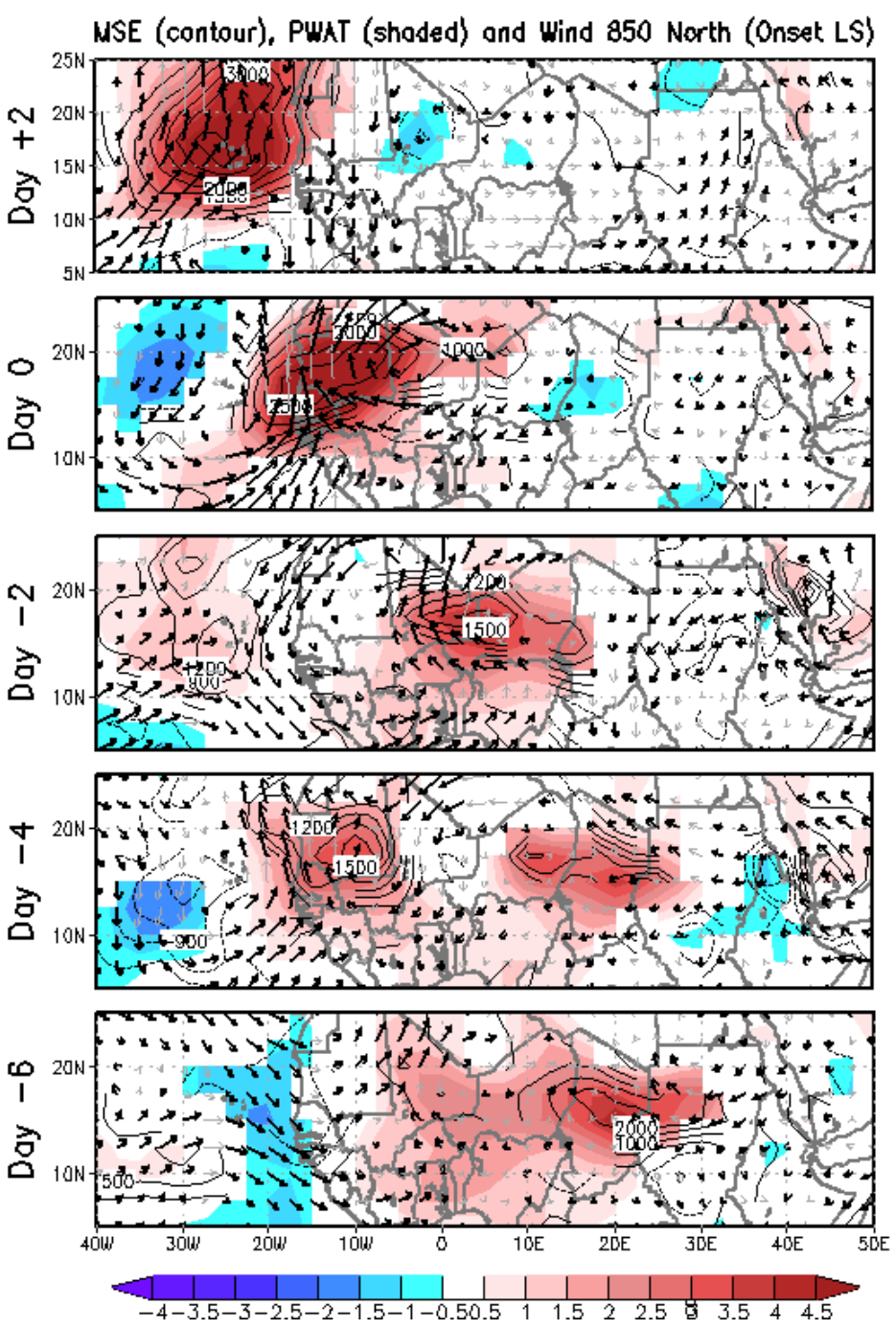


DYNAMIC OF THE ATMOSPHERE AROUND THE TIME OF THE ONSET

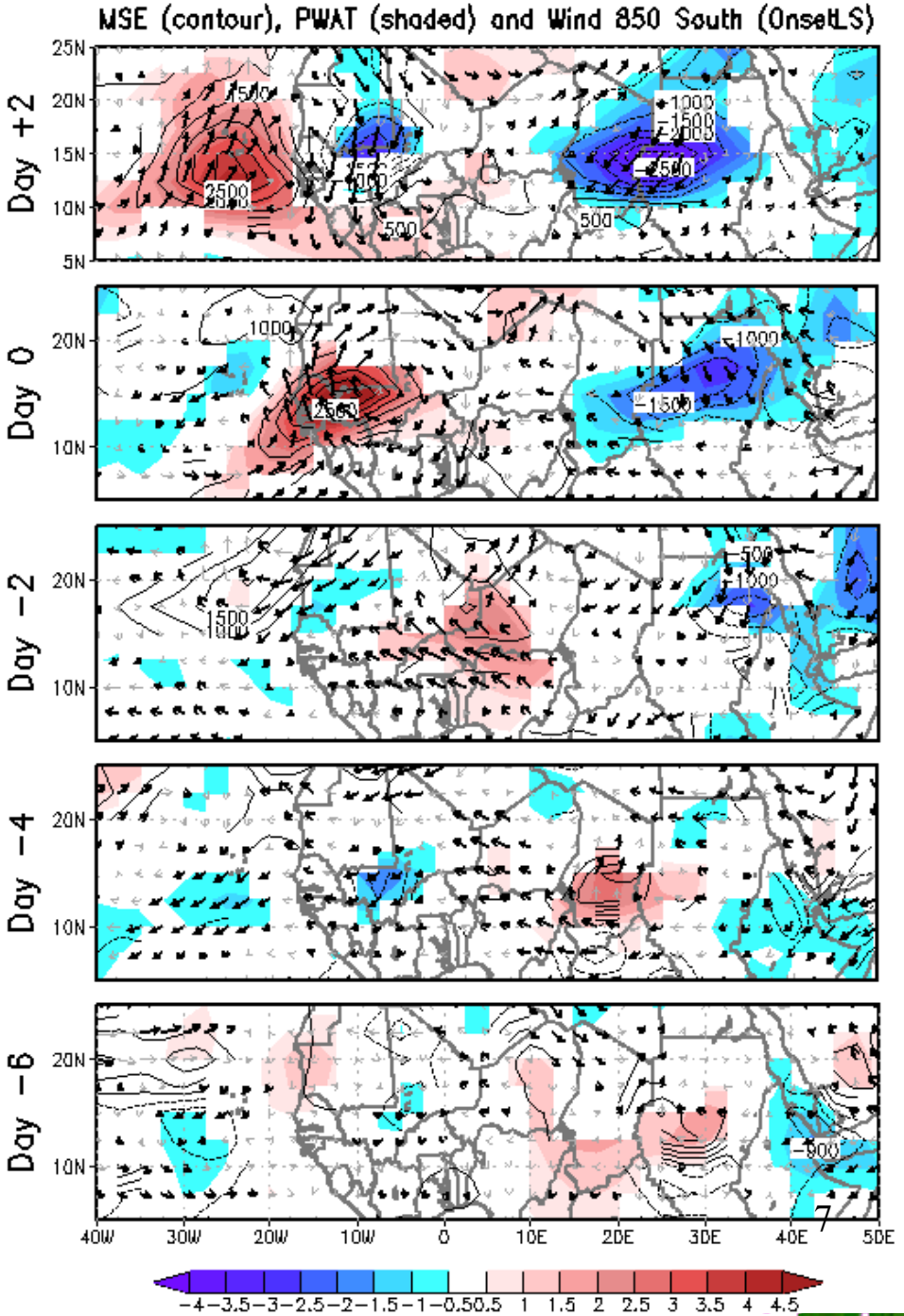


Propagation around the first regional Onset event

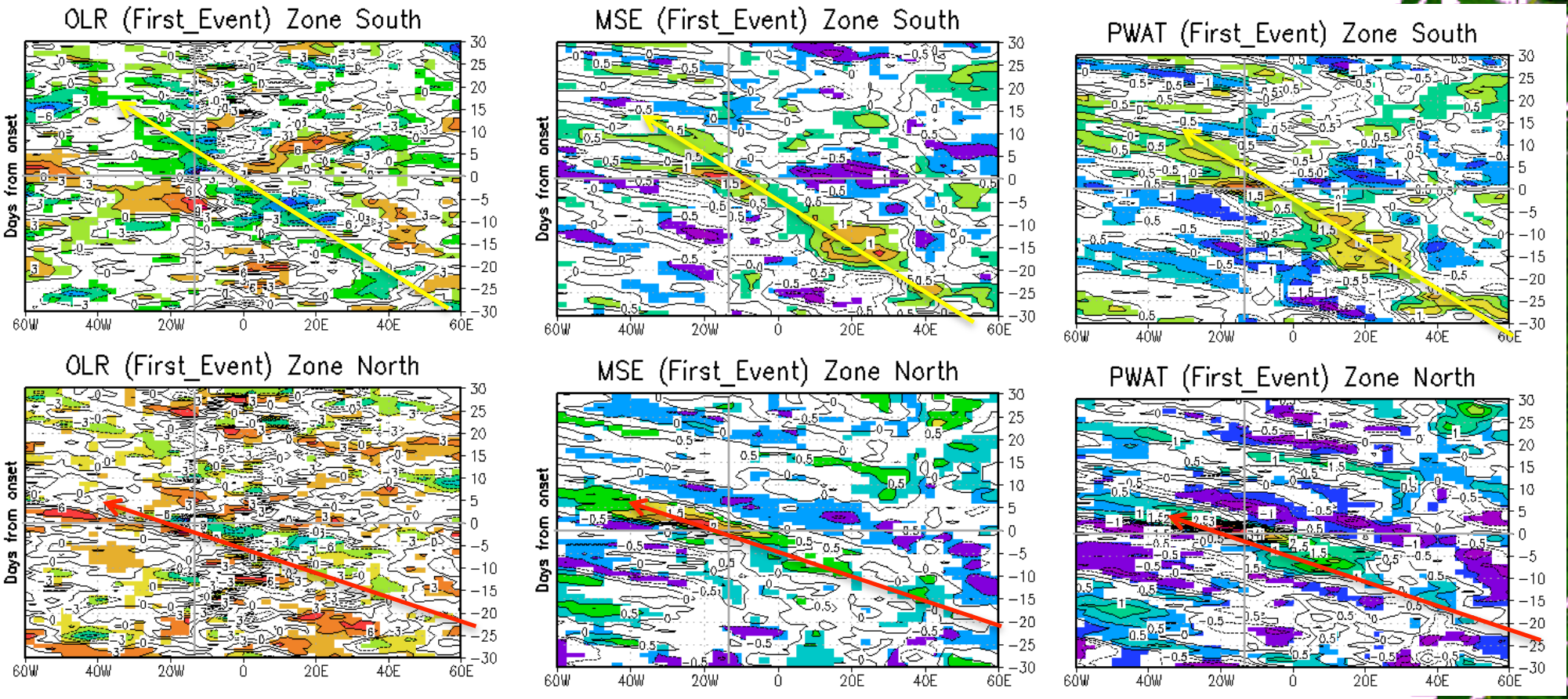
NORTH



SOUTH



Atmospheric wave propagation around the first significant rainfall event for the northern and southern region (different speed)



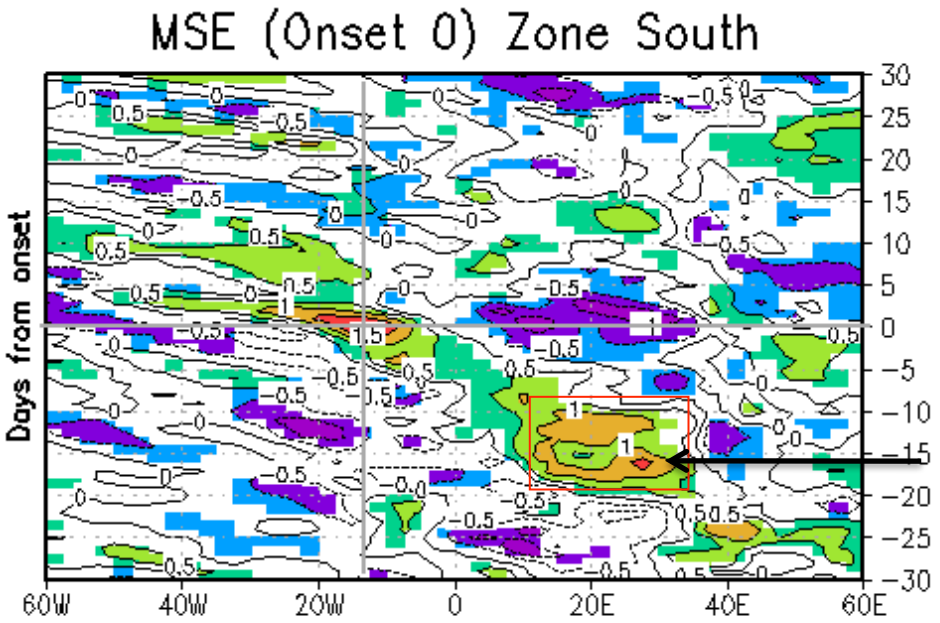
Estimate :

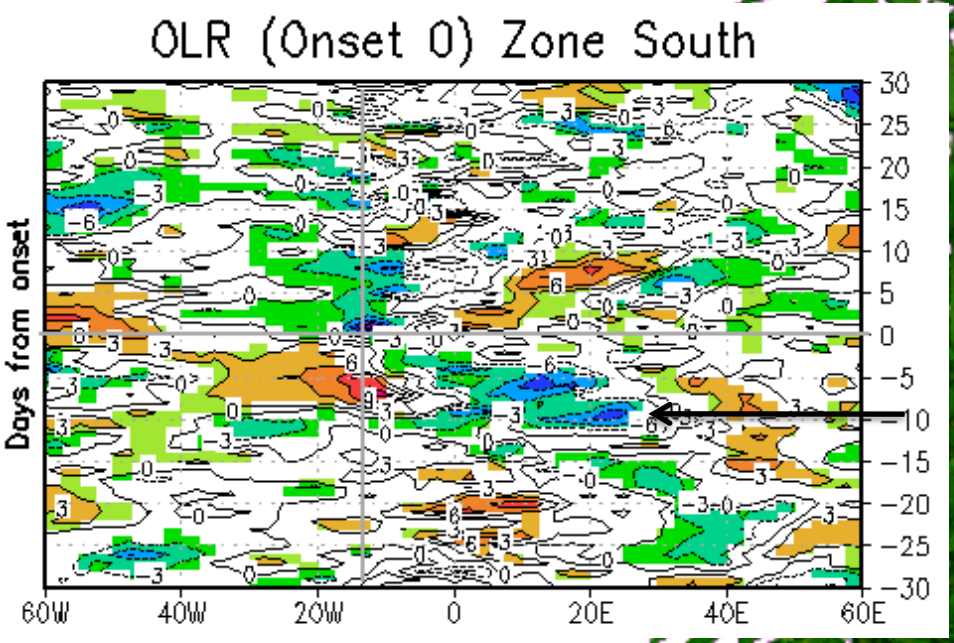
North : 35° in 5 days ≈ 8.5 m/s (easterly wave 3-5 days 15°N, Diedhiou et al. 2008)

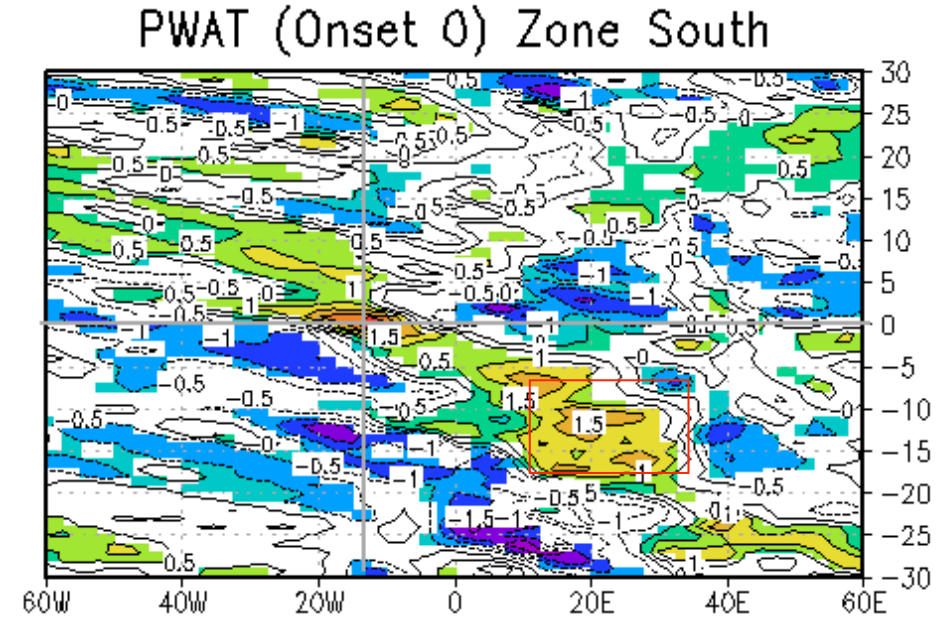
South : 37° in 17 days ≈ 2.8 m/s

10N-20N OLR time space evolution around the onset date

First event



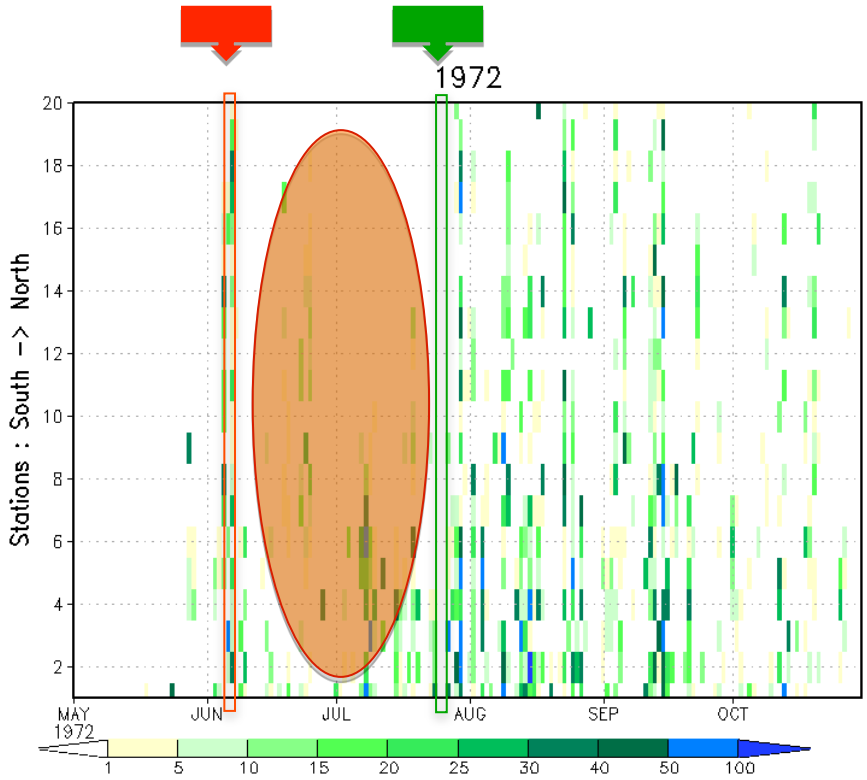




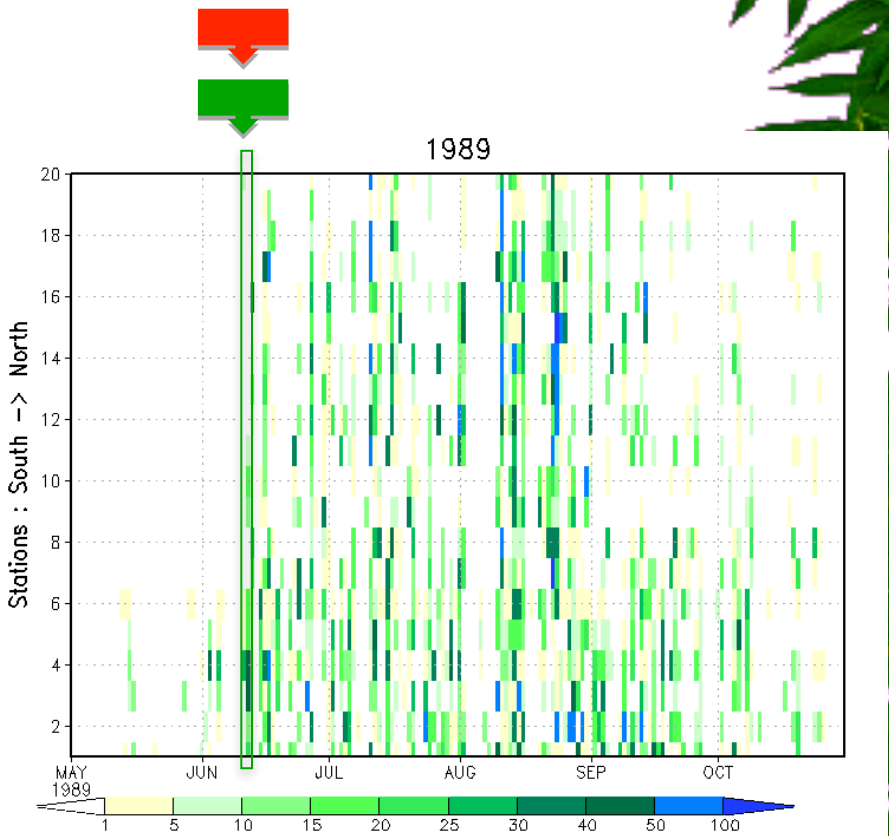
Example of true versus false onset

Same period of onset but followed by dry spell which affect any planning

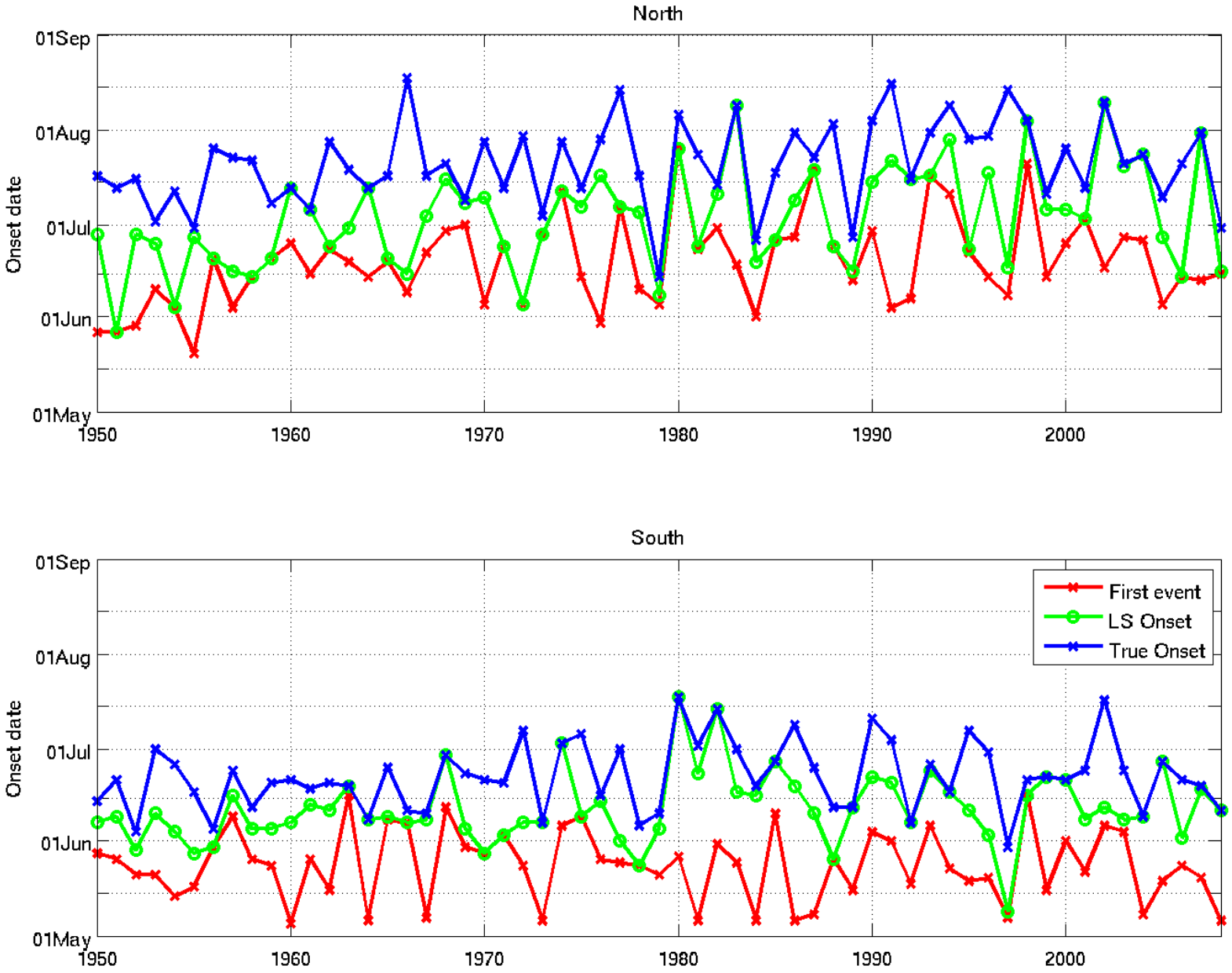
False Start



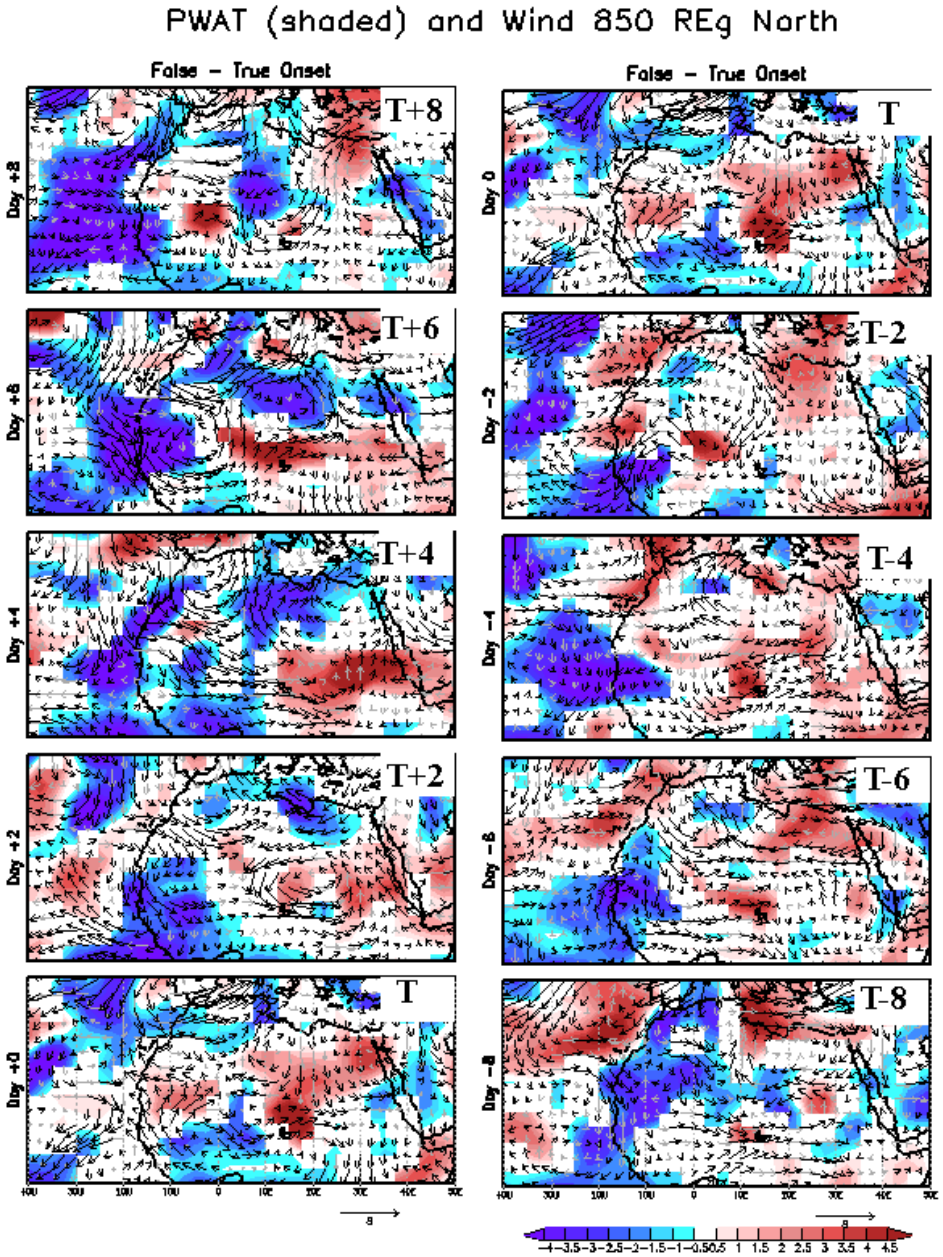
True Start



onset indices : first event , first regional onset event and true onset.



False Start MINUS True Start – Evolution of Atmosphere Before, during and after the rainfall event



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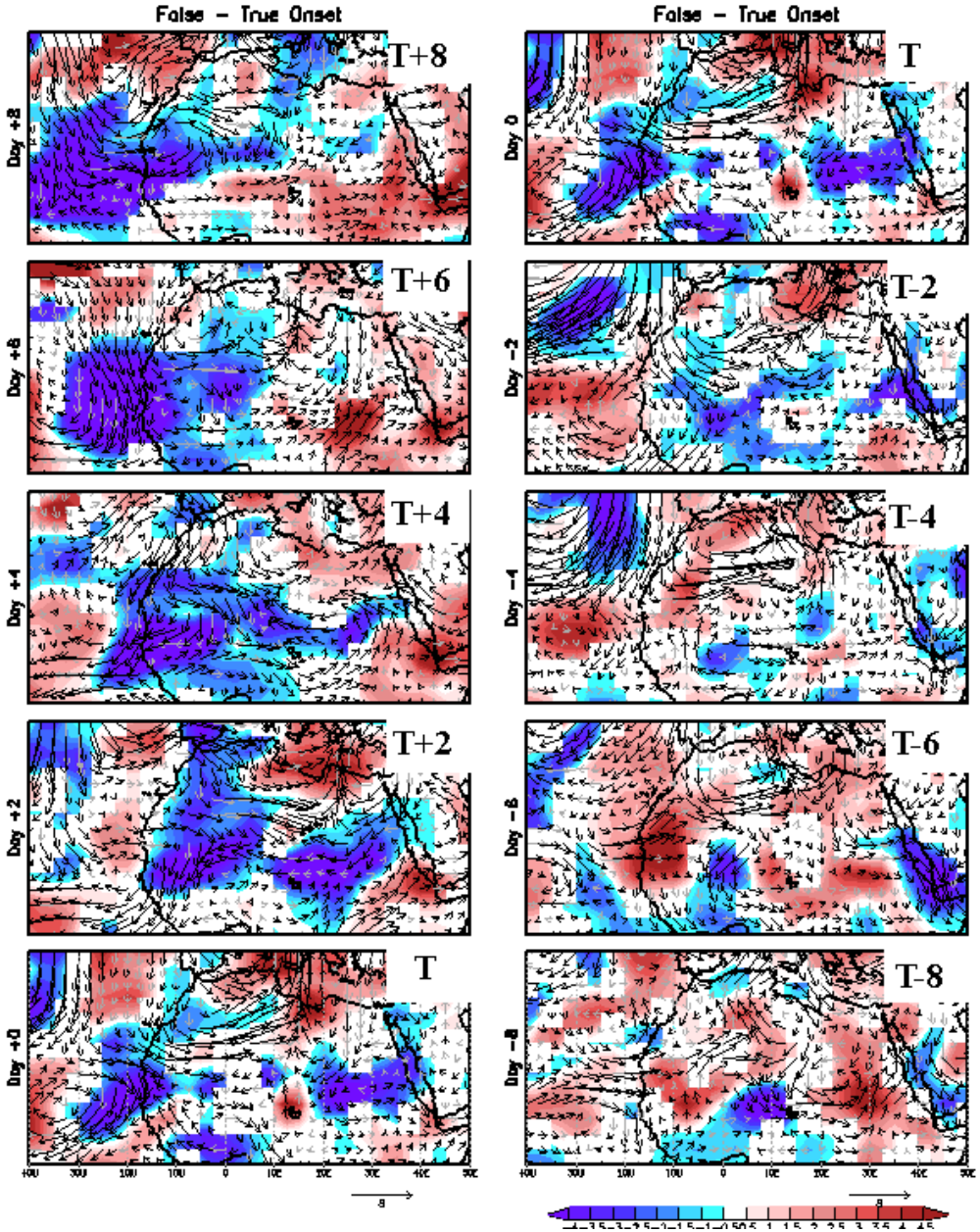
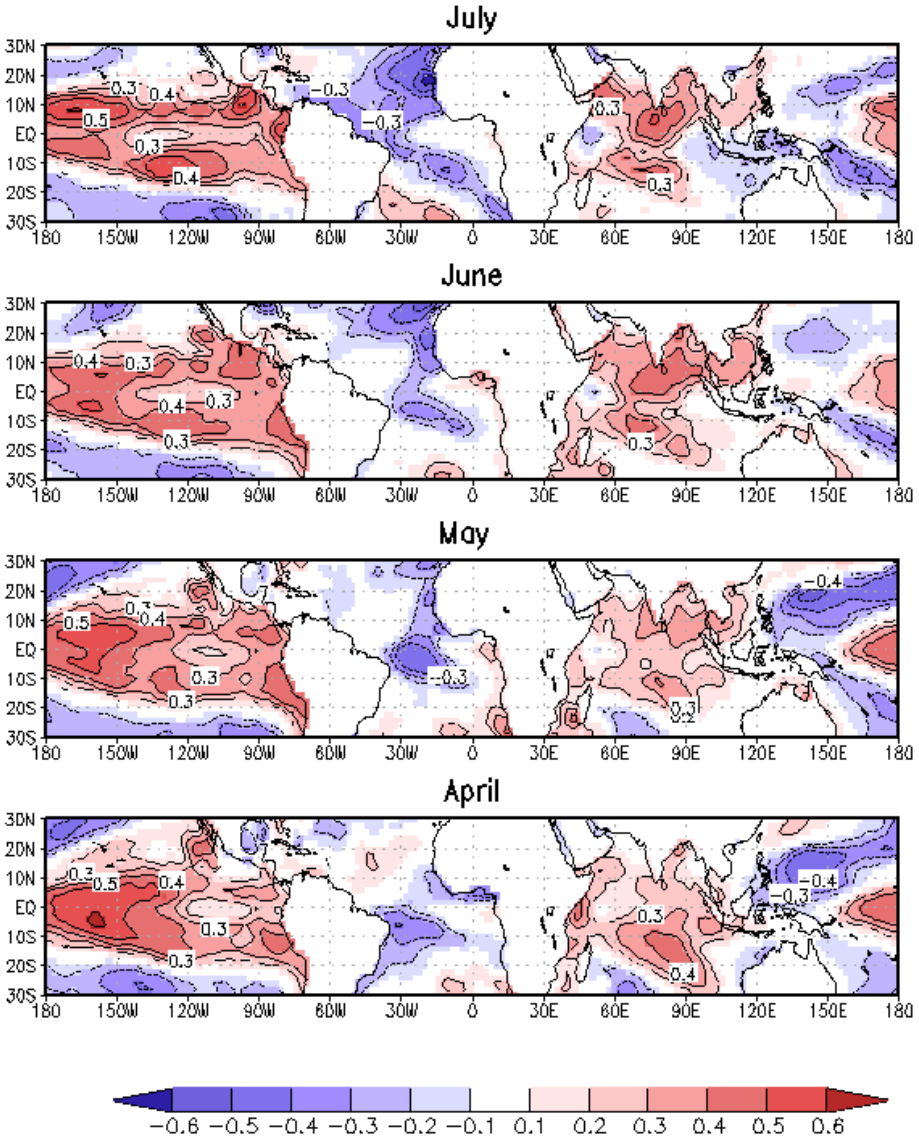
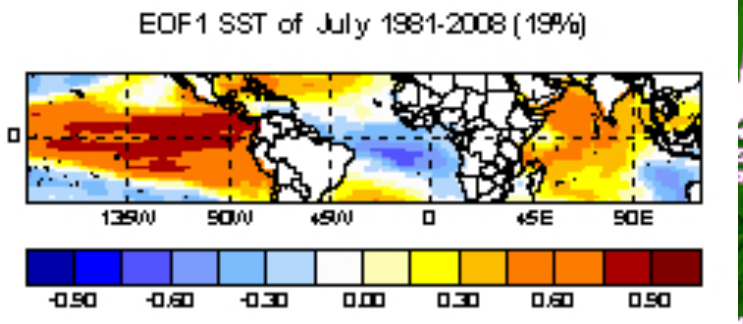
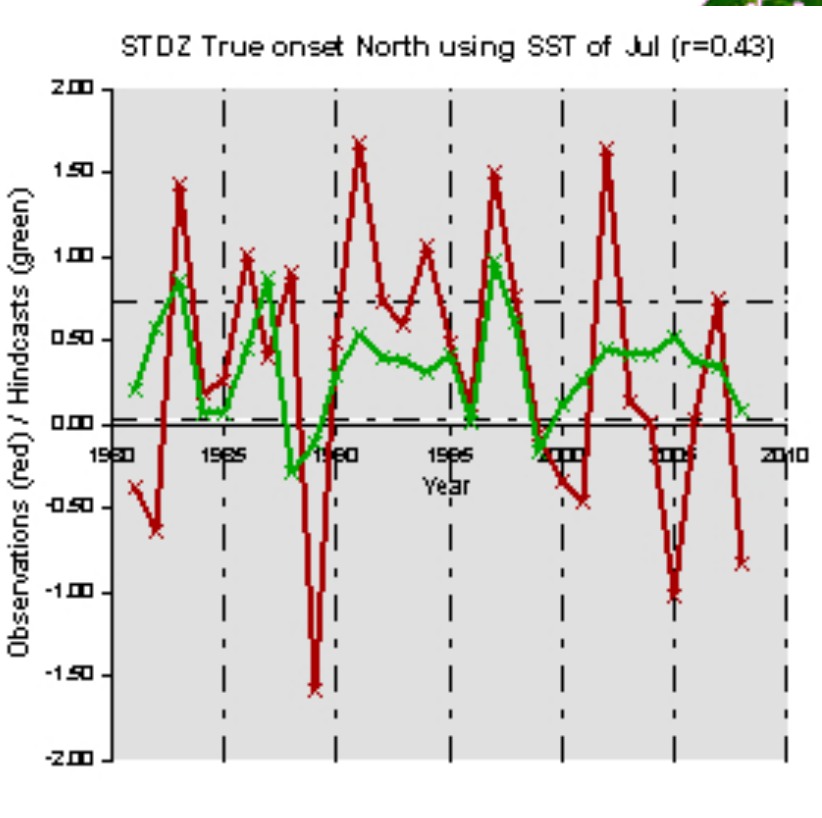


SEASONAL FORECASTING OF THE ONSET

Onset STDZ index over northern Senegal 1981-2008

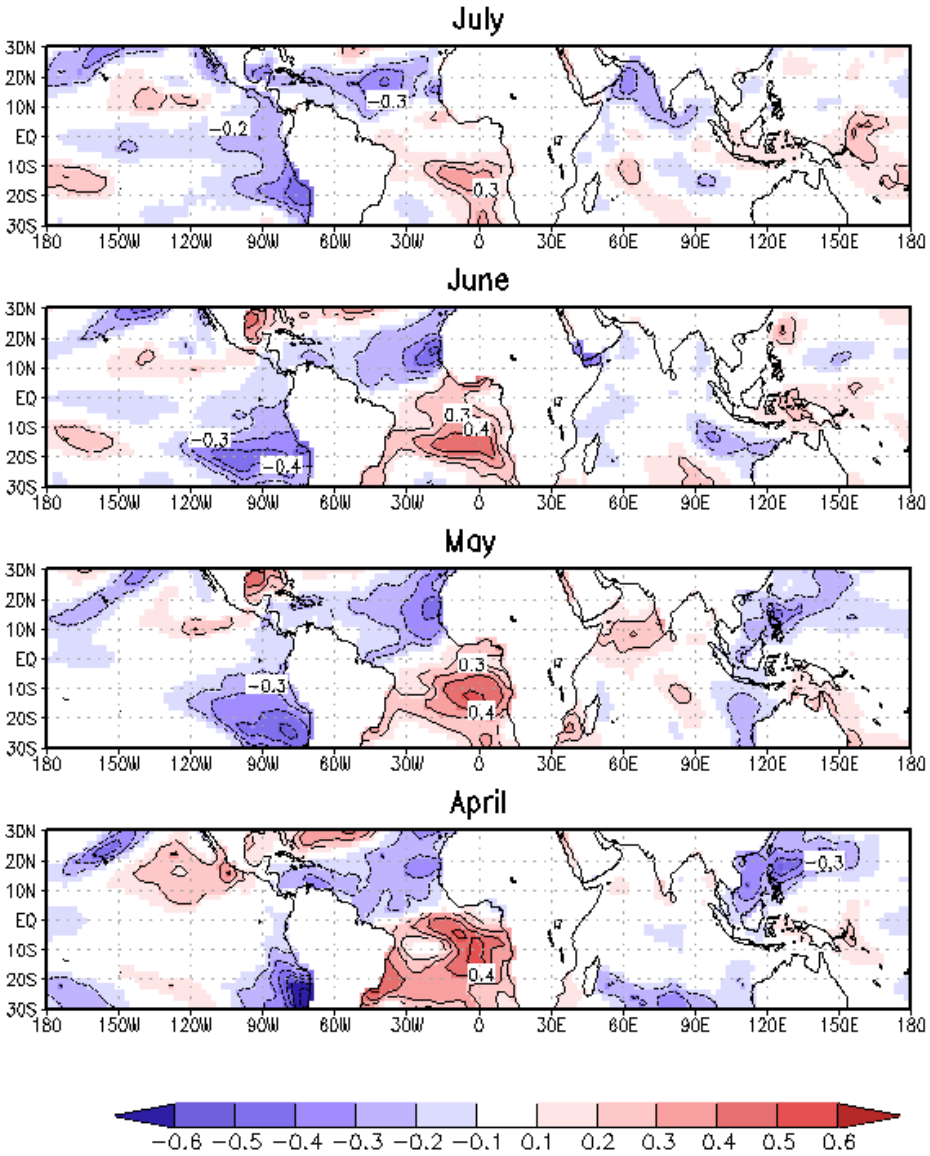






True Onset	Apr	May	Jun	Jul
R	0.12/0.23(2)	0.30	0.28/0.36(5)	0.43

Onset STDZ index over Southern Senegal 1981-2008

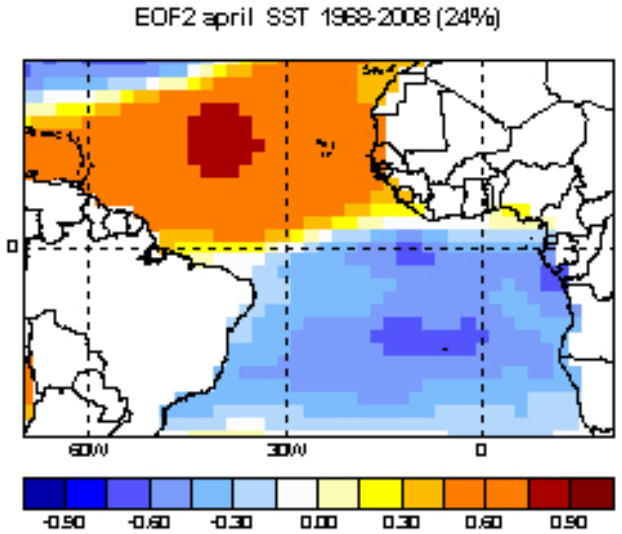


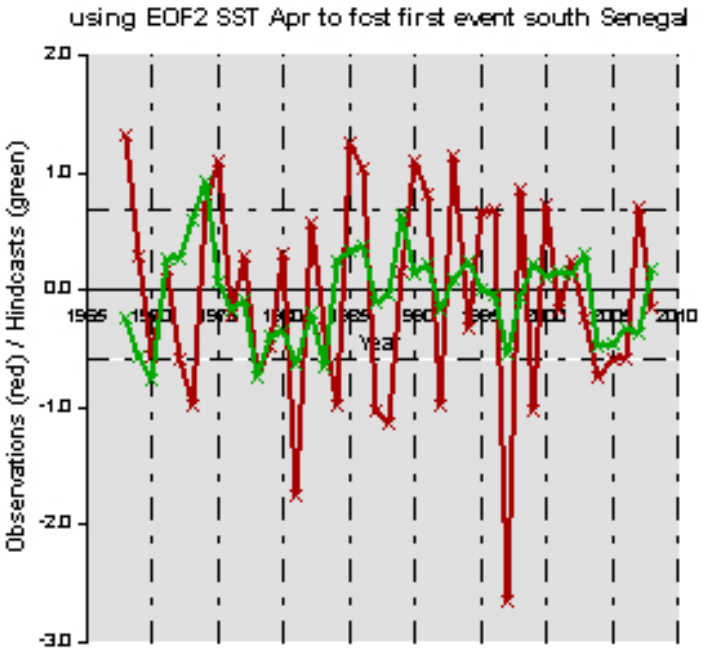
Jul

Jun

May

Apr





LS onset	Apr	May	Jun	Jul
R	031/0.36(4)	0.31/0.42(4)	0.27/0.37(5)	0.34

CONCLUSION

- Two onset regions over Senegal (north and south) following the ITCZ

- Clear signal at synoptic time scale of the onset : propagation of atmospheric signal (PWAT, Va at 600-700 hPa) – northern region onset more influenced by faster propagating features

- Onset has some influence of large scale signal (SST) :
  - North Senegal : near global SST (time of influence by ENSO)
  - South Senegal : tropical Atlantic dipole (new timing of influence, around May)

- Early warning system for False and true onset : anomalous weak PWAT with cold air intrusion (contrasting process for north and south given different time in monsoon evolution – not shown here)

- Does MJO play a role during certain years ? Inter-action between Kelvin and Rossby waves ? What about SHL ? QBO ?

THANK YOU