

AMMA

**African Monsoon Multidisciplinary Analyses**  
**Analyses Multidisciplinaires de la Mousson Africaine**  
**Afrikanischer Monsun: Multidisziplinäre Analysen**  
**Analisi Multidisciplinare per il Monsone Africano**  
**Afrikanske Monsun : Multidisiplinære Analyser**  
**Analisis Multidisciplinar de los Monzones Africanos**  
**Afrikaanse Moesson Multidisciplinaire Analyse**

**WG 3 report :**

**Land surface atmosphere interactions**

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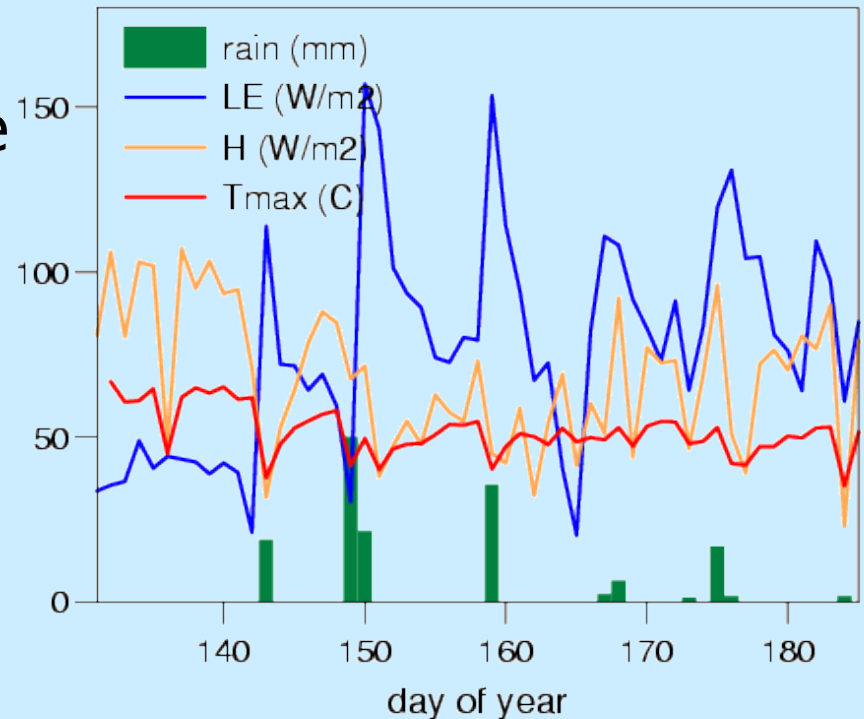
# State of the art

It has been recognized that the intra and inter-annual variability of rainfall lies in the properties of individual convective systems.

Surface properties and the functioning of the surface is fundamentally altered by the passage of a convective event.

Can the surface affect the genesis and evolution of convective systems ?

The consequence is that the surface atmosphere interaction needs to be analyzed on synoptic events.



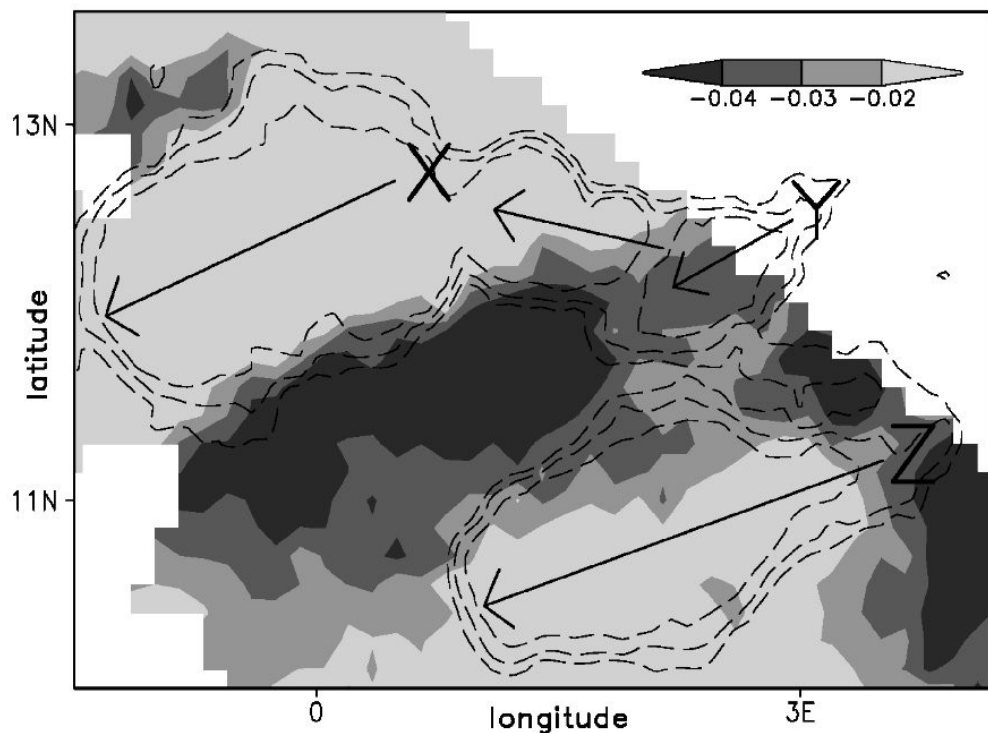
Observations from savannah site at the start of the 1990 wet season (Gash et al)



# Events compositing by Taylor and Elis

The case of 13<sup>th</sup> of June 2000.

- ★ The TRMM polarisation ratio is used to pick up wet patches (grey scale).
- ★ Meteosat TIR is a proxy for detecting convection (isolines).

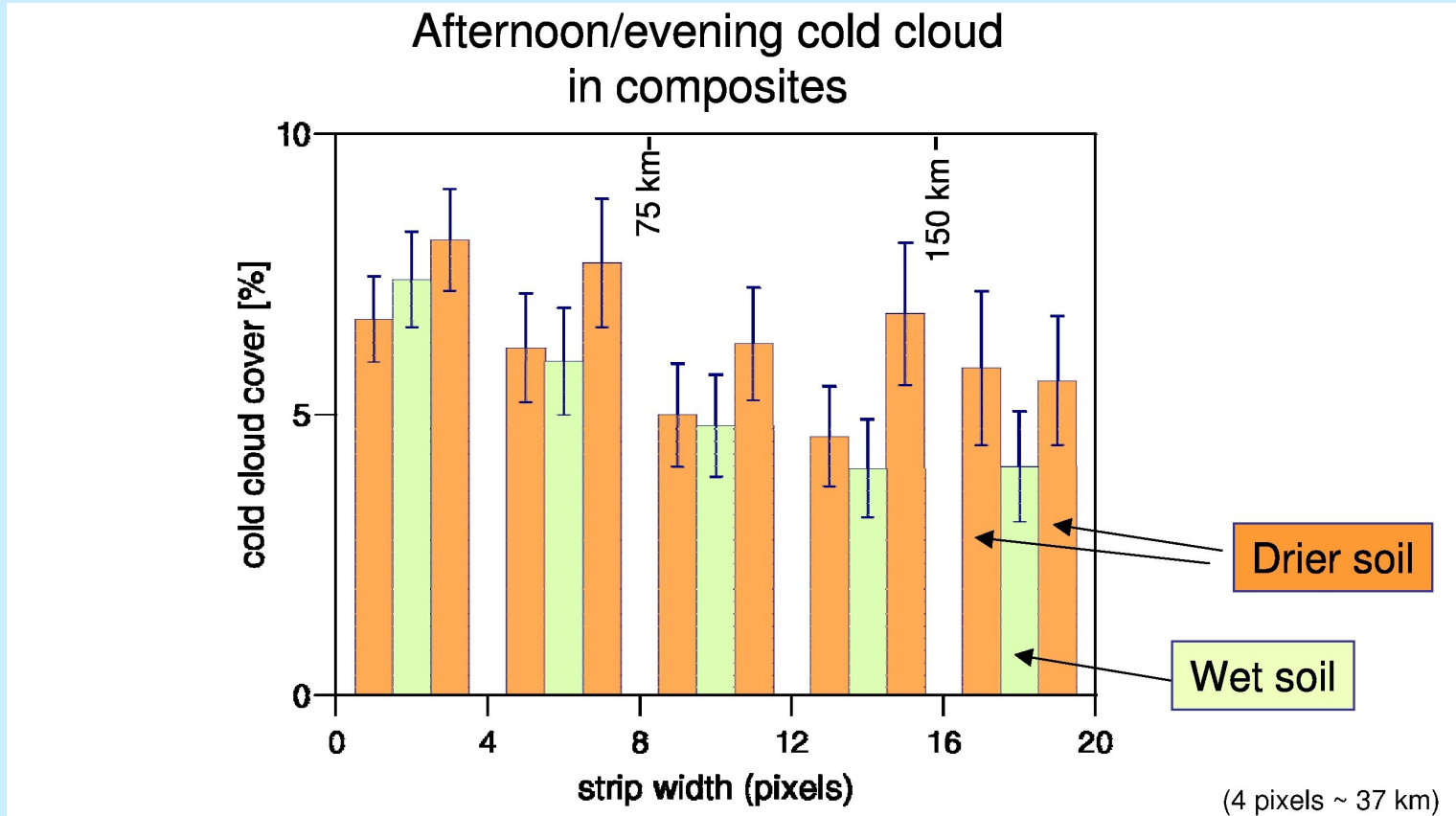


★ System Y avoids the wet patch

★ The extension en systems X and Z are limited by the wet patch.

# Is this a general pattern ?

The wet patch/cloud relation is examined in over 100 cases.

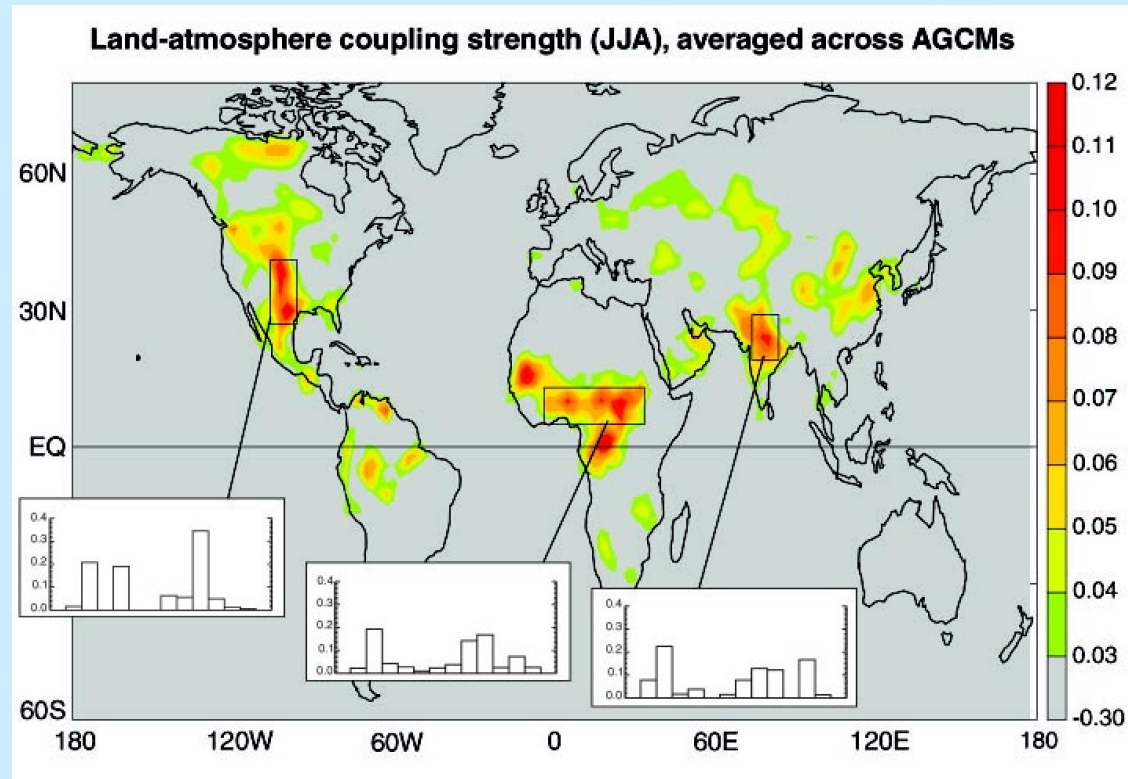


**The larger the patch the stronger is its impact on the evolution of the convective systems.**



# How do models reproduce these observations ?

Which of the models used in GLACE show the same relation between the surface states and the evolution of convection ?



*Using such diagnostics we can perhaps refine the results of GLASS and increase our confidence in the results.*



# Open questions

★How does the land surface integrate the atmospheric input at different scales ?

*Surface drying and runoff/infiltration characteristics.*

★What are the spatial characteristics of the land surface state resulting from the atmospheric forcing ?

*Combining rainfall patterns and surface structures.*

★What is the effect of heterogeneities in surface conditions on convection and the large scale atmospheric situation ?

*Does the surface do more than guide convection ?*

★How do the actions of surface processes and sea-surface temperatures combine in the making of the rainy season ?

*SSTs and surface states will certainly not act independently from each other.*

★Which models do represent the observed surface atmosphere feedbacks ?

*Are CRM able to simulate the feedback ? Is any GCM credible ?*



# Preparatory work for the field campaigns

- ★ALDAS/ALMIP activities (CNRM, UPS, ...)
- ★Development of satellite tools to identify moisture related heterogeneities (CEH) and other surface characteristics (IGUC)

*These activities will provide guidance for the research flights during the SOP-1 and SOP-2.*

- ★Case studies of the diurnal cycle with a meso-scale model simulations for the region (U. Leeds)
- ★Theoretical fluxes associated with circulations at the diurnal time scale (IBIMET)

*The theoretical studies provide guidance on selecting cases during the SOP but also later for the analysis.*



# Other ongoing activities

- ★ Identifying the main modes of spatio-temporal variability of the continental land surface and comparison of observations (U. Bourgogne)
- ★ Surface impact on inter-annual variability of the monsoon one climate model (CNRM)
- ★ Single column model experiments for assessing the soil moisture – convection feedback loops in GCM parameterizations (CNRS and U. Perugia)





# A strategy for WG3

The progress towards our objective is broken down into 3 steps :

- 1) Land surface processes and atmospheric forcing
- 2) Atmospheric response to land surface processes
- 3) Coupling processes

