



DEVELOPING RAINFALL ONSET INFORMATION FOR AGRICULTURE IN SENEGAL, INCLUDING THE DISTINCTION OF TRUE AND FALSE ONSET EVENTS.

Ousmane NDIAYE^{1,2}, and M. Neil WARD^{2,3}

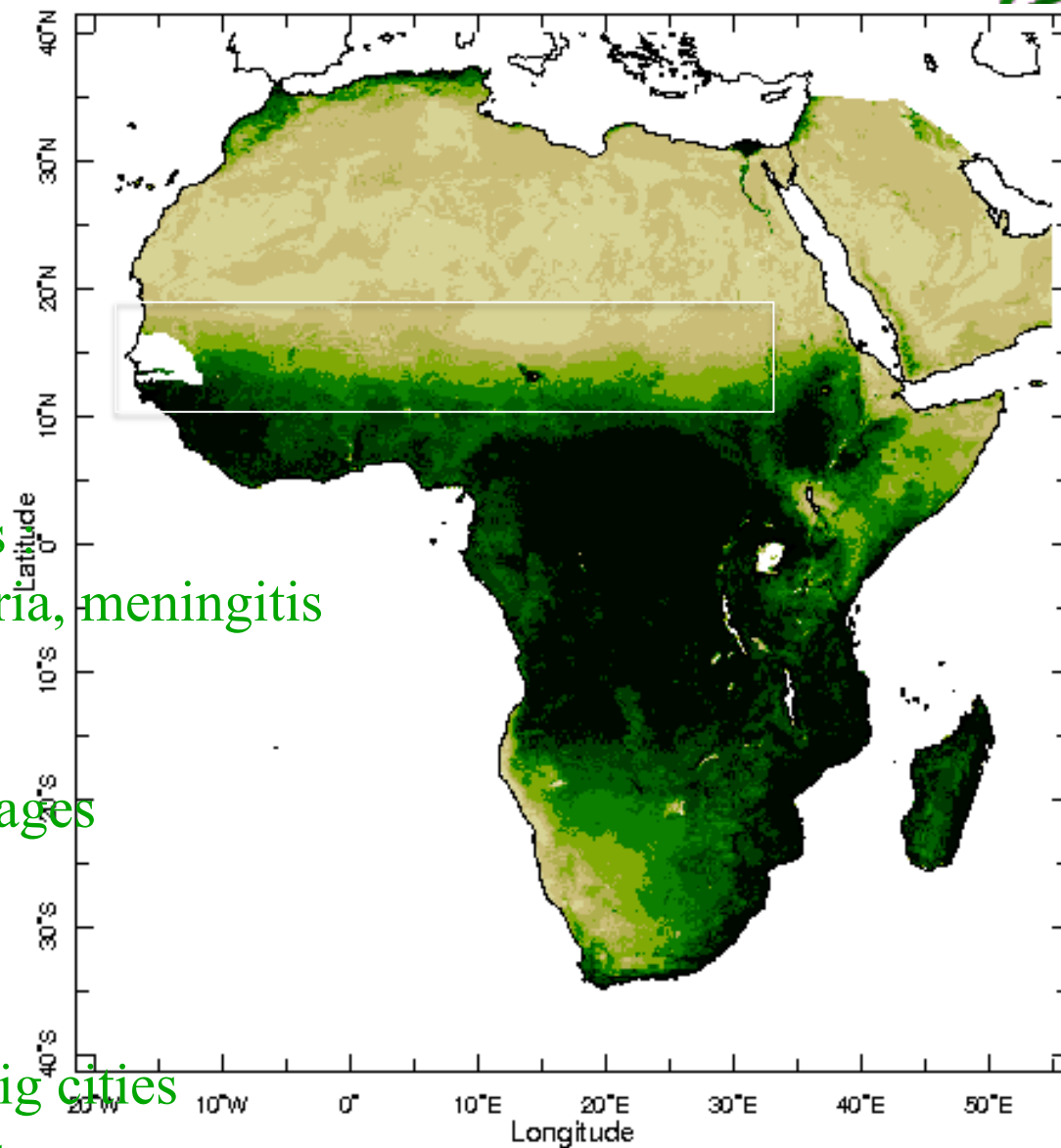
¹Agence Nationale de la Météorologie du Sénégal (ANAMS), Senegal

²International Research Institute for Climate and Society (IRI), Columbia University, New York, USA

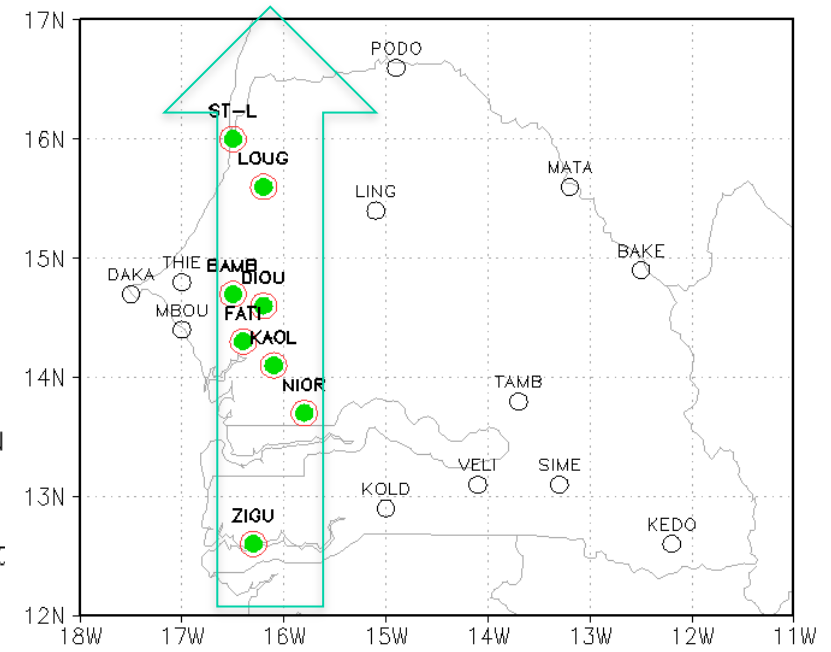
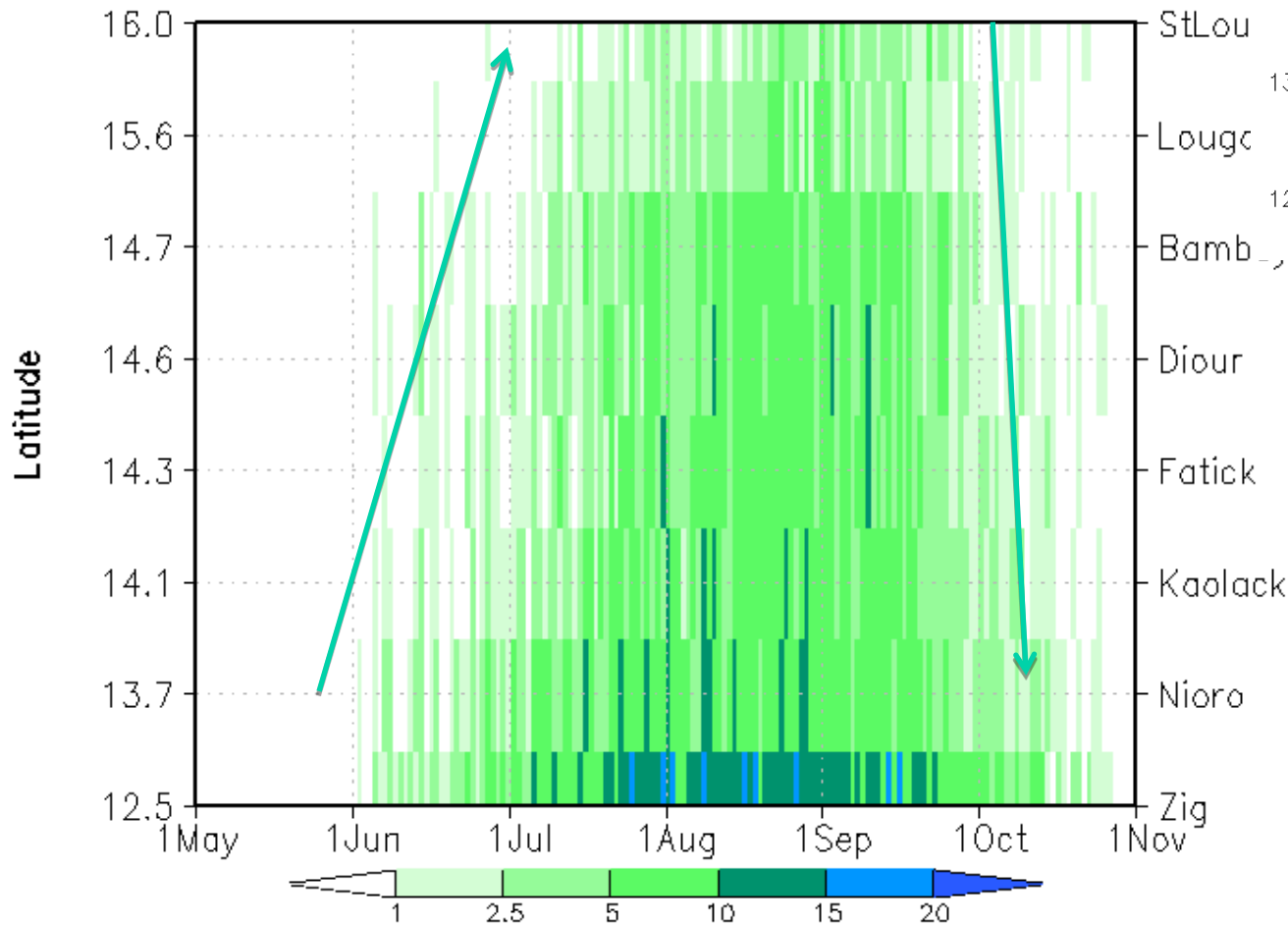
³ Independent Scholar, Basking Ridge, New Jersey, USA

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 preparedness in big cities
 - ✓ limited economic resources



Daily rainfall seasonal evolution : South to North.



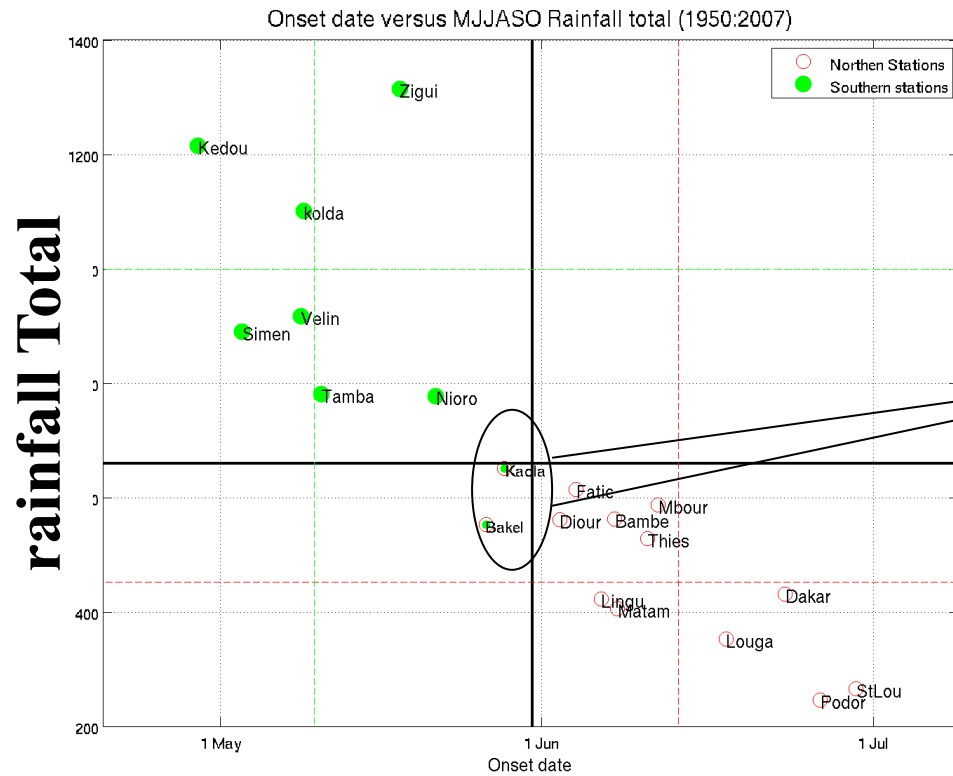
DEFINITION OF RAINFALL ONSET :

farming perspective

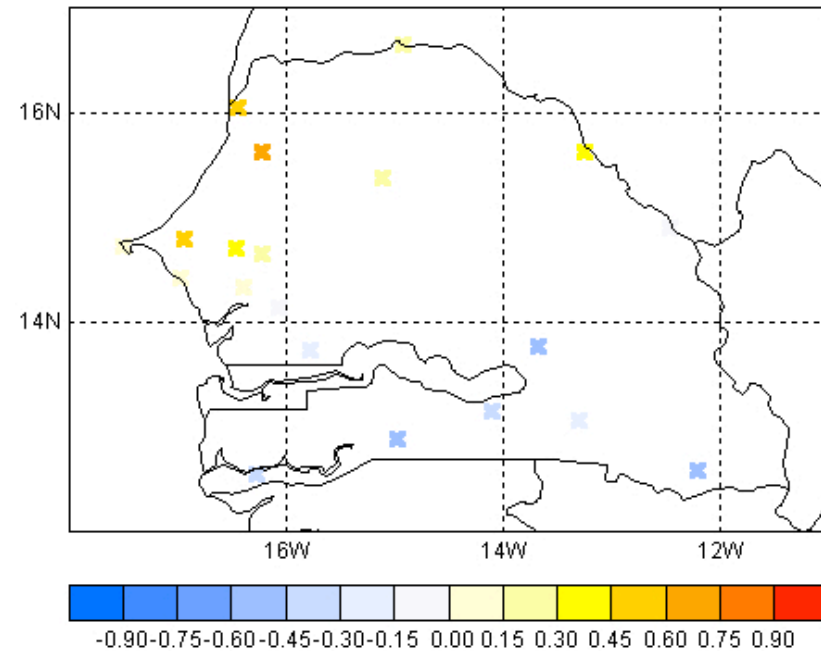
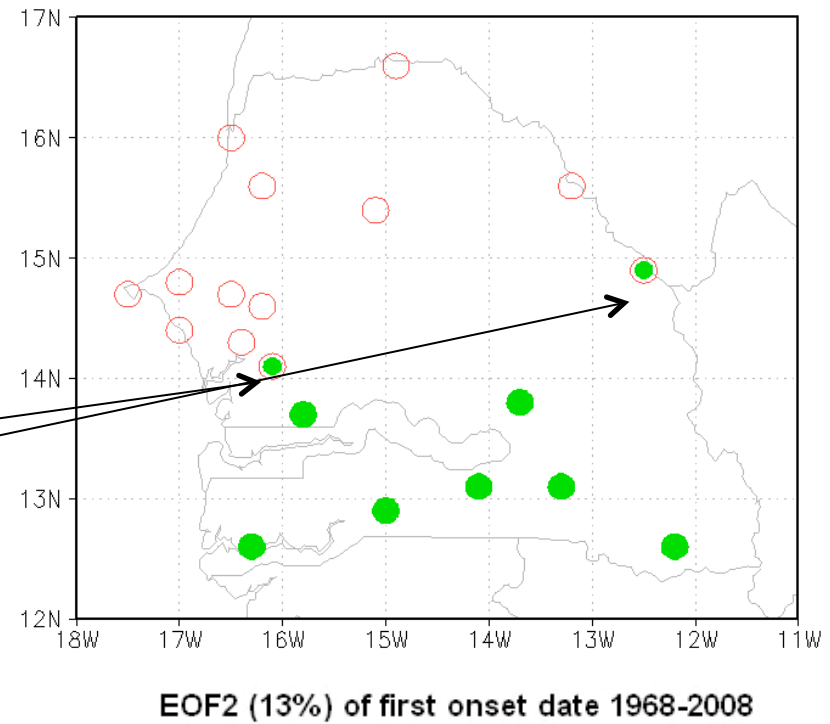
Significant rainfall event : 20mm over less than three-day period

- **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

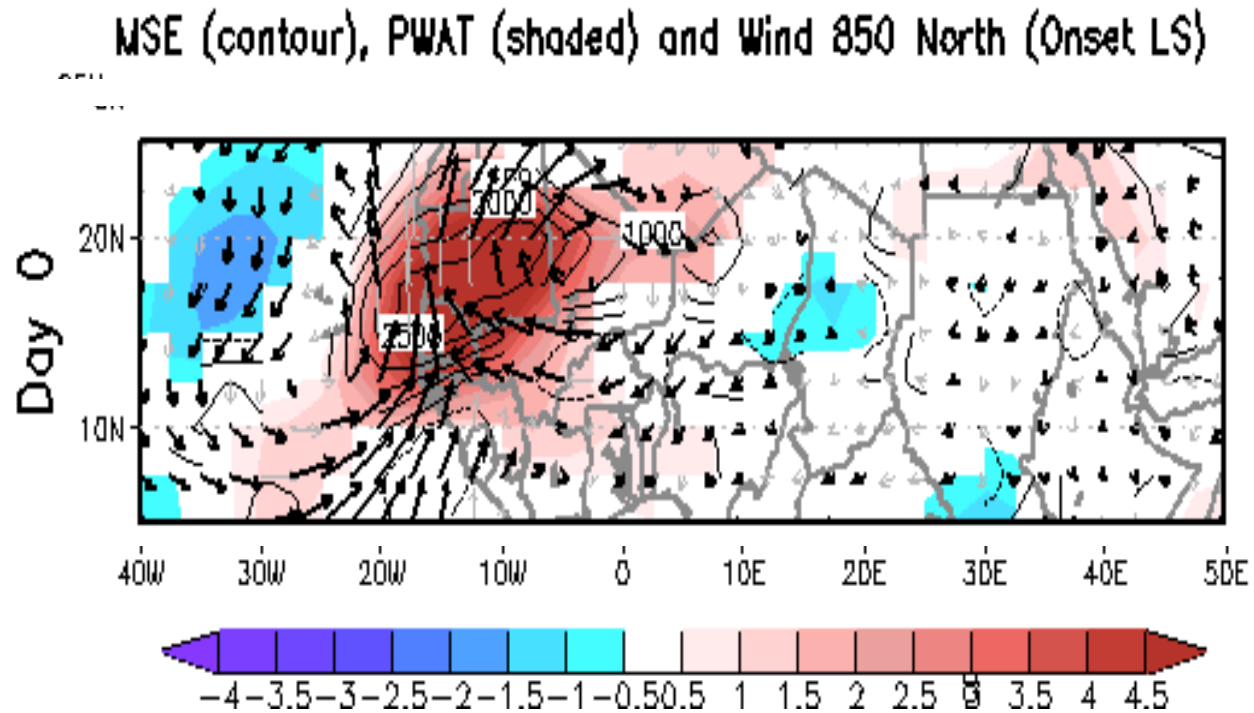
Northern and southern regions division in Senegal



Onset date



ATMOSPHERE DURING ONSET DATE

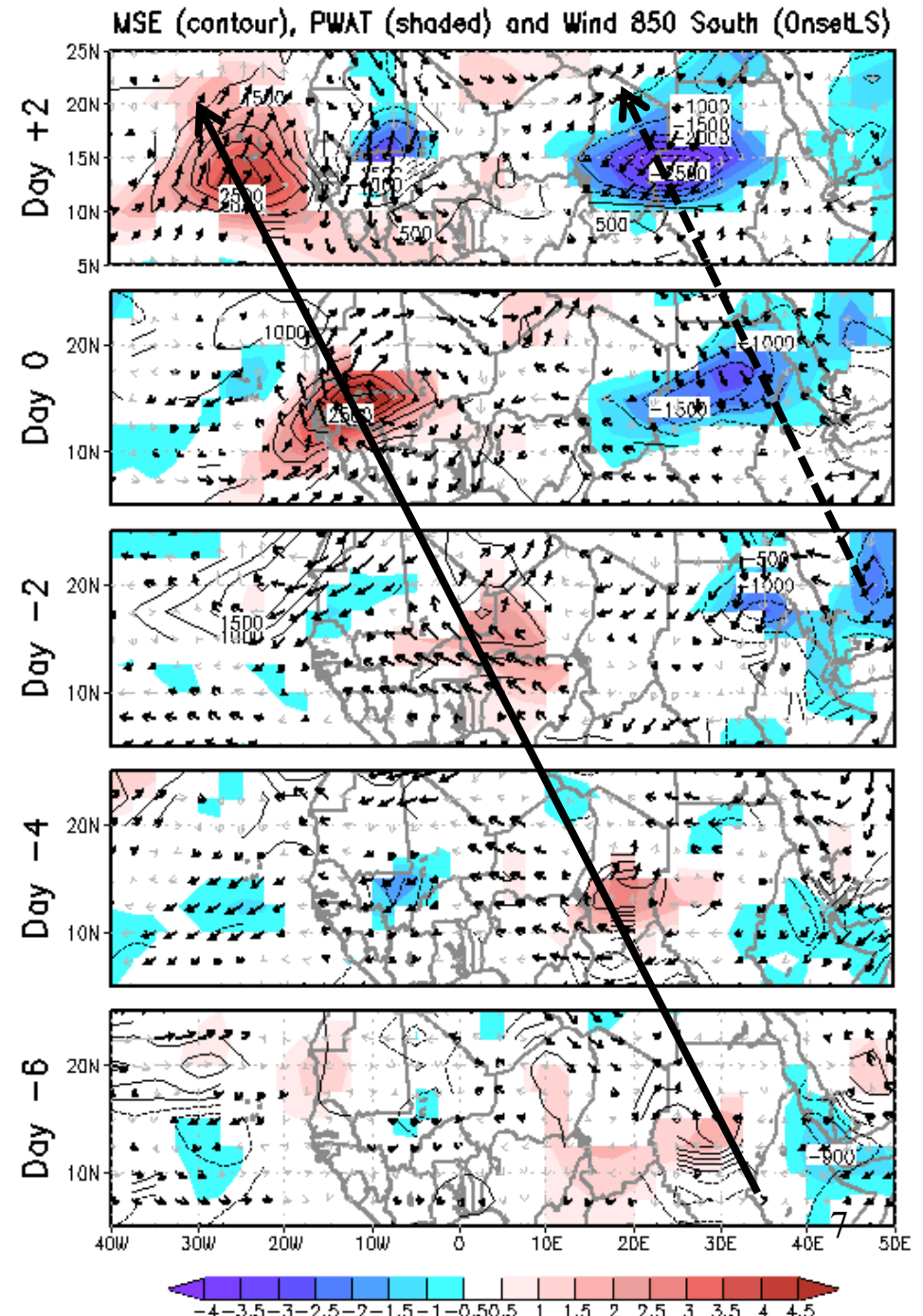
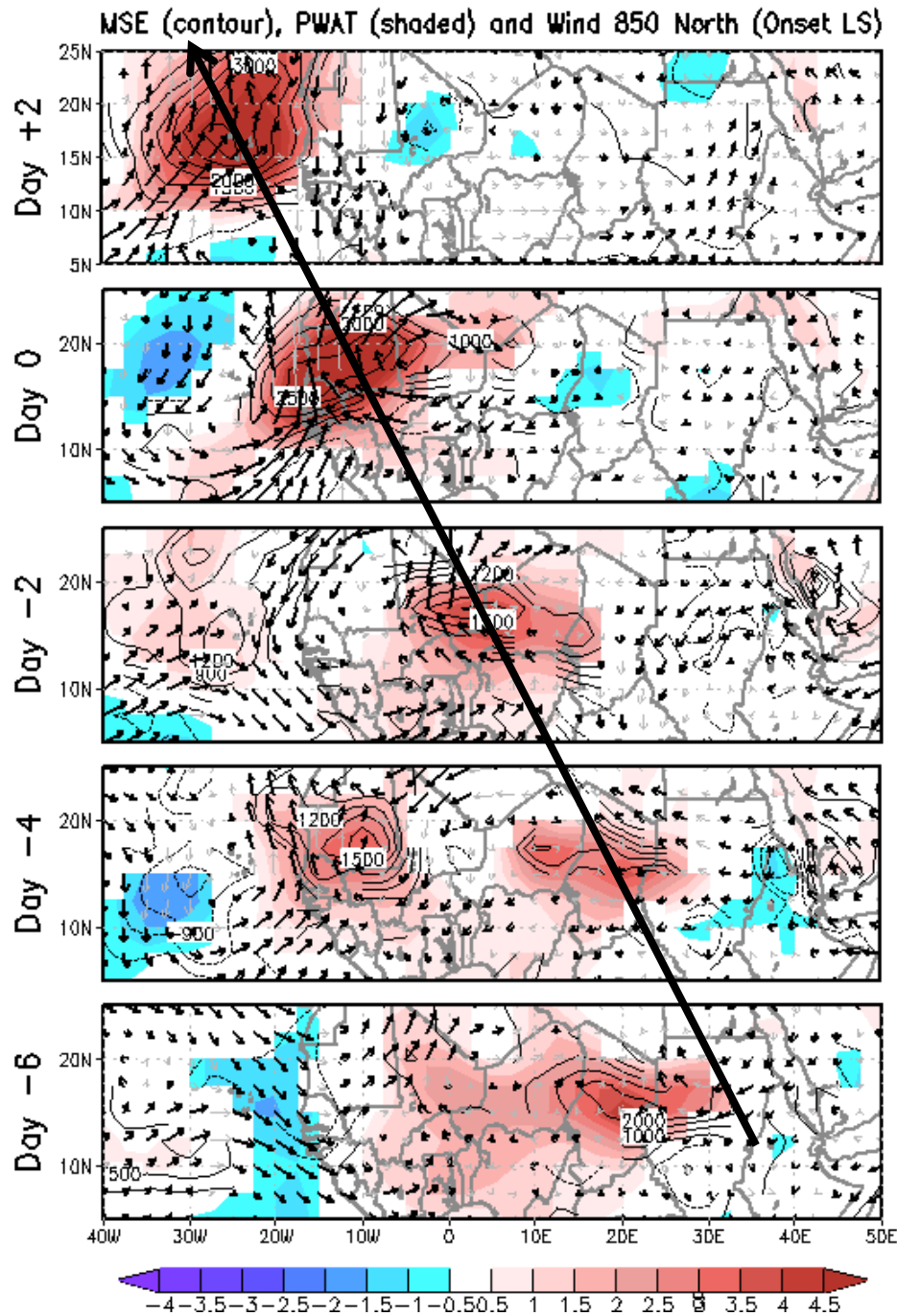


No filtering just remove the daily mean : 1968-2008

Propagation around the first regional Onset event

NORTH

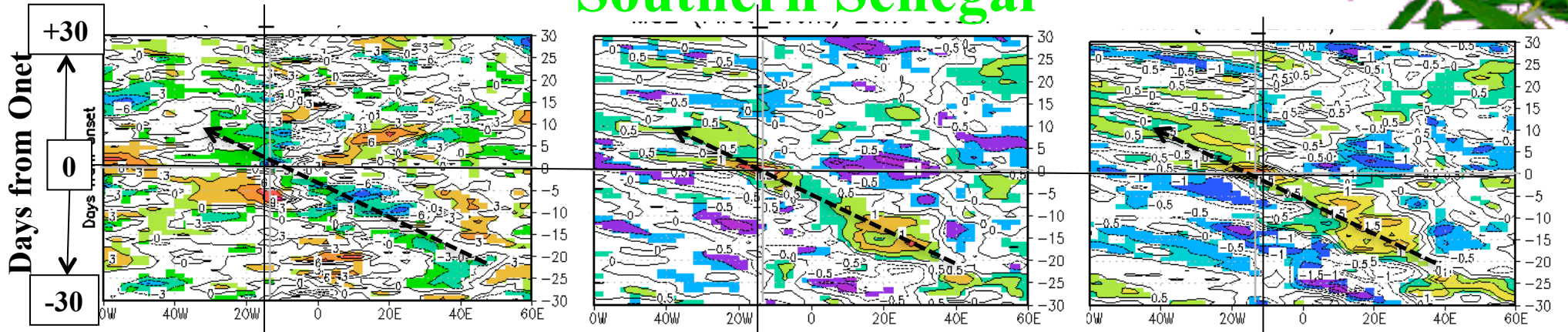
SOUTH



PROPAGATING FEATURES AROUND THE ONSET

10-20° North (Senegal)

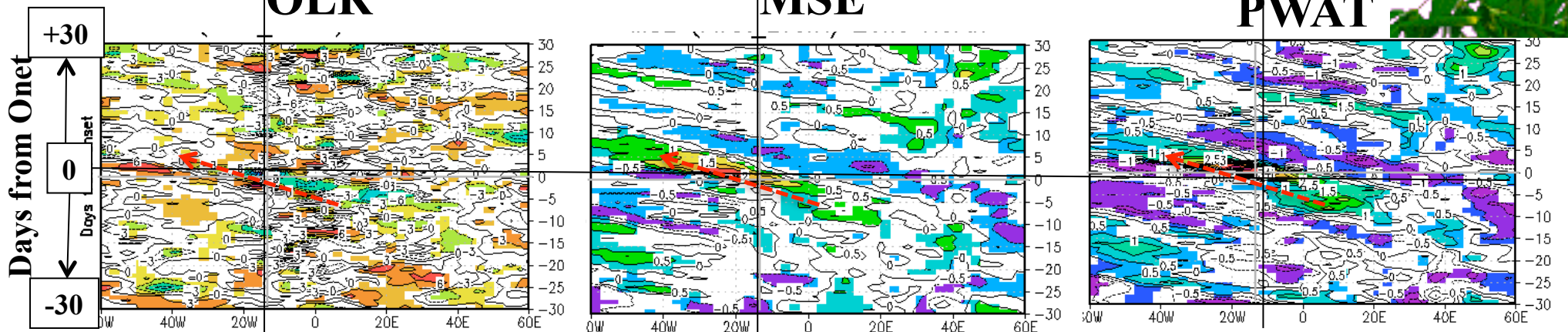
Southern Senegal



OLR

MSE

PWAT



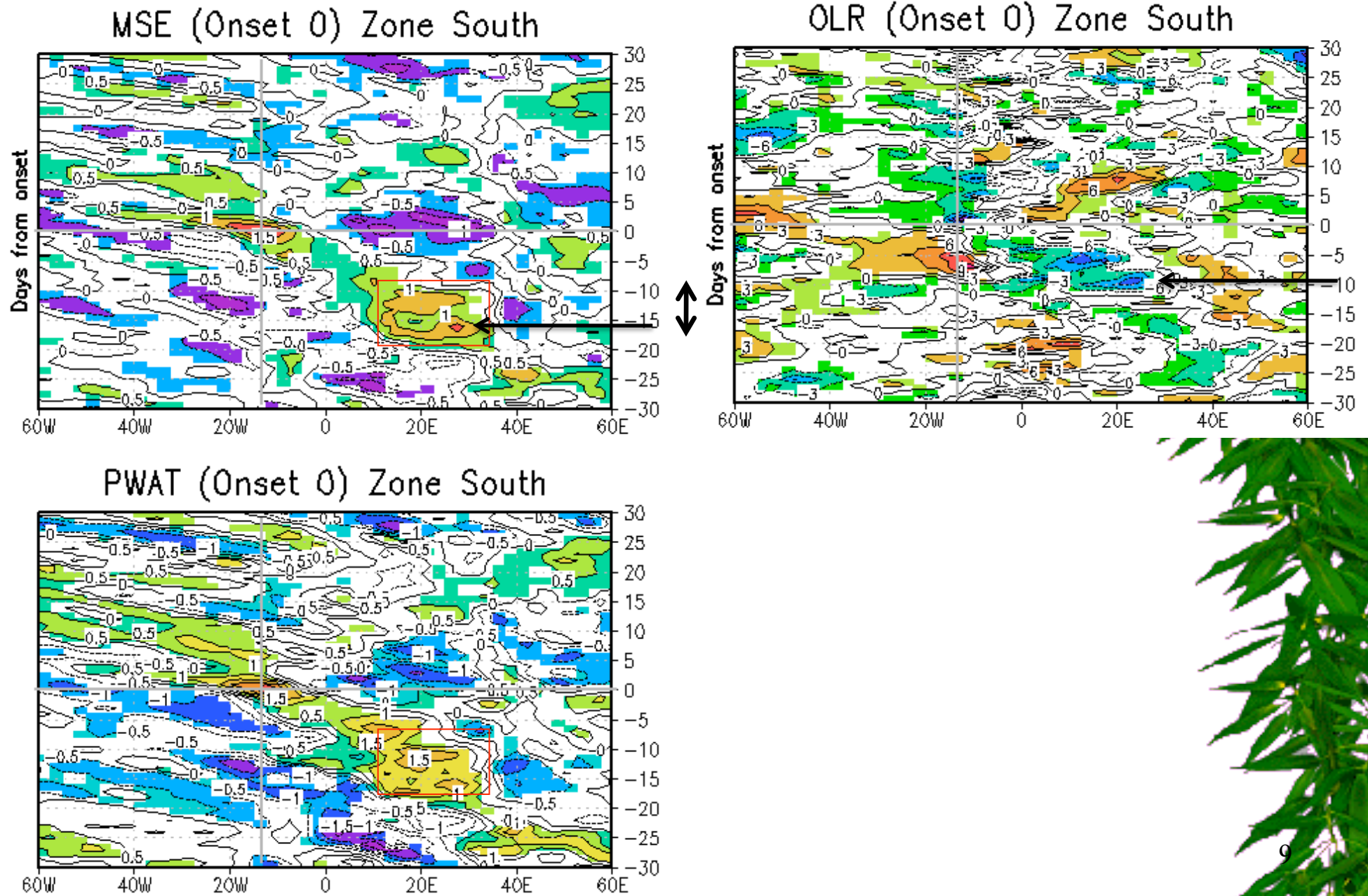
Northern Senegal

Estimate :

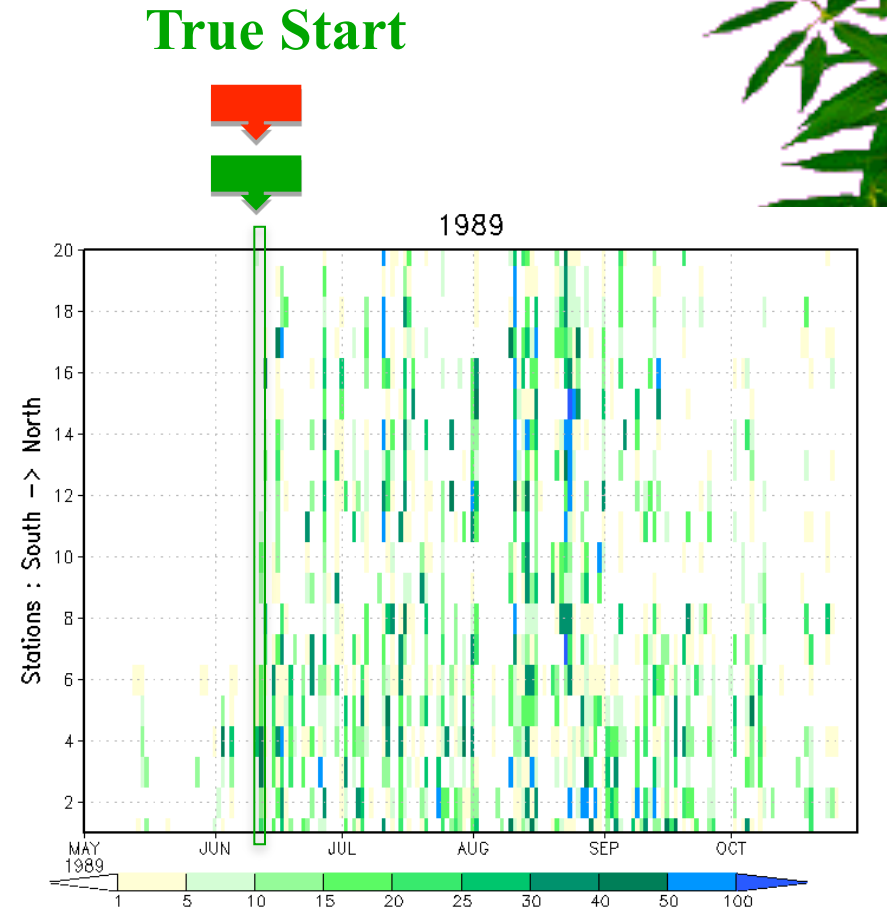
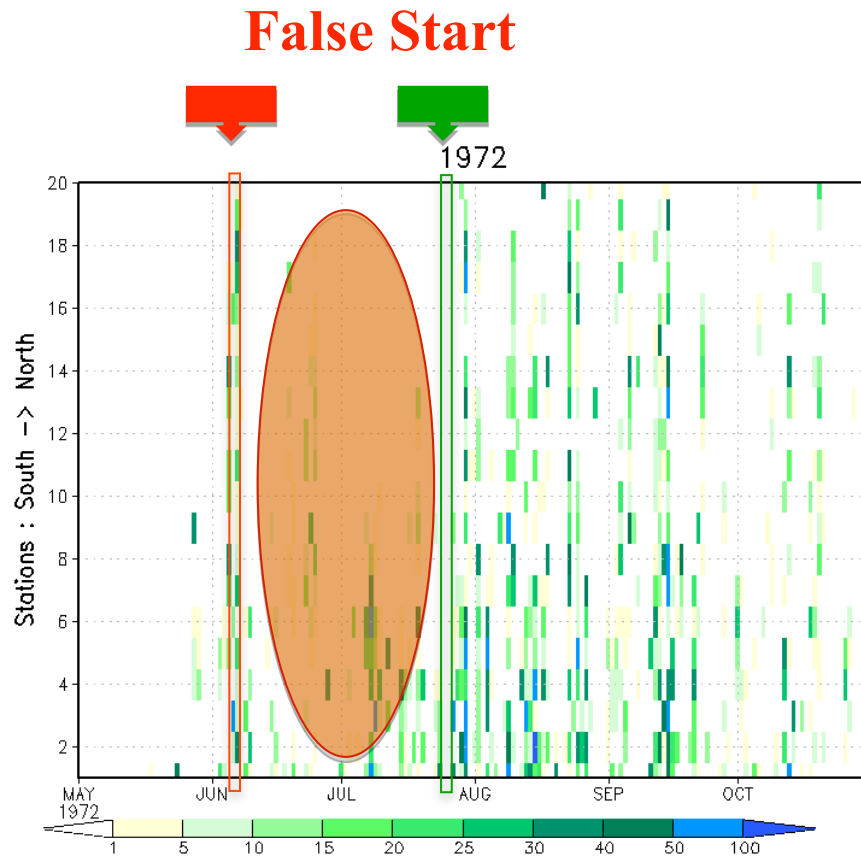
South : 37° in 17 days ≈ 2.8 m/s

North : 35° in 5 days ≈ 8.5 m/s (easterly wave 3-5 days 15° N)

OLR time space evolution around the onset date



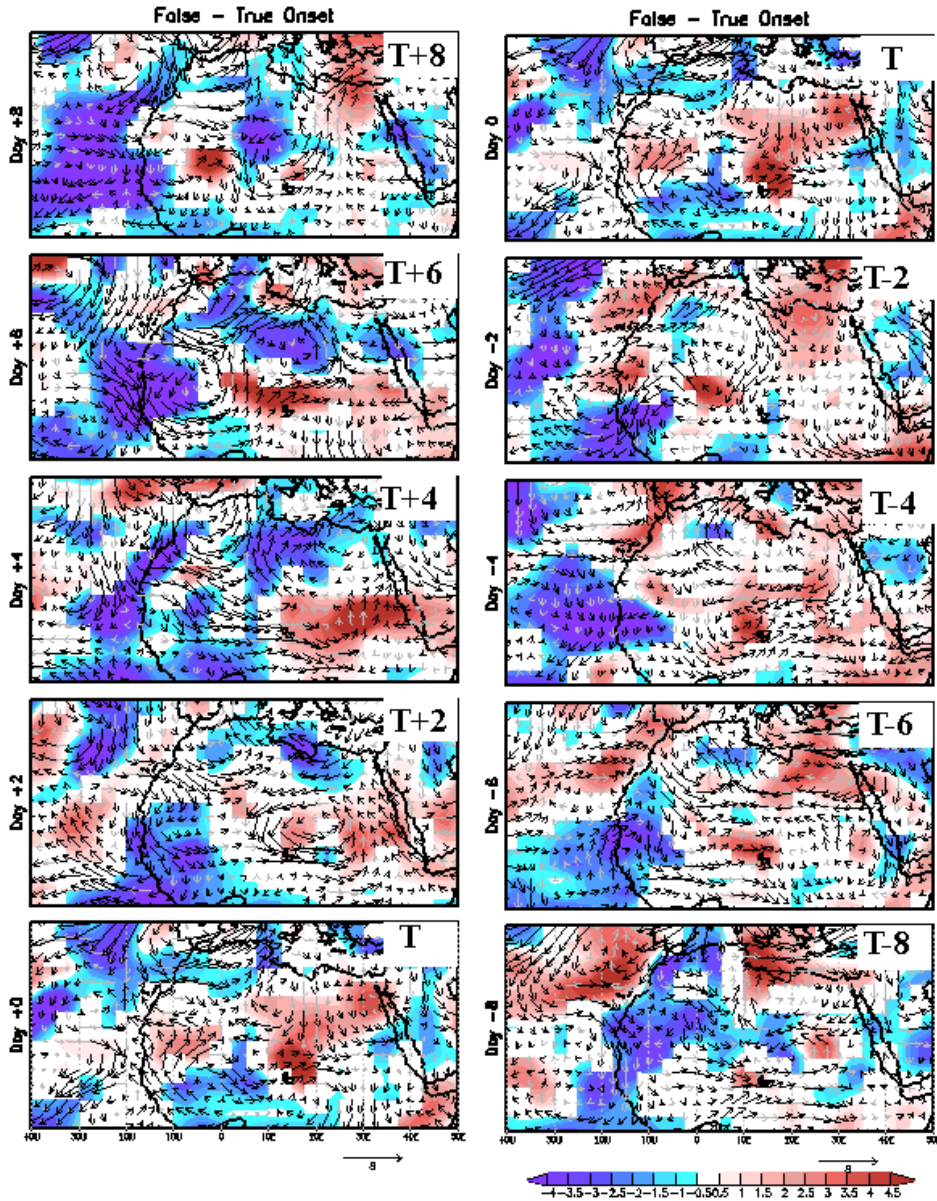
Example of true versus false onset



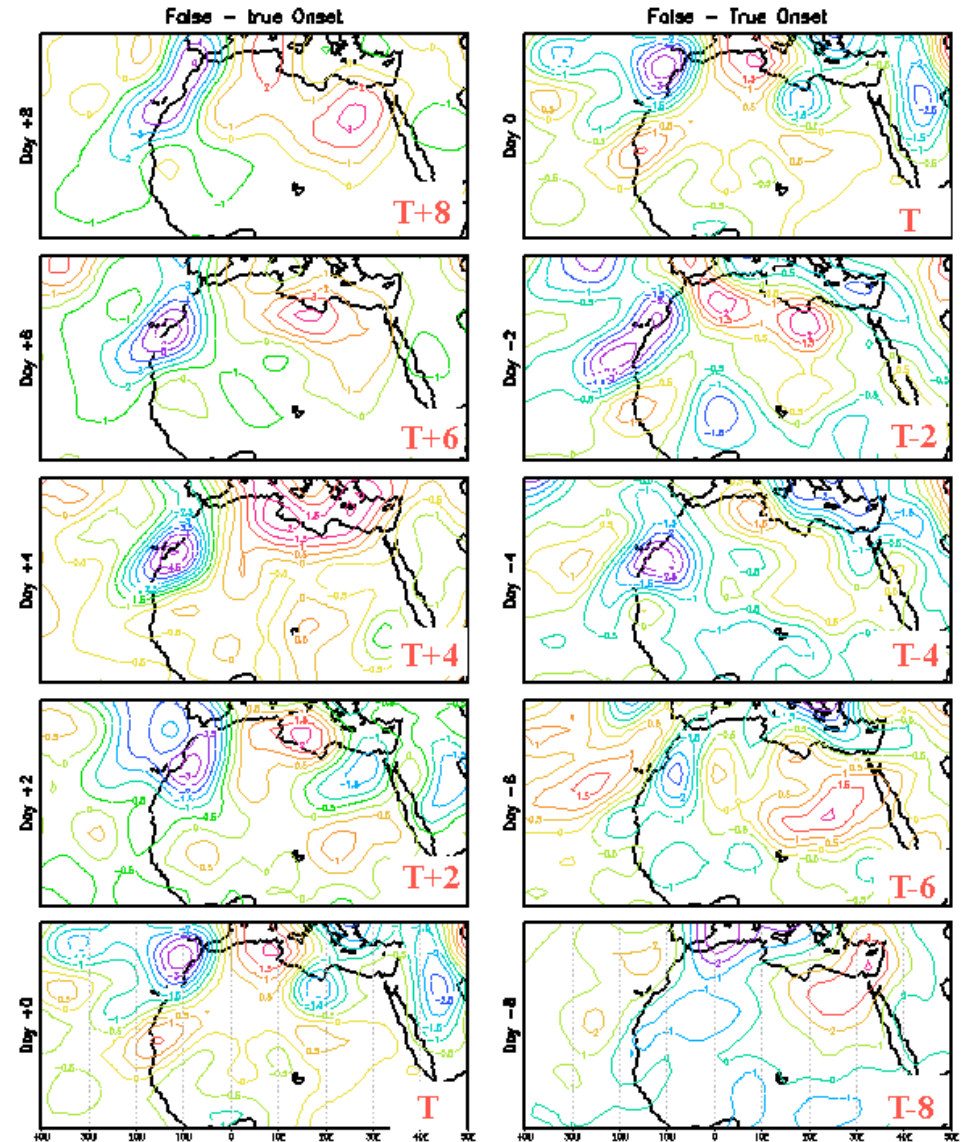
Same period of onset but followed by dry spell which affect any planning

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

PWAT (shaded) and Wind 850 REg North

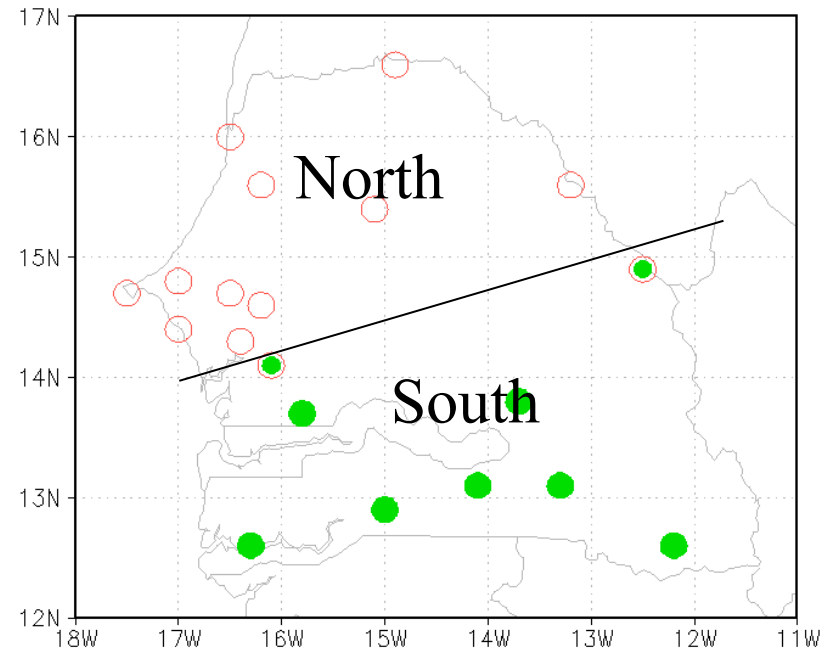
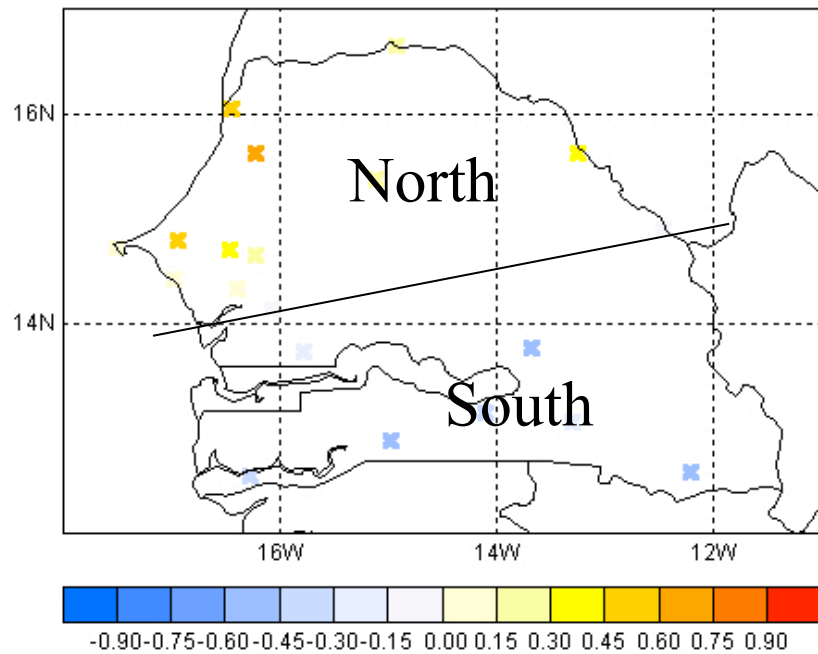


Theta at 925hPa North



SEASONAL FORECASTING OF THE ONSET

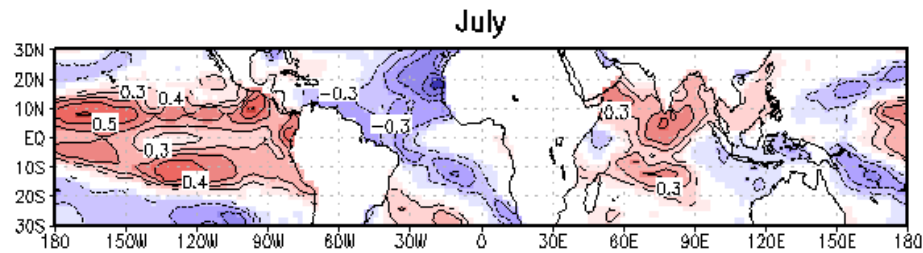
EOF2 (13%) of first onset date 1968-2008



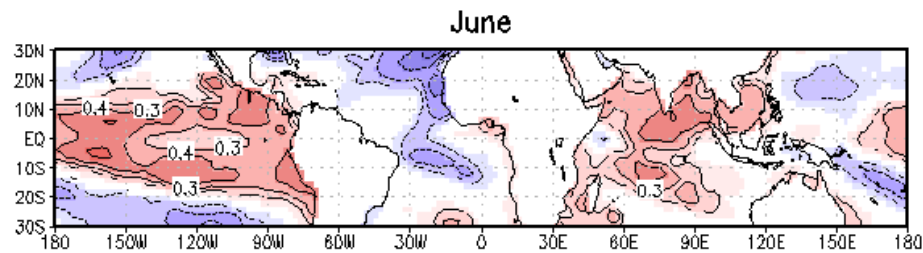
Building two regional indices : standardized index

Onset STDZ index over northern Senegal 1981-2008

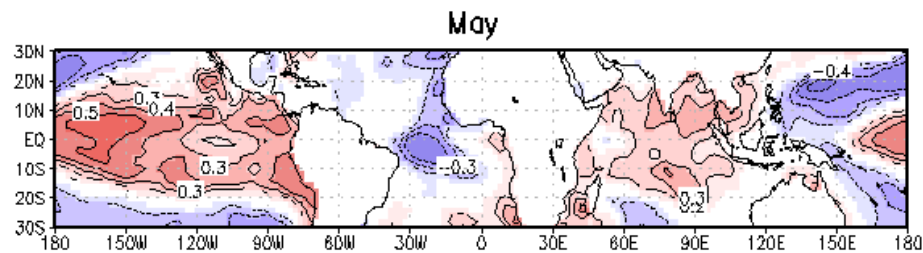
Correlation Onset versus SST



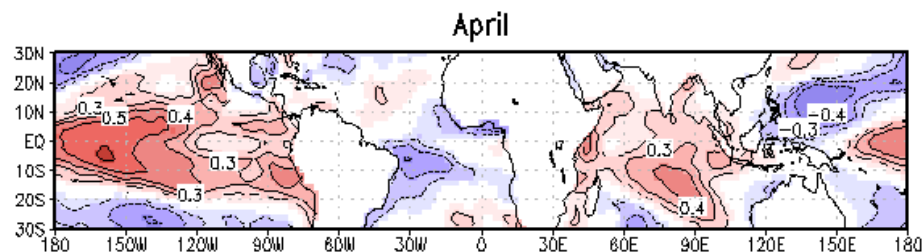
Jul



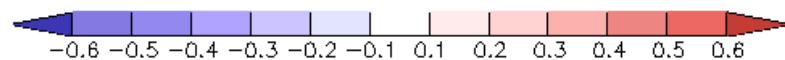
Jun



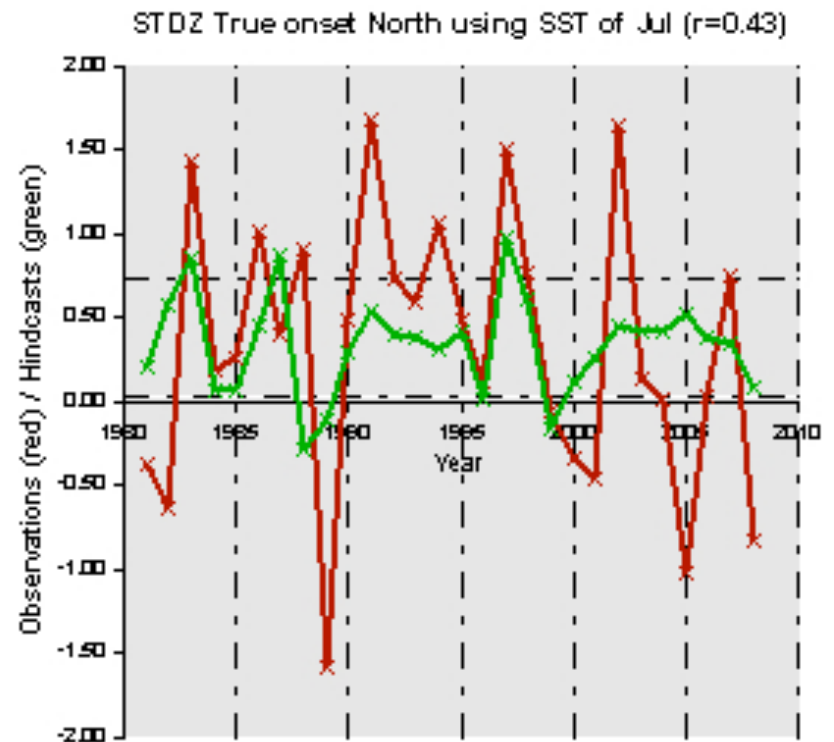
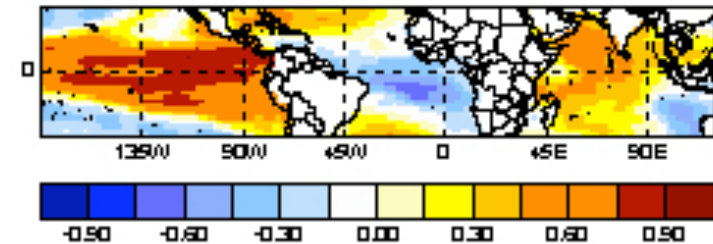
May



Apr



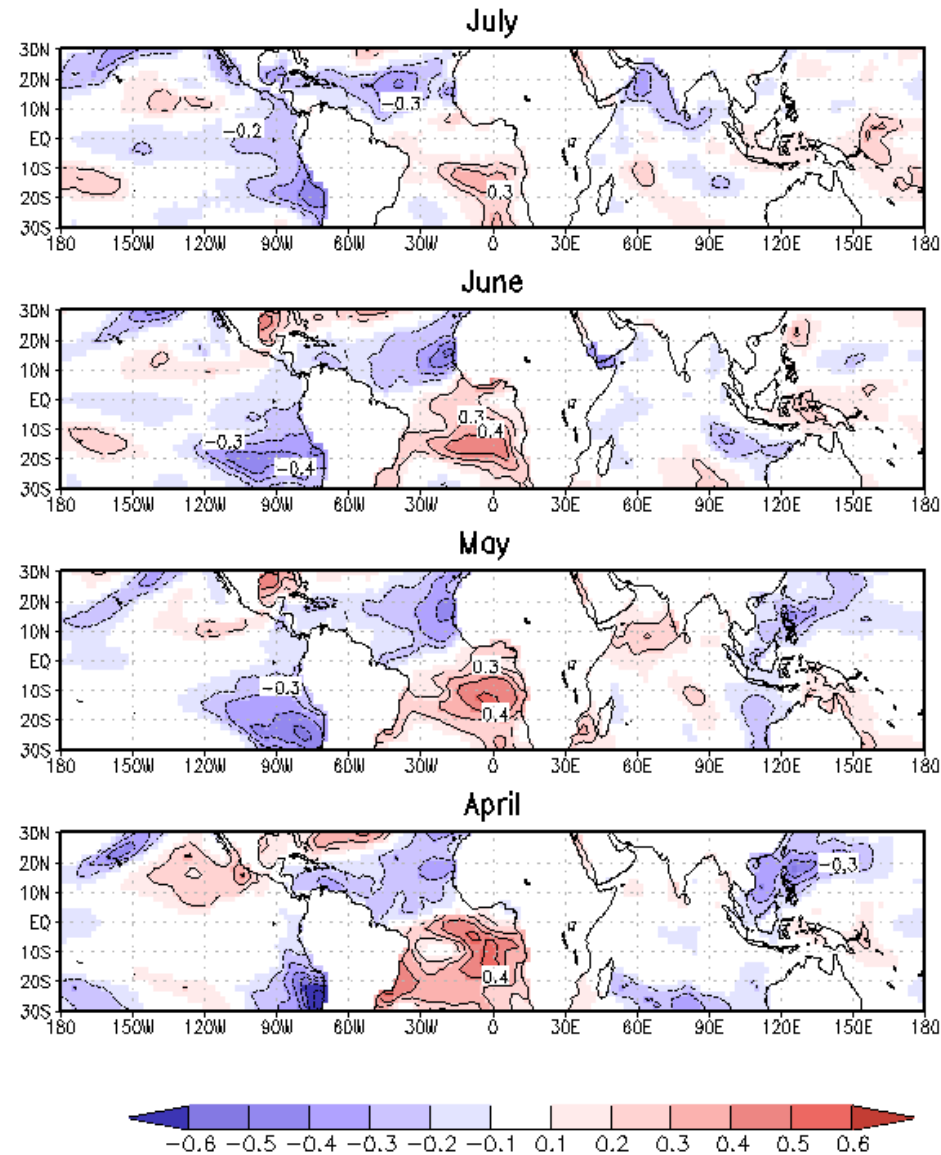
EOF1 SST of July 1981-2008 (19%)



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

Correlation Onset versus SST



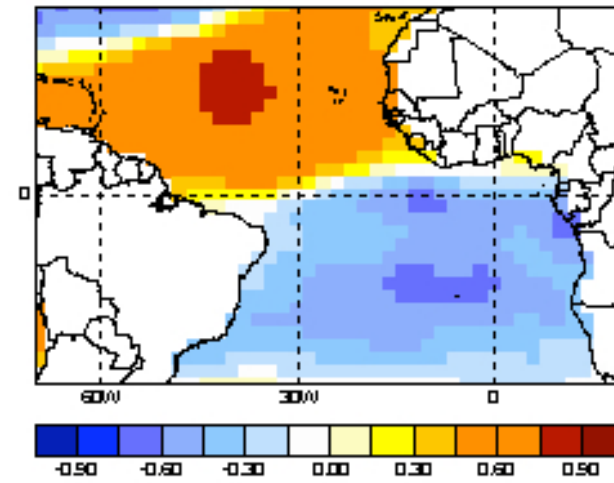
Jul

Jun

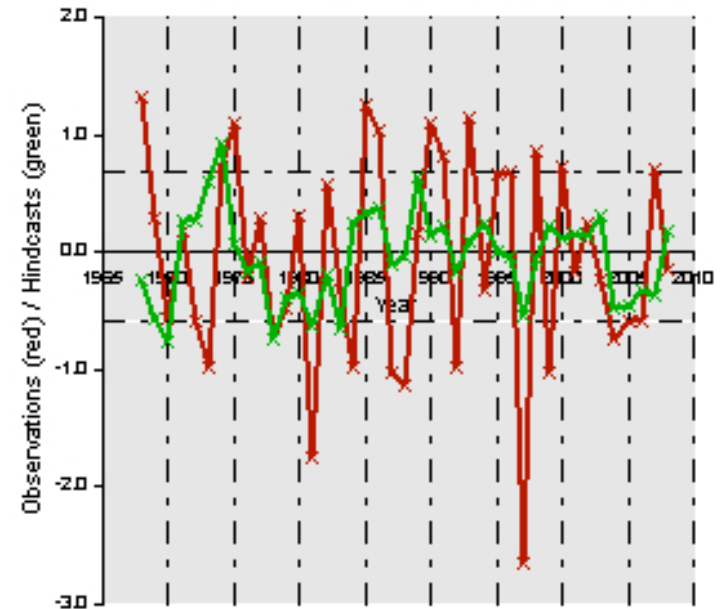
May

Apr

EOF2 april SST 1968-2008 (24%)



using EOF2 SST Apr to fcast first event south Senegal



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, V_a at 600-700 hPa) – northern region onset more influenced by faster propagating features
- Large scale signal (SST) has some influence on the onset:
 - 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 ? NAO ?

THANK YOU

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

PWAT (shaded) and Wind 850 REg South

Theta at 925hPa South

