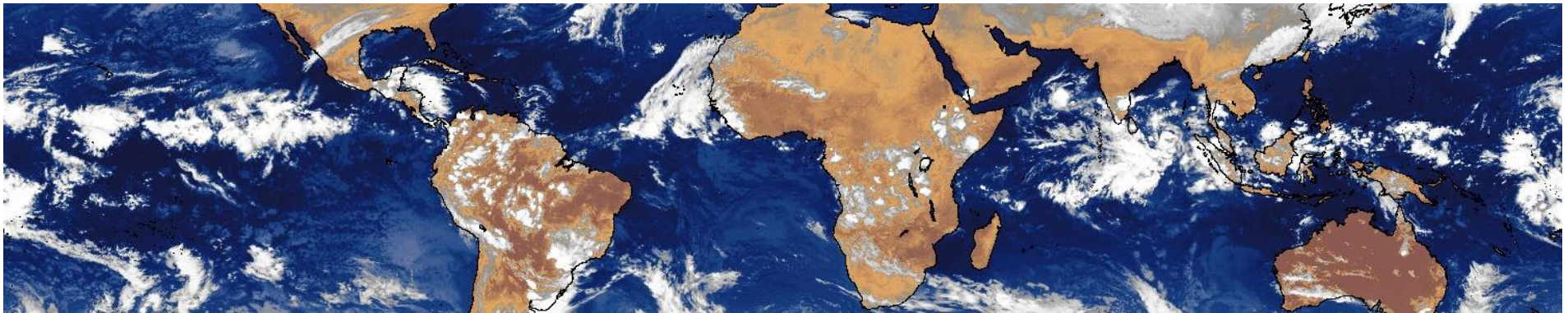


# Mesoscale Convective Systems in the Tropics



IR mozaic 13 Nov 2015 00Z Courtesy of [www.satmos.meteo.fr](http://www.satmos.meteo.fr)

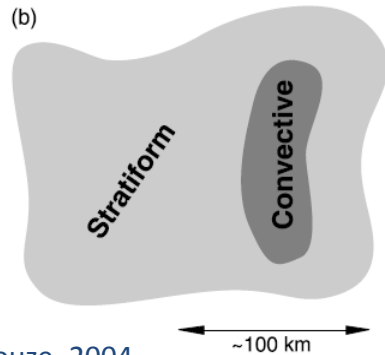
**Rémy Roca (CNRS) OMP/LEGOS, Toulouse, France  
and Dominique Bouniol (CNRS), CNRM, Toulouse, France**



**Acknowledgments to Thomas Fiolleau**

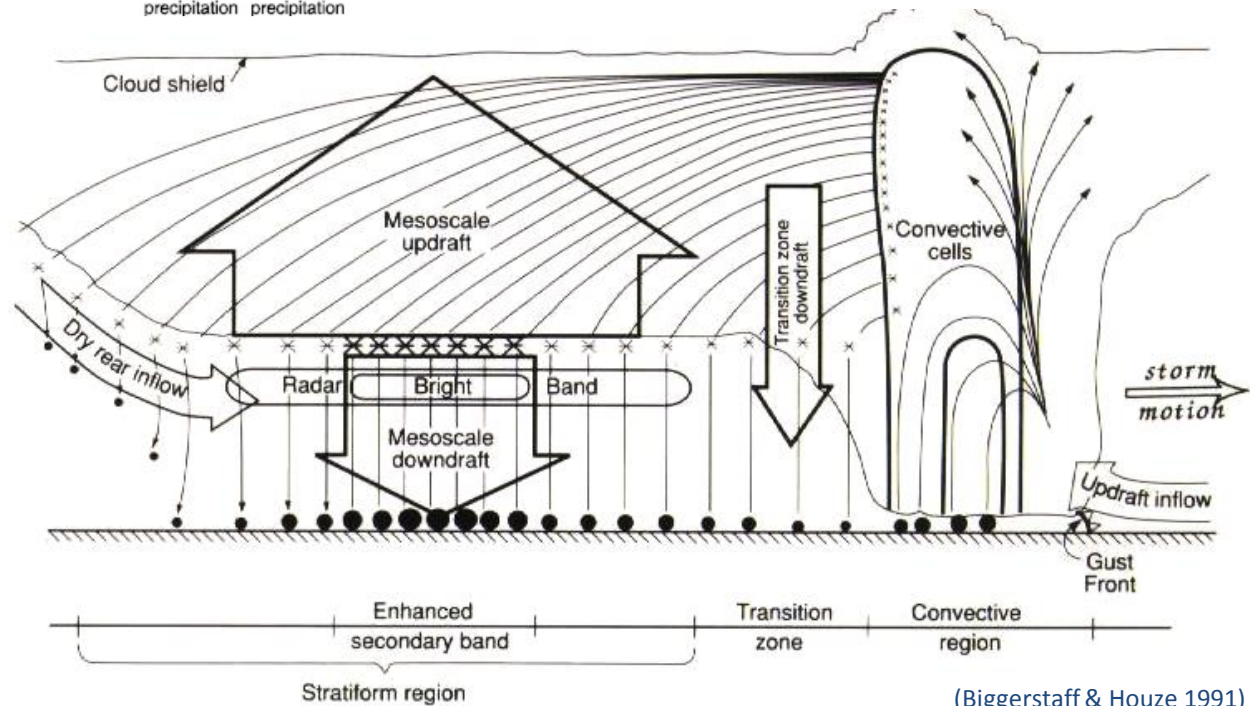
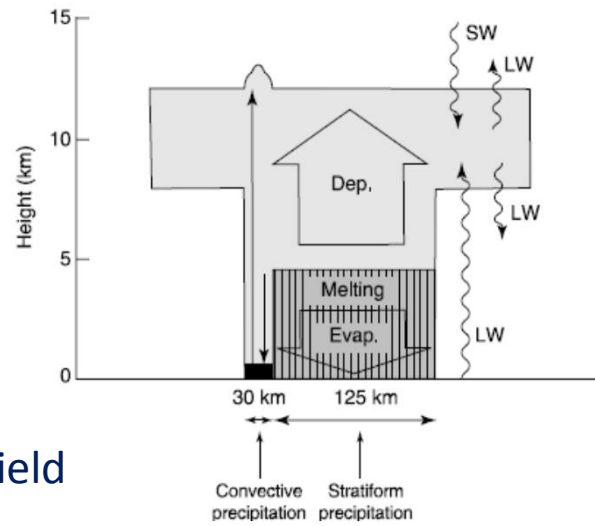
# What is a mesoscale convective system (MCS) ?

A large corpus of knowledge from radar meteorology, campaigns etc... (1/2)



Houze, 2004

Continuous cold cloud shield

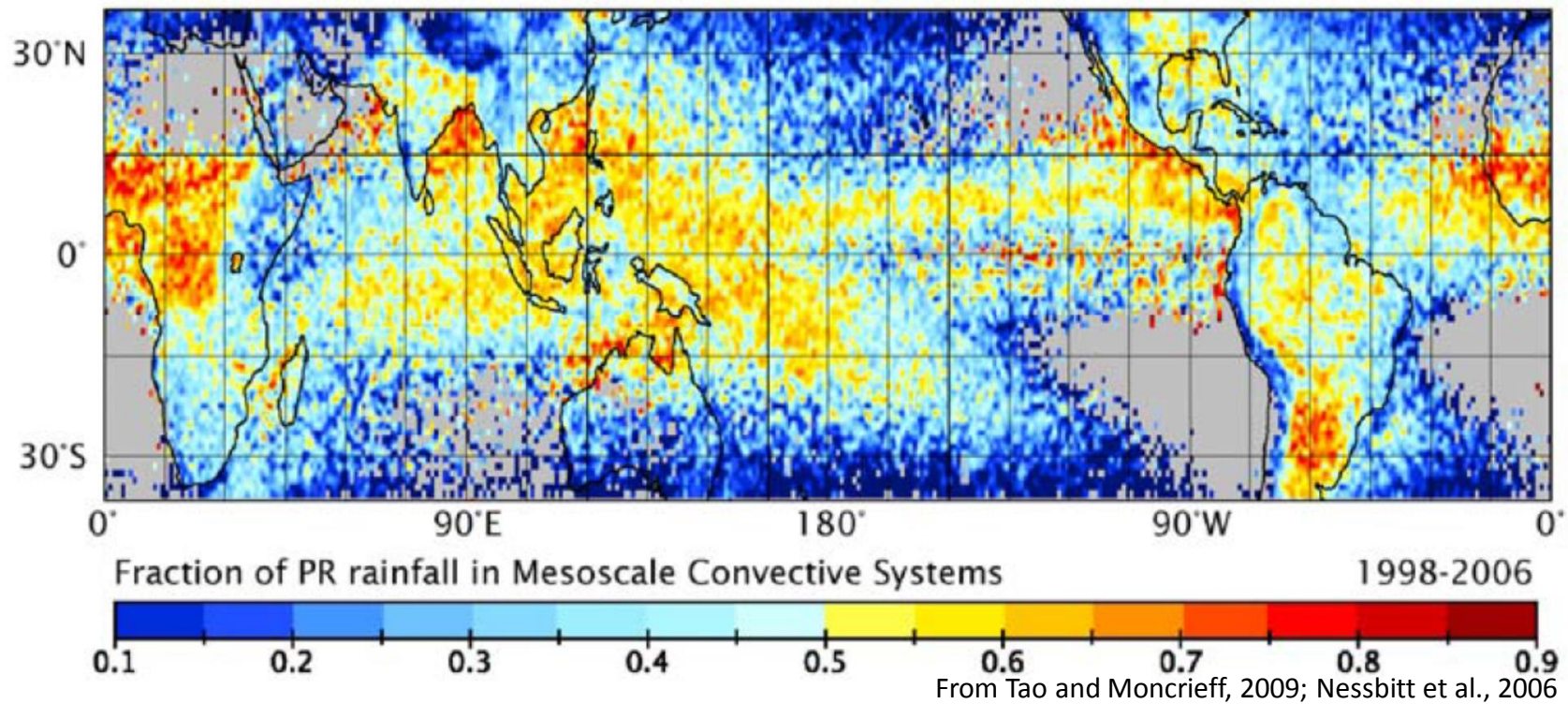
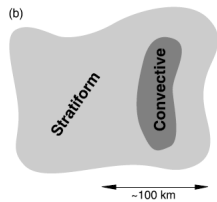


(Biggerstaff & Houze 1991)



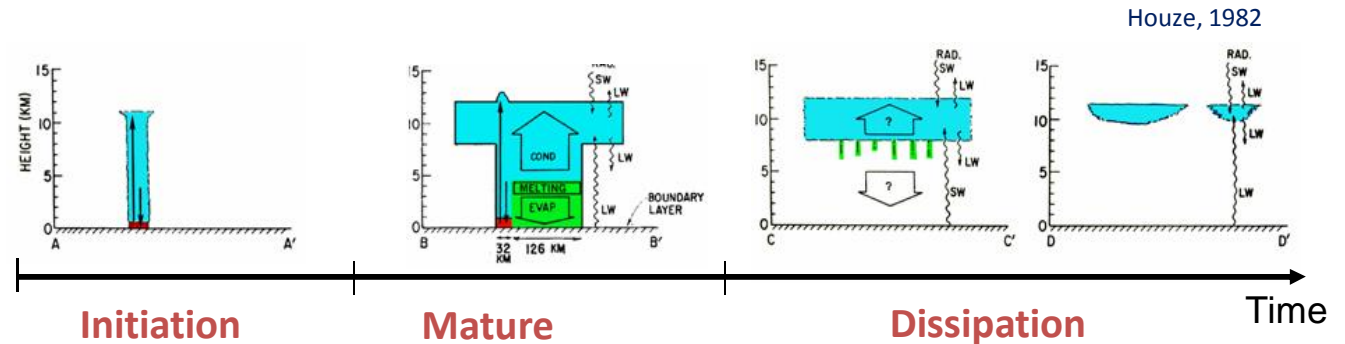
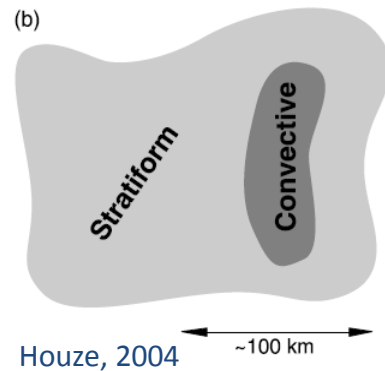
# The contribution of MCS to the tropical precipitation

An achievement of the TRMM mission



# What is a mesoscale convective system (MCS) ?

A large corpus of knowledge from radar meteorology, campaigns etc... (2/2)



Continuous cold cloud shield

that evolves during its life cycle from genesis to lysis

The organization of deep convection can be characterized by the MCS dynamical morphology:

- “ its **duration** in hours
- “ its **propagation** distance in km
- “ etc....

**READILY**

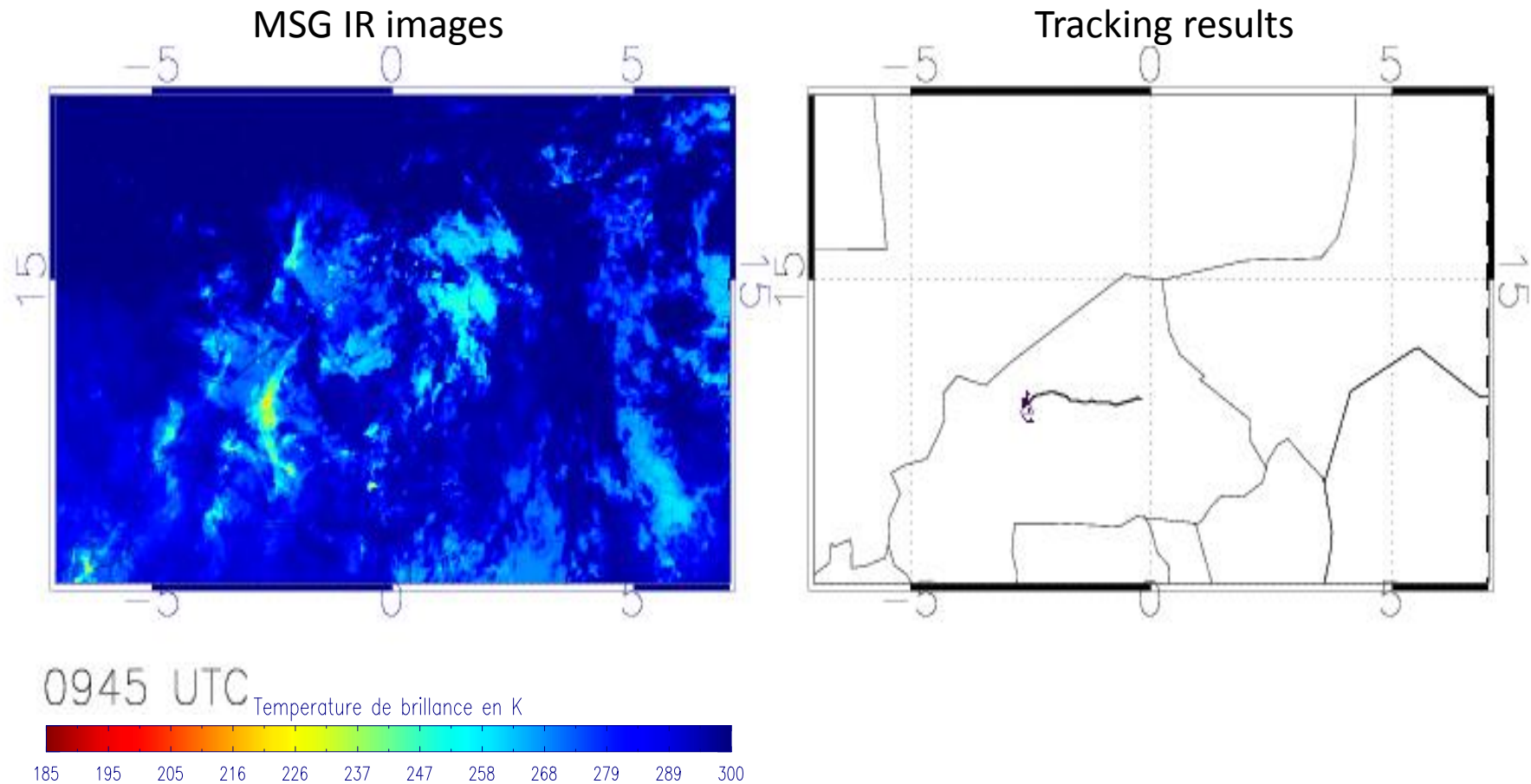
obtained from geostationary infrared imagery and a pattern recognition and tracking algorithm

Fiolleau T. and R. Roca, (2013), An Algorithm For The Detection And Tracking Of Tropical Mesoscale Convective Systems Using Infrared Images From Geostationary Satellite, Transactions on Geoscience and Remote Sensing, doi: 10.1109/TGRS.2012.2227762.

# What is a mesoscale convective system (MCS) ?

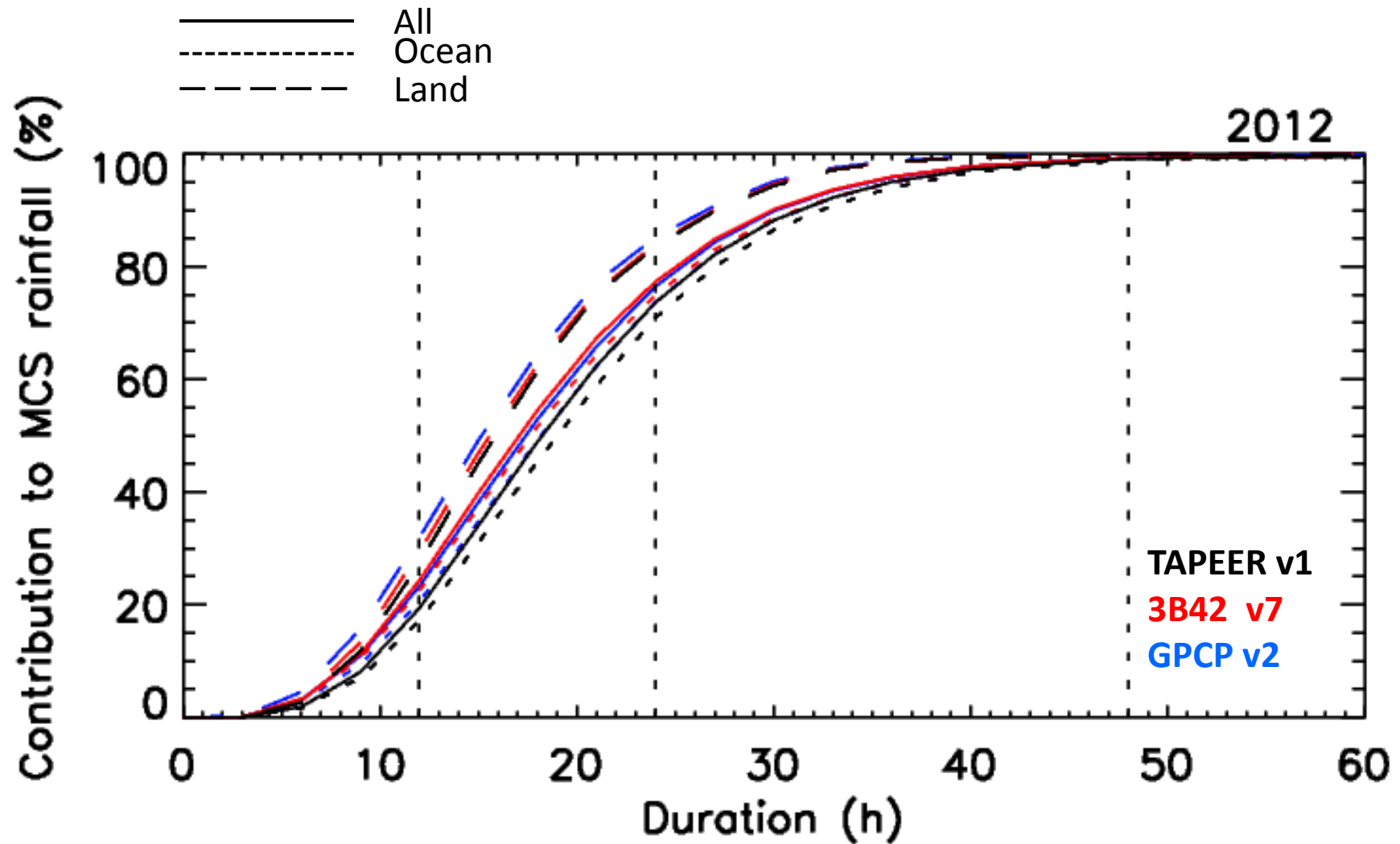
An example from METEOSAT observations

Sahel : Niger and Mali during the AMMA campaign (11/09/2006)



# The contribution of MCS to the tropical precipitation

Quantifying the importance of organized convection

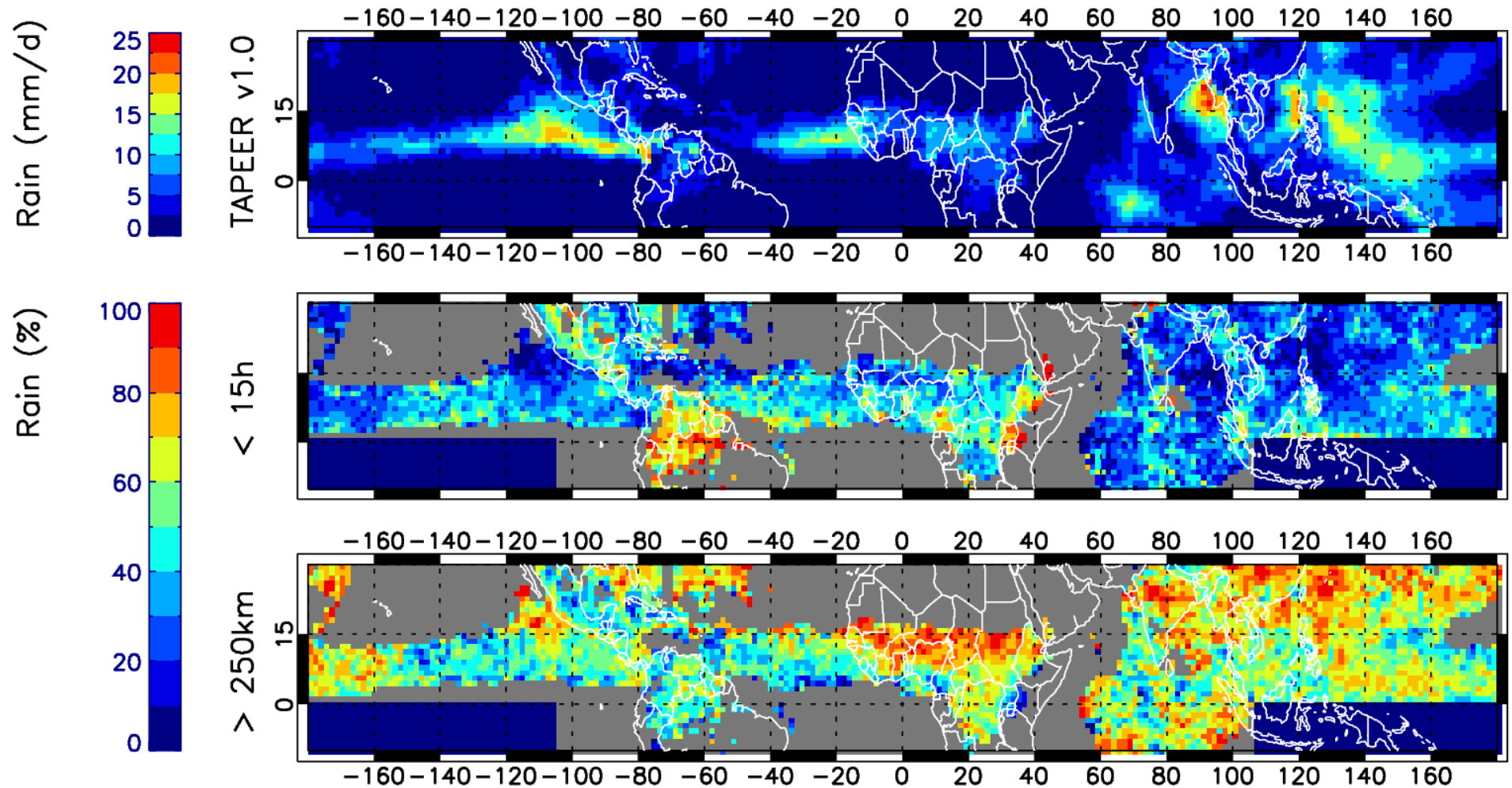


Update from Roca et al., J Clim, 2014

# The contribution of MCS to the tropical precipitation

## Tracking organized convection on the GEOring

Mean daily rain for JJAS 2012



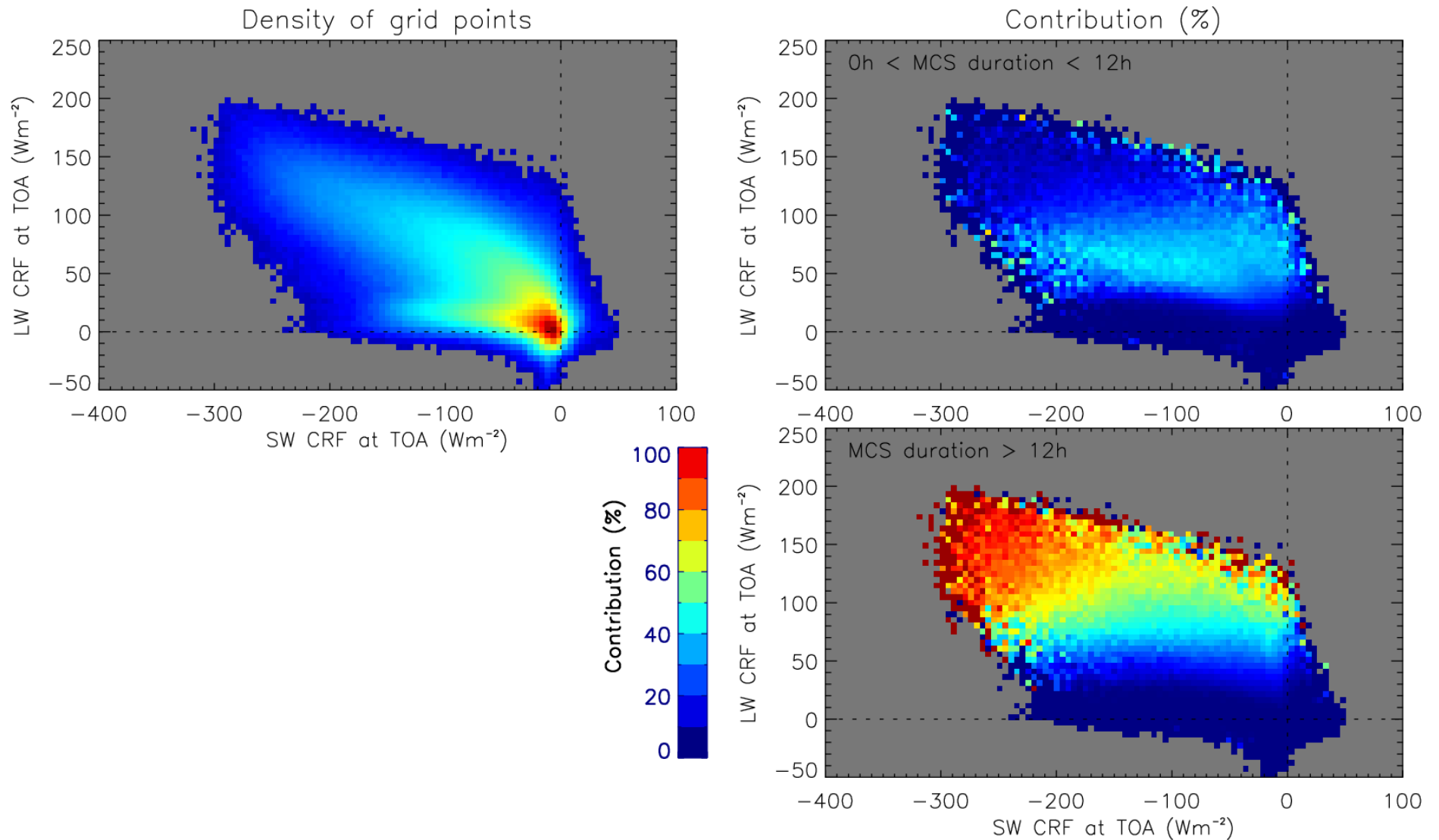
Update from Roca et al., J Clim, 2014



# The contribution of MCS to tropical radiation budget

Importance of long lasting systems to the distribution of CRF

JJAS 2009 / 30°s-30°n / 1°-1day/ SYN products + « Most representative MCS of the day » product





# Summary

## Importance of organized, long lasting & propagating storms to the tropical rainfall

- “ **Geostationary satellite data permit to characterize the time evolution of the MCS morphology and properties in the tropics**
- “ **While occurring over ~30% of the region, the MCS contribute to 90% of the total tropical rainfall**
- “ **The systems lasting more than 12h contribute to 80% of the total rain, a little less over land**
- “ **The systems propagating more than 250km correspond to 60% of the total rainfall**
- “ **Large geographical variability due to the various MCS regimes**
- “ **Extreme percentiles of rainfall exhibit a dependency upon the MCS duration and propagation.**

# Extra-slides

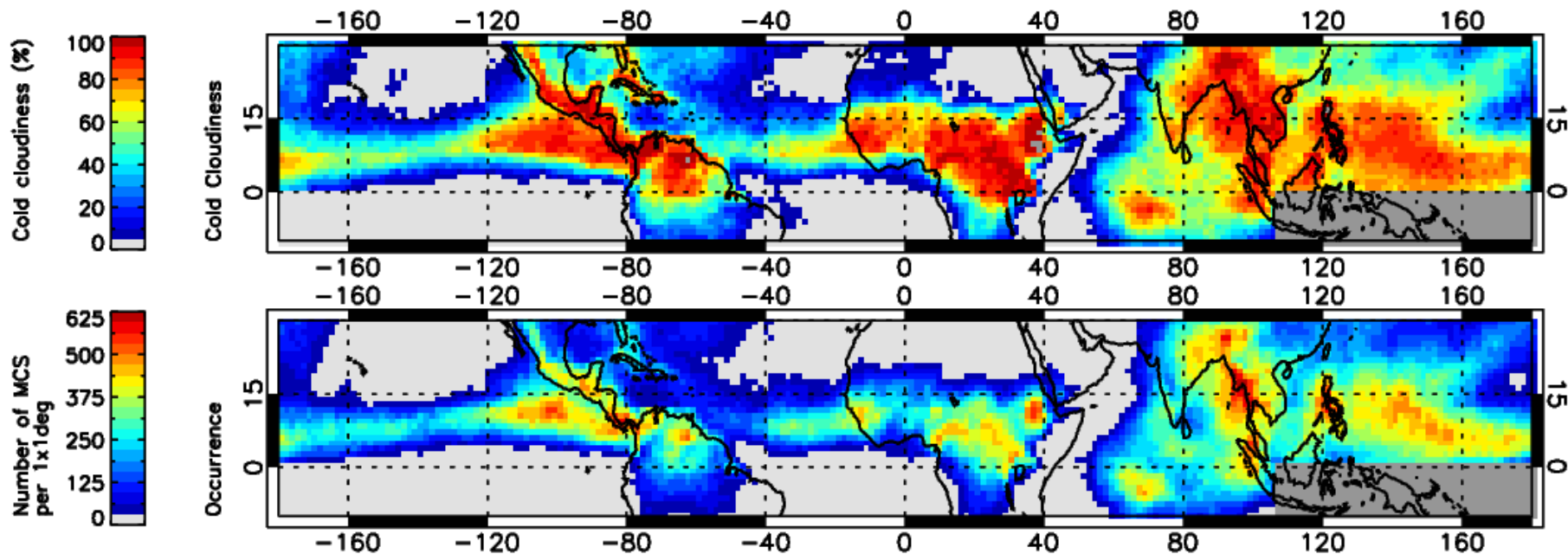
# The contribution of MCS to the tropical precipitation

## Summer 2012 4 months of data 1°/1 day

### “ MCS

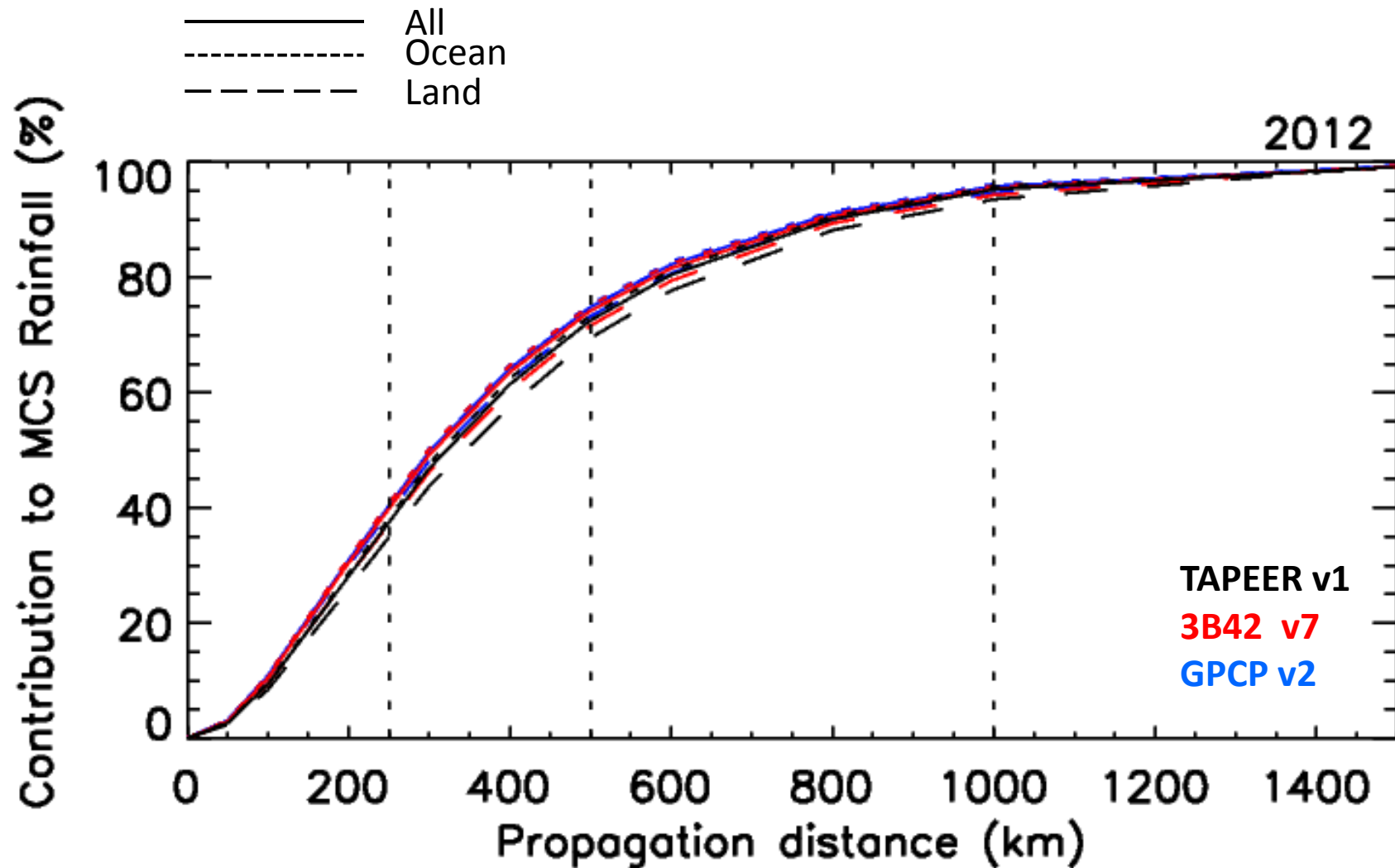
Cloud tracking algorithm run using the full resolution GEO infrared imagery  
GOES-15, GOES-13, GOES-14, MSG-2, MET-7 and MTSAT-2.  
only where 30 minutes, ~5km

missing southern hemisphere over Australia and West Pacific



# The contribution of MCS to the tropical precipitation

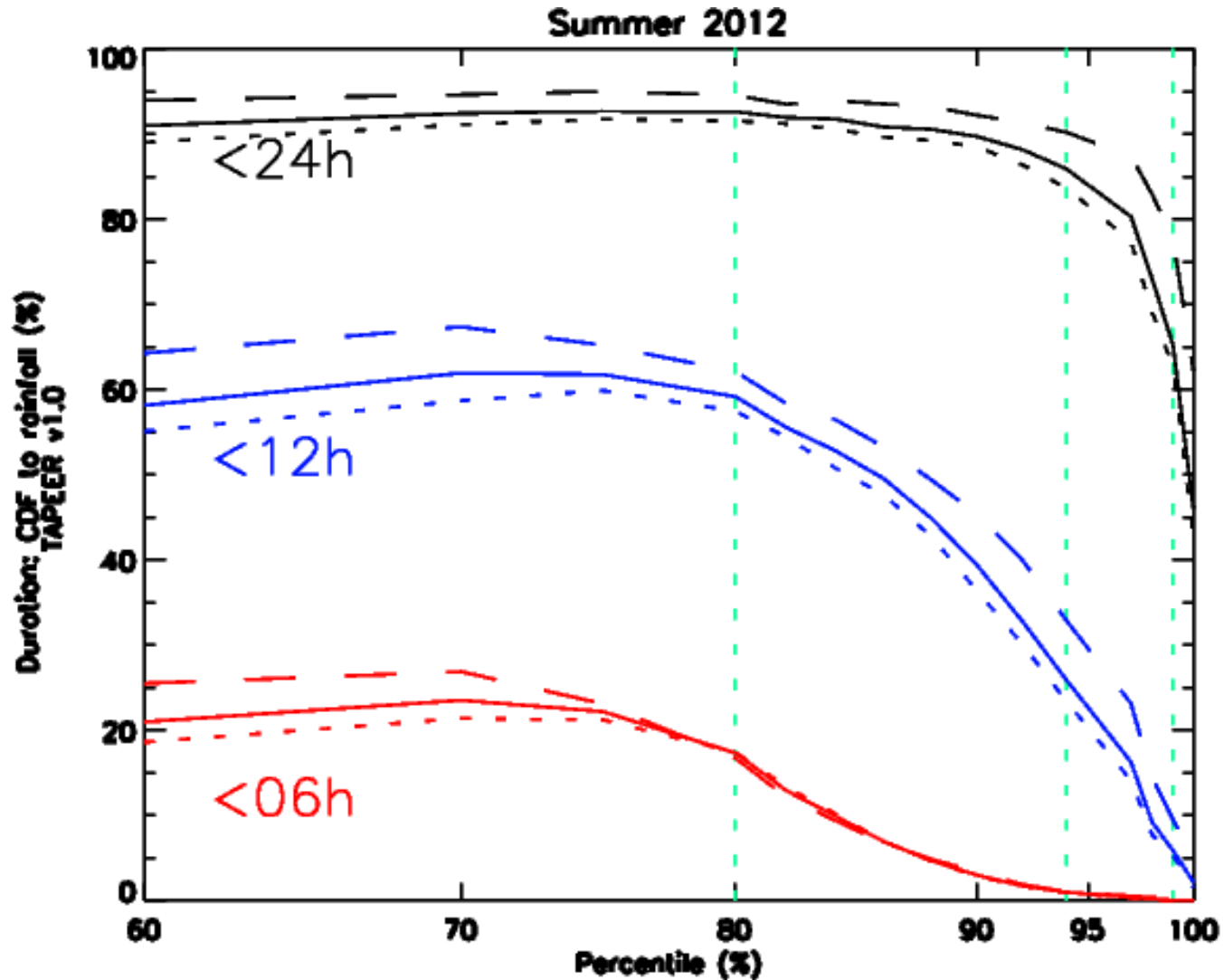
Quantifying the importance of organized convection





# Extreme rainfall events and MCS

Importance of organized (long lasting & propagating storms)

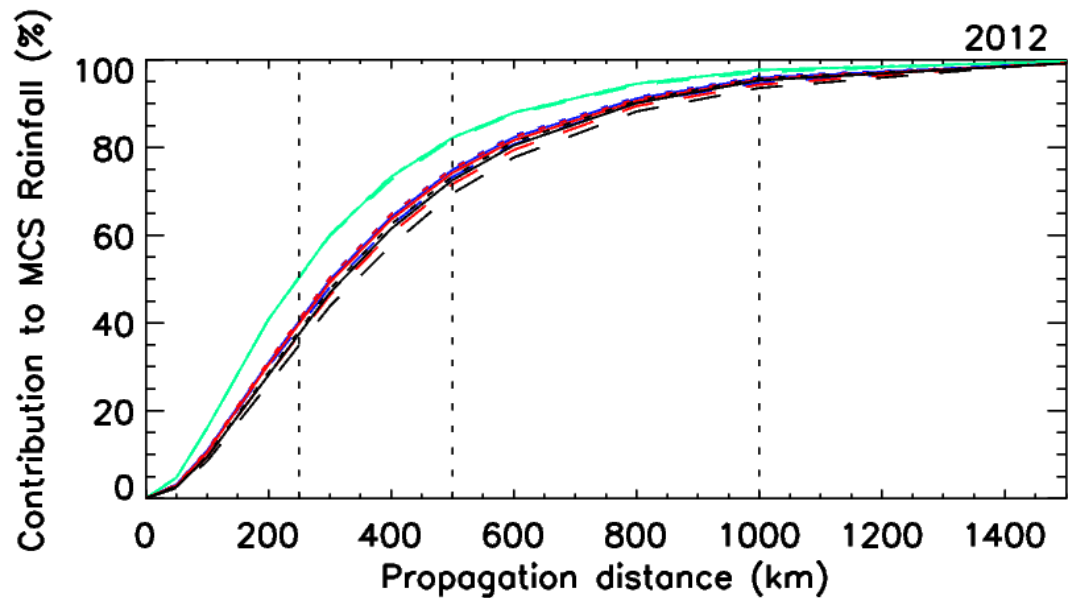
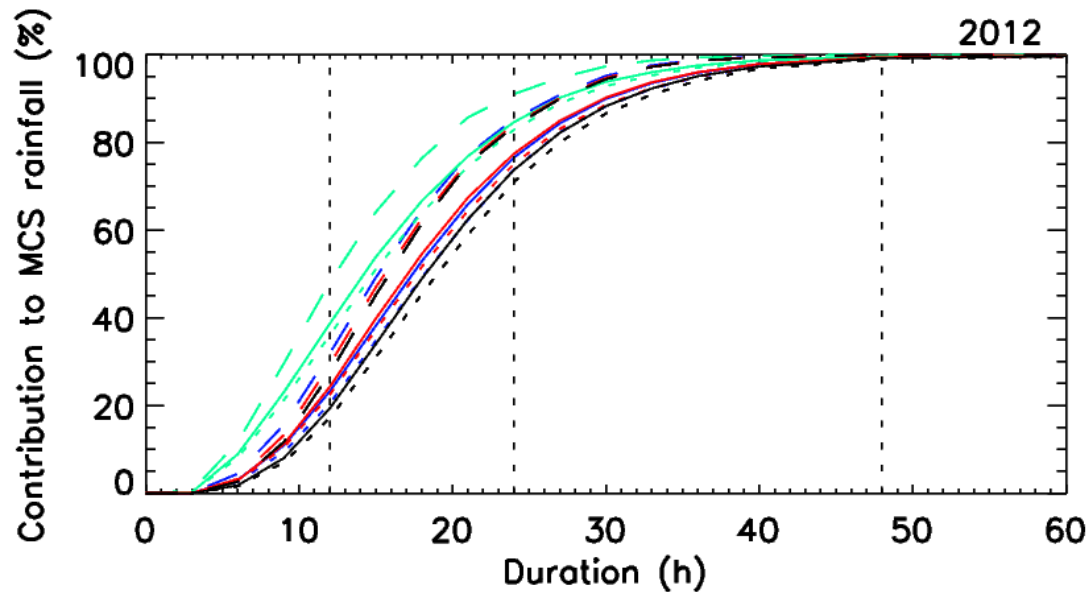


(Unpublished yet)

# The contribution of MCS to the tropical precipitation in ECMWF ERAi

## Quantifying the importance of organized convection

— All  
- - - Ocean  
- - - Land



TAPEER v1  
3B42 v7  
GPCP v2  
ECMWF ERAi