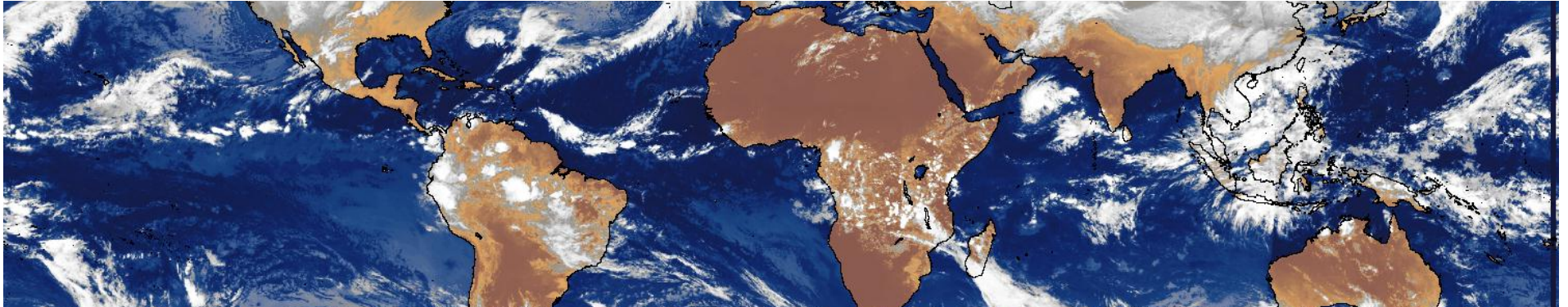




The Megha-Tropiques Mission

Science Status



Courtesy www.satmos.meteo.fr Nov 7th 12Z

Rémy Roca
Et le groupe français MT



R Roca et al, MT Status, PMM Meeting, Denver, USA, November 7th, 2011

The Megha-Tropiques mission

Successfully launched October 12th 2011 !



This morning 6:48AM

The Megha-Tropiques mission

Overview



Indo-french mission realized by

The Indian Space Research Organisation (ISRO) and the
Centre National d'Etudes Spatiales (CNES)

Megha means cloud in sanskrit and tropiques means tropics in french

Dedicated to the

Water and energy cycle in the Tropics

Low inclination on the equator (20°);

865 km height

High repetitivity of the measurements

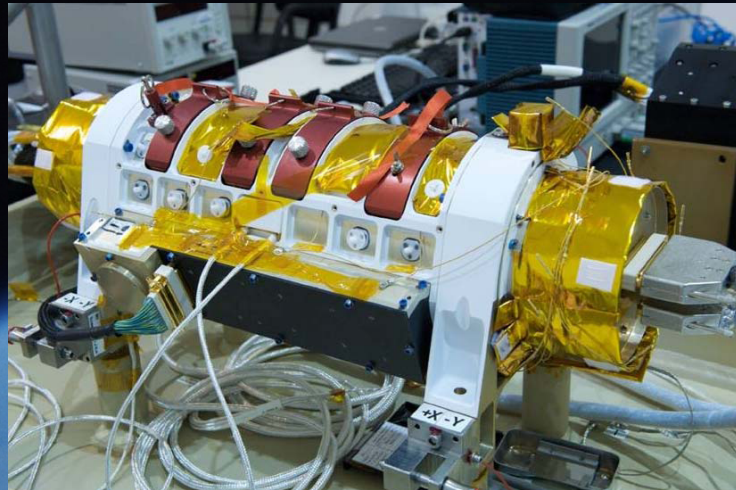
WEB site <http://megha-tropiques.ipsl.polytechnique.fr>

The Megha-Tropiques mission

Payloads (1/3)



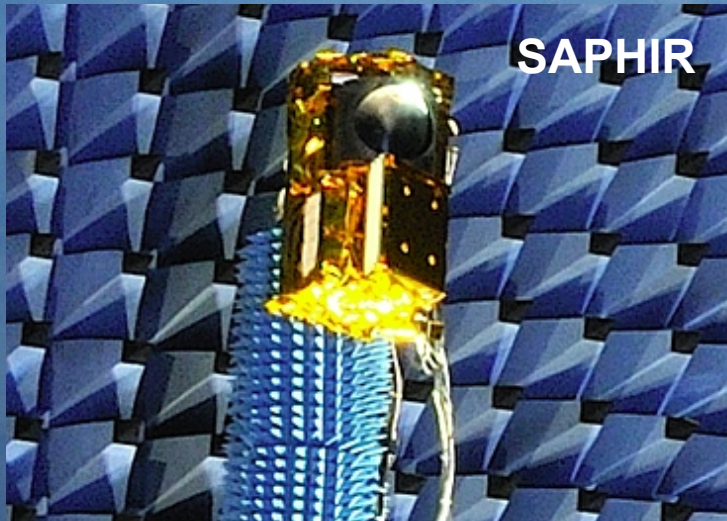
SCARAB



MADRAS



SAPHIR



+ GPS-ROSA

Courtesy CNES

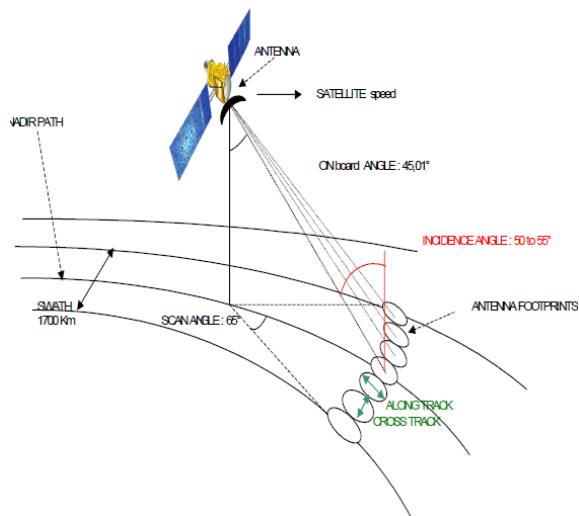
The Megha-Tropiques mission

Payloads (2/3)



Source: N. Karouche, CNES

- **MADRAS** : microwave imager for precipitation : channels at 18, 23, 37, 89 and 157 GHz, H and V polarisations. (conical swath, <10 km to 40 km)



	18 H	18V	23	36H	36V
NEDT spec	0,7	0,7	0,7	0,7	0,7
NEDT	0,4	0,47	0,44	0,35	0,37
	89H	89V	157H	157V	
	1,1	1,1	2,5	2,5	
	0,44	0,41	1,17	1,09	

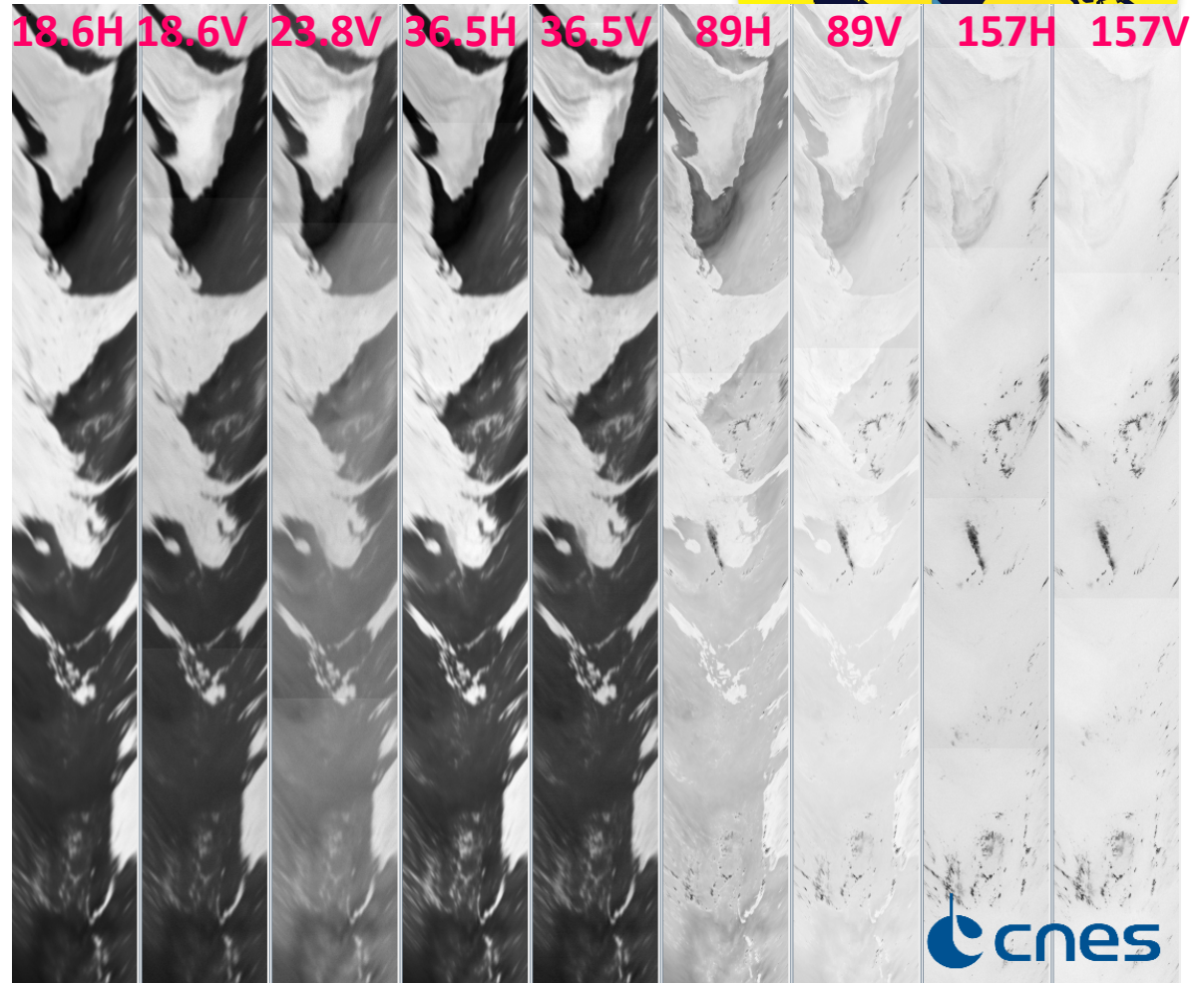
Source: N. Karouche, CNES



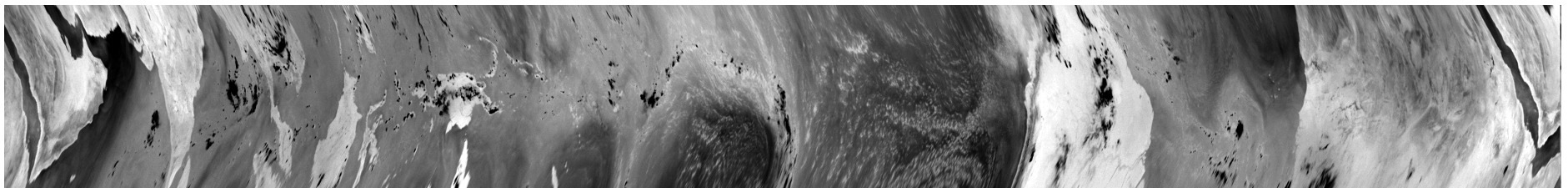
The Megha-Tropiques mission



« First » images from MADRAS
Raw data, numerical count



MADRAS 89V channel

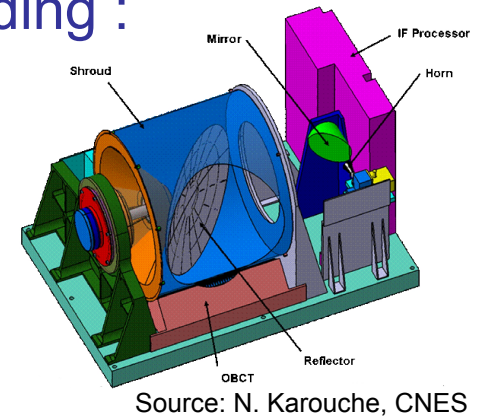


The Megha-Tropiques mission

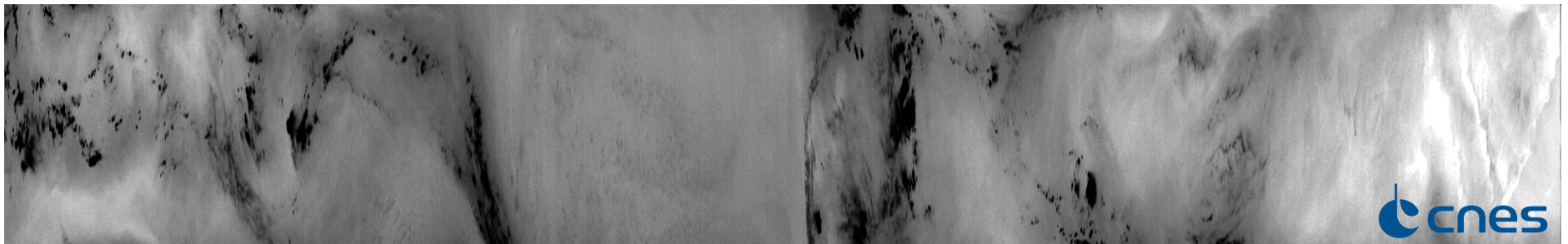
Payloads (3/3)



SAPHIR : microwave sounder for water vapour sounding :
6 channels in the WV absorption band
at 183.31 GHz. (cross track, 10 km)



« First » images from SAPHIR
Raw data, numerical count channel 6

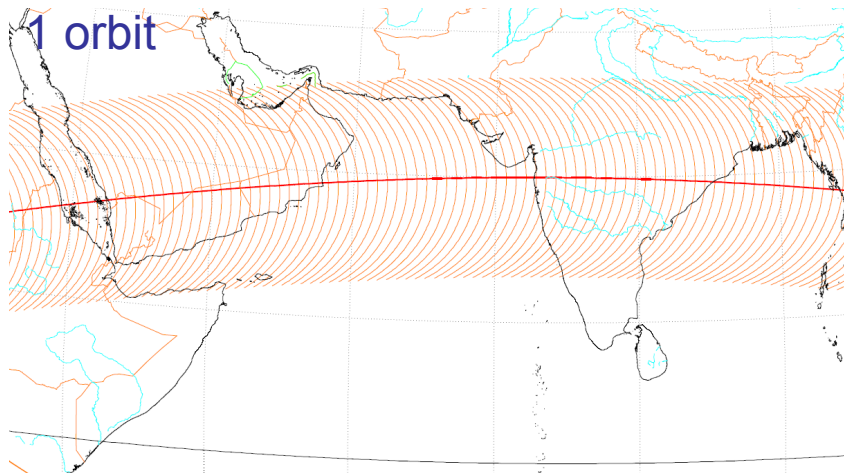
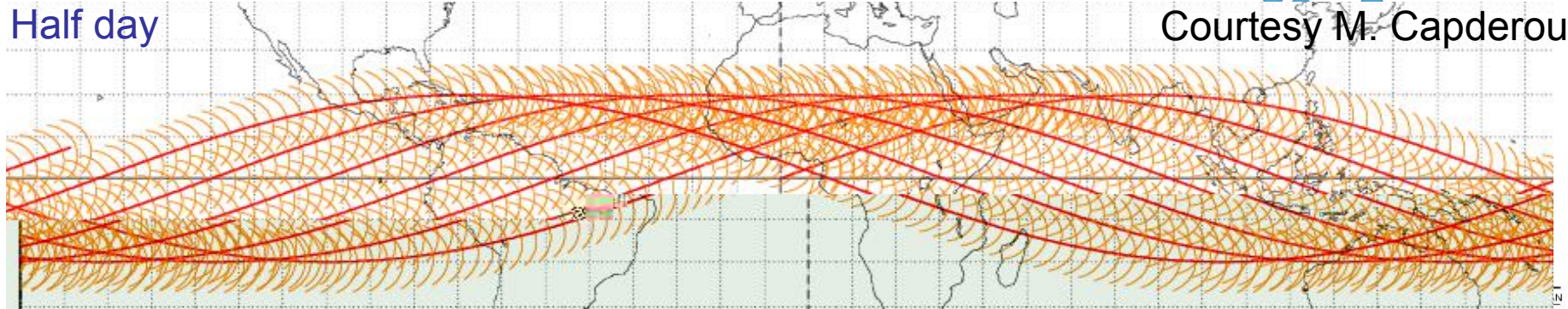


Megha-Tropiques

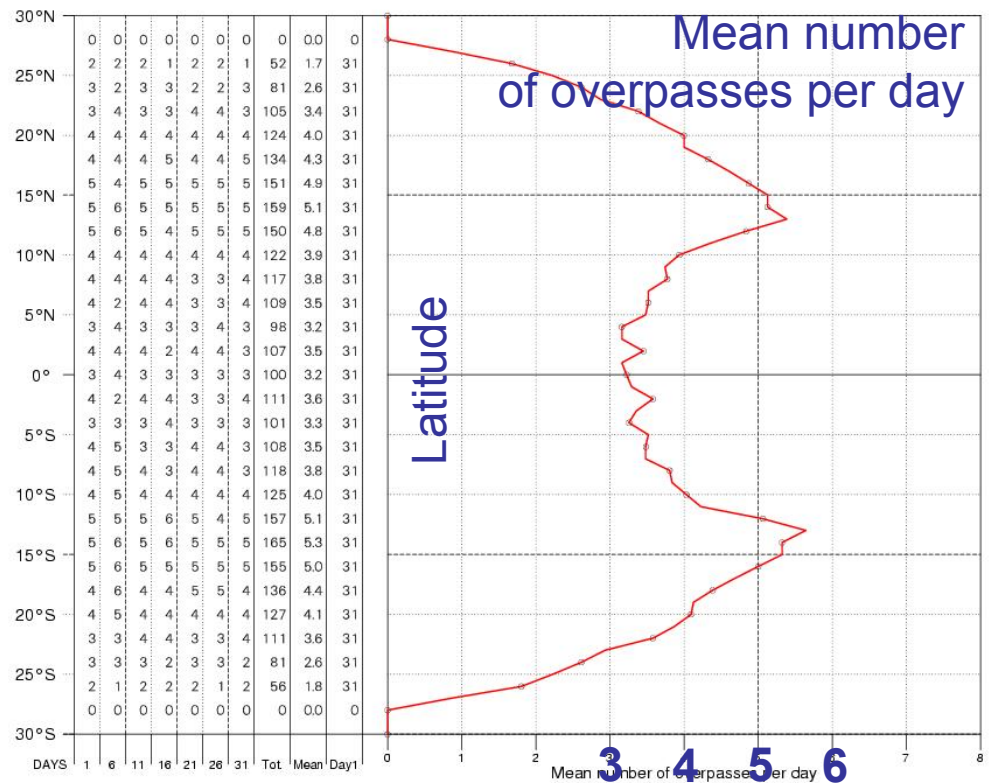
An equatorial orbit



Courtesy M. Capderou



MADRAS sampling over 20°S-20°N
 Min 3 per day
 Max 5 per day



The Megha-Tropiques mission

Scientific objectives



Atmospheric energy budget in the intertropical zone and at system scale (radiation, latent heat, ...)

Life cycle of Mesoscale Convective Complexes in the Tropics (over Oceans and Continents)

Monitoring and assimilation for Cyclones, Monsoons, Mesoscale Convective Systems forecasting. **NRT Activities**

Level 2 rain retrieval from MW imagers

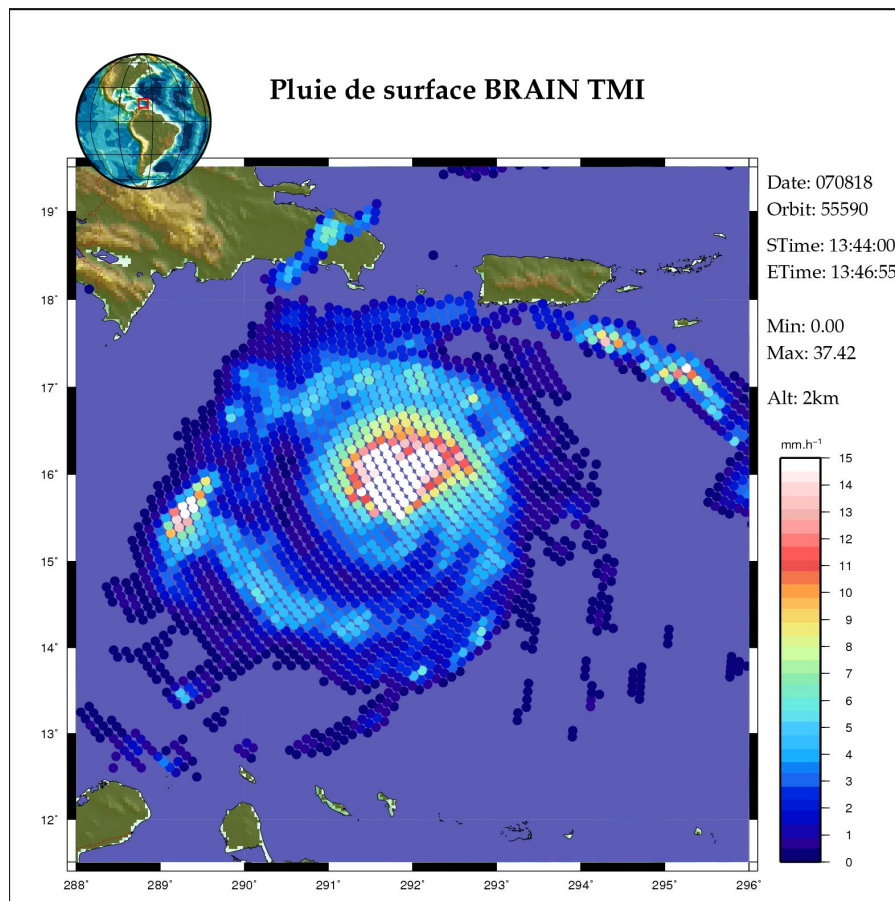
The BRAIN algorithm



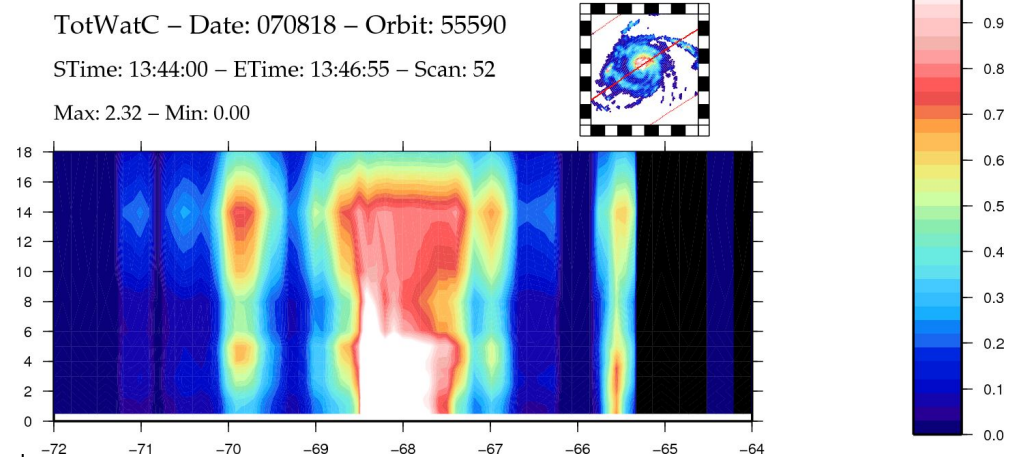
Brain results (TRMM) over hurricane Dean (12kmx12km resolution)
MADRAS will provide similar products but with lower resolution (25kmx25km)

Surface Rain

Viltard et al., 2011

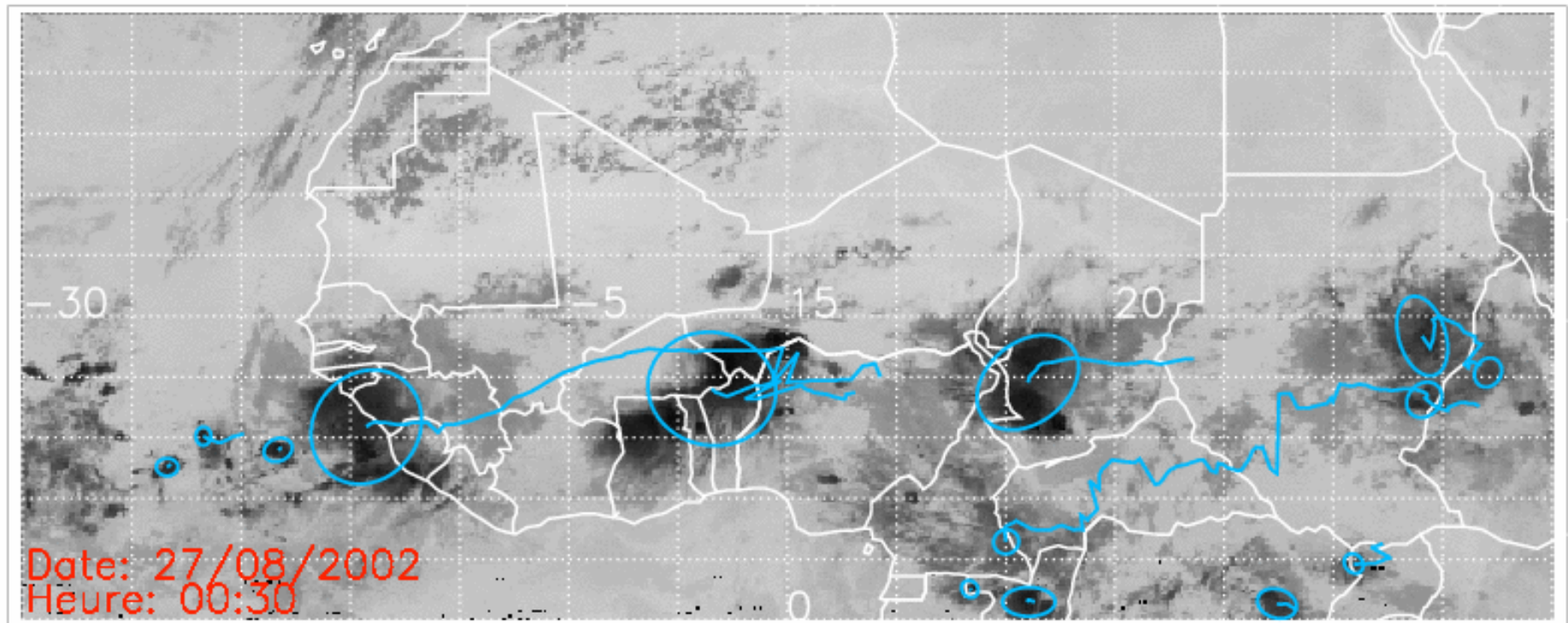


Vertical cross-section of: rain,ice,liquid
and ice cloud [g.m⁻³]
14 layers



Life cycle of MCS in the tropics

An orbit for the life cycle study



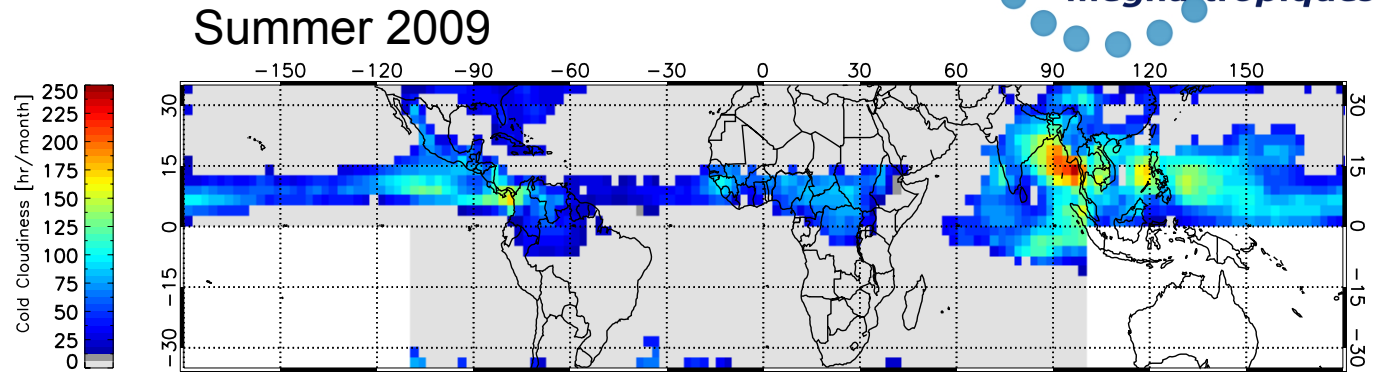
Courtesy T. Fiolleau

Life cycle of MCS in the tropics

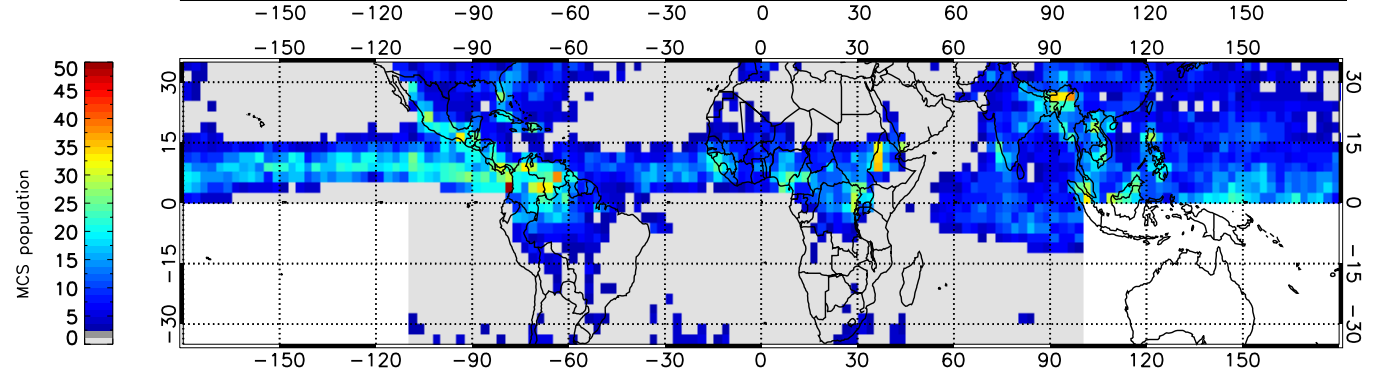
Mesoscale Convective system life cycle BRAIN+GEO



Cold cloud fraction

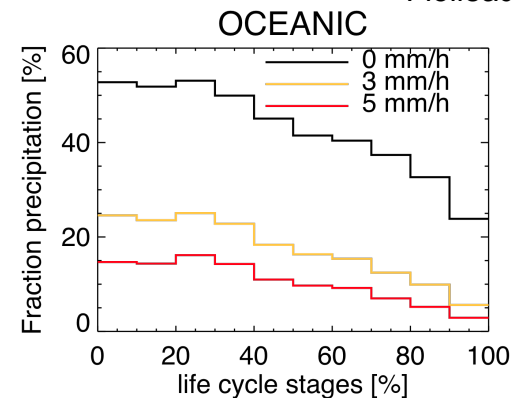
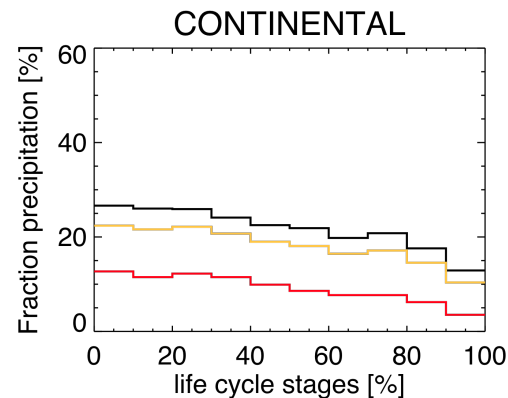


Tracking algorithm Results From half hourly images



Fiolleau and Roca, 2011

Composite results

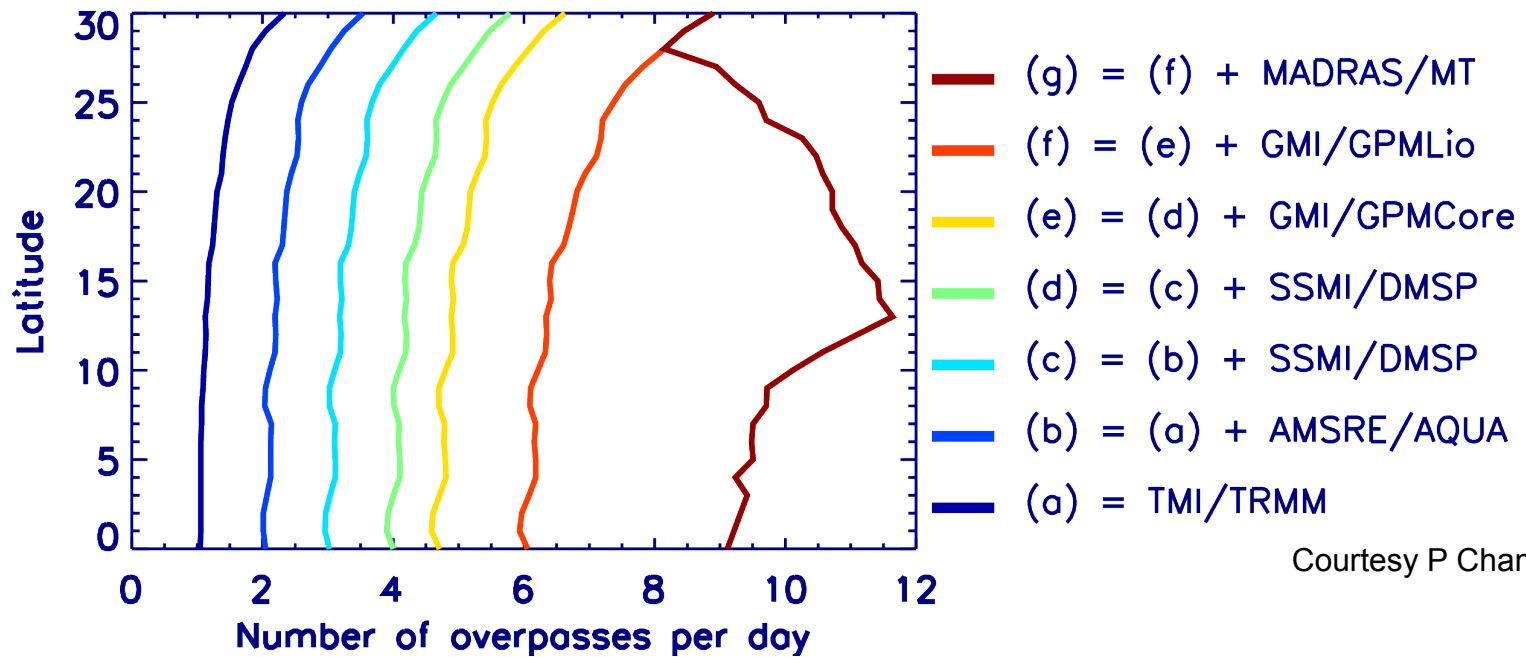
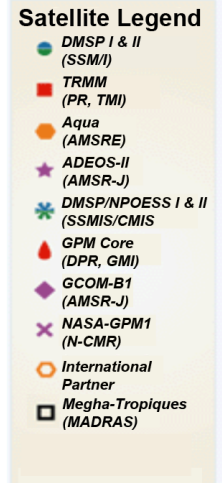


Rainfall estimation over the tropics



Participation to GPM

2011 and Beyond



Courtesy P Chambon

Rainfall estimation over the tropics

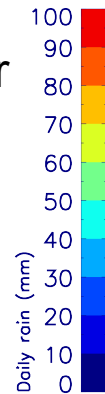
Level 4 Multi MW platforms + GEO



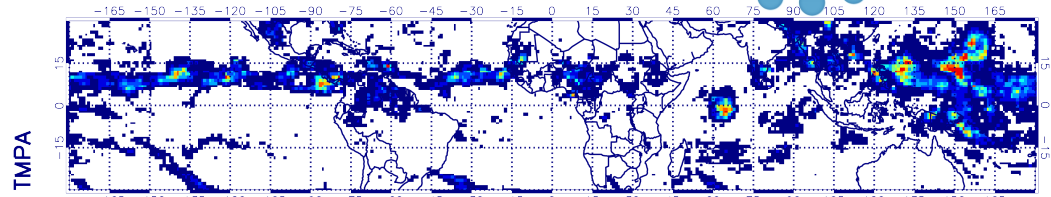
Tropical Amount of Precipitation with ERRors (TAPEER) – BRAIN

1°/1day

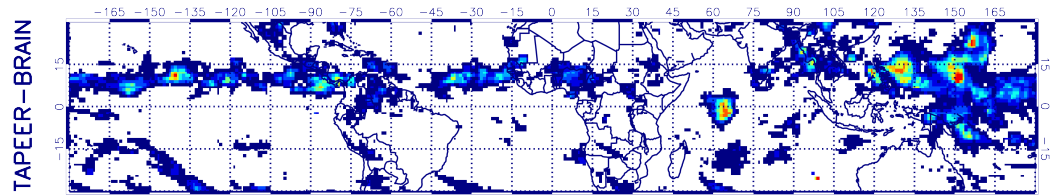
accumulated rainfall + Error



(a)



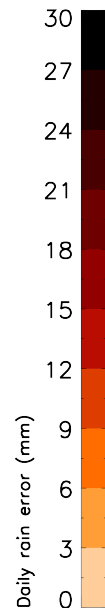
(b)



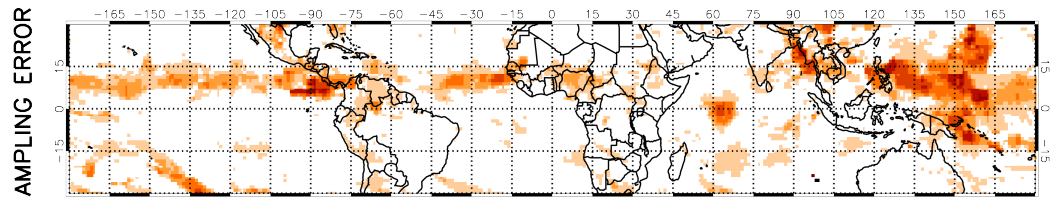
Estimation of the error
For the BRAIN
Instantaneous retrieval

West Africa (Sahel)
(Kirstetter et al., 2011)

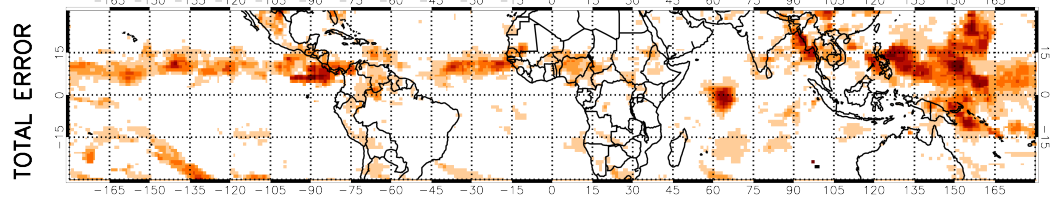
Brazil, India, West Africa
With the upcoming
Validation plan



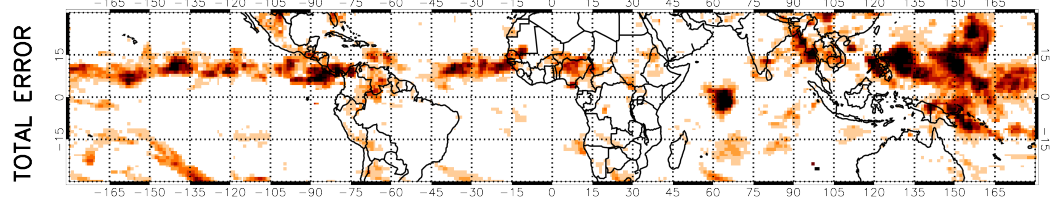
(c)



(d)

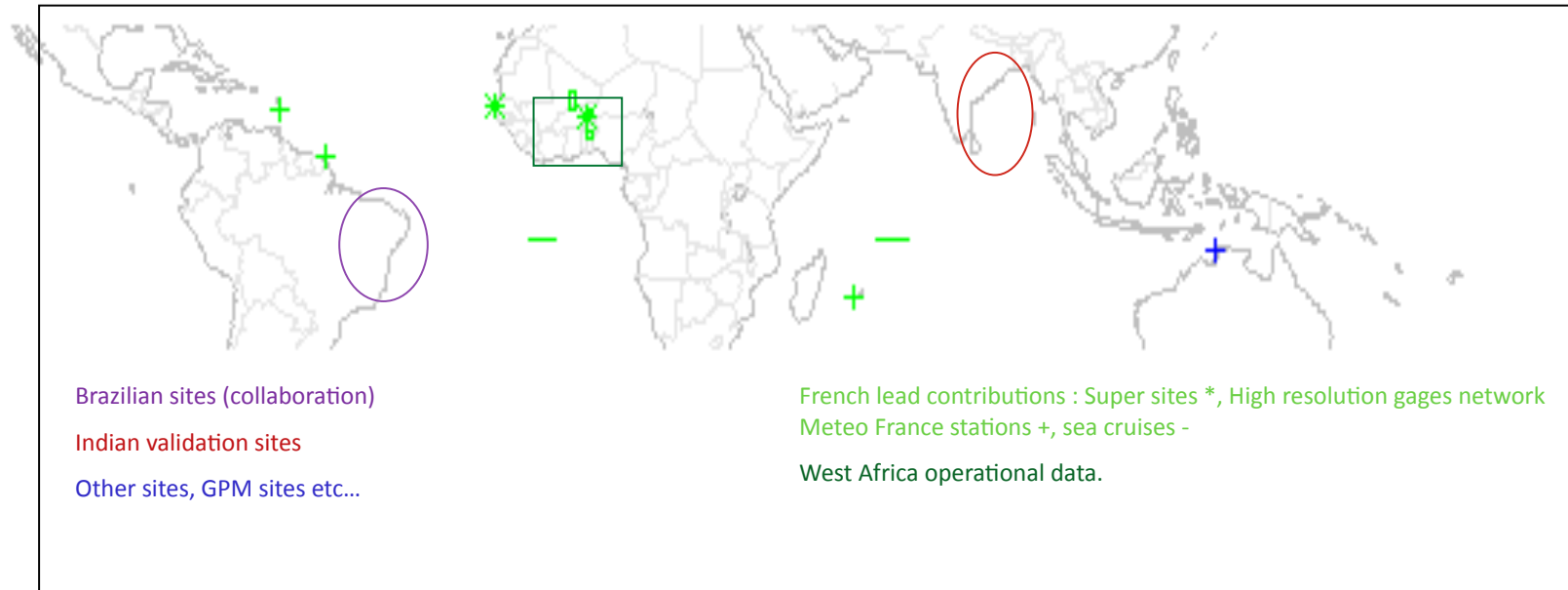


(e)



Chambon et al., 2011

Validation effort International plan



Courtesy M. Gosset

Plan global –international collaborations

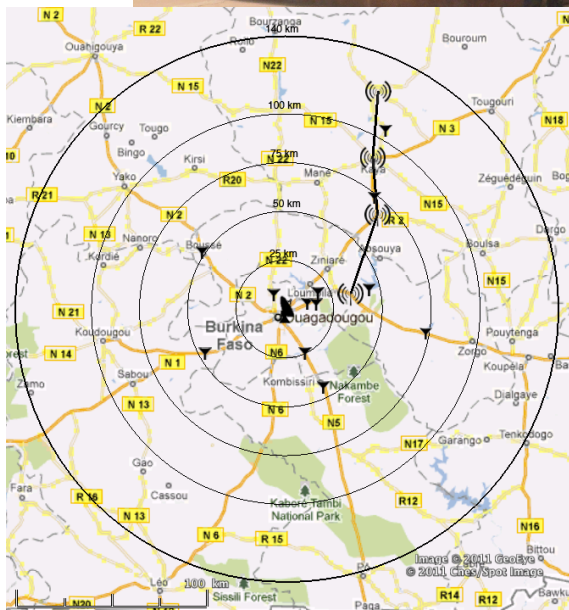
- India Brazil
- Sites GPM GV et data from IPWG.
- Meteo-France 'lame d'eau' (Guyana, Caribbean, Reunion)
- Collaboration In West Africa (AGRHYMET, DMN, MIT NASA, GPM GV)

A super site in West Africa

2011 : Relocation of the super site from Niamey to Ouagadougou
Burkina Fasso



Courtesy M. Gosset



R Roca e

Algorithm Validation

Rationale



Main source of uncertainties in TB simulation over land in the Tropics: PSD parametrization in the Radiative Transfer Model

- Set up some polarimetric Doppler radars to build a climatology of particles classification as a function of season, lifecycle, type of the system
- On a limited number of systems, perform **in-situ** measurements with a plane
- Come up with PSD properties where the plane flew and cross-reference it with the **radar** particles classification
- Set the parametrization in the RTM used to build the retrieval database rttov

2 experiments:

- **Niamey 2010: MIT radar, X-Port and Falcon 20 (in-situ + RASTA)**
- **DYNAMO 2011: SMART-R, S-PolKa and same Falcon 20**

Algorithm Validation

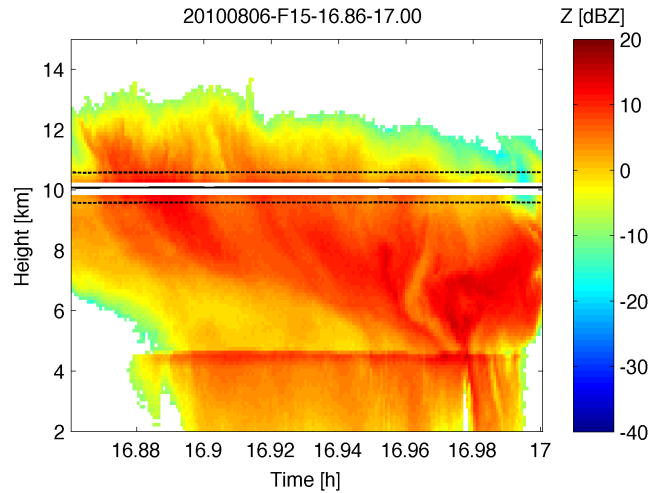
First results

“Classical” case when best match is $m(D) = 2 \cdot 10^{-6} D^{2.2}$

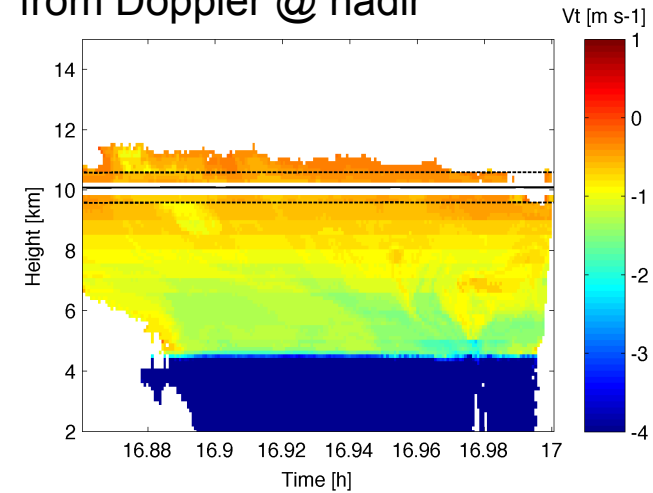


RASTA Z

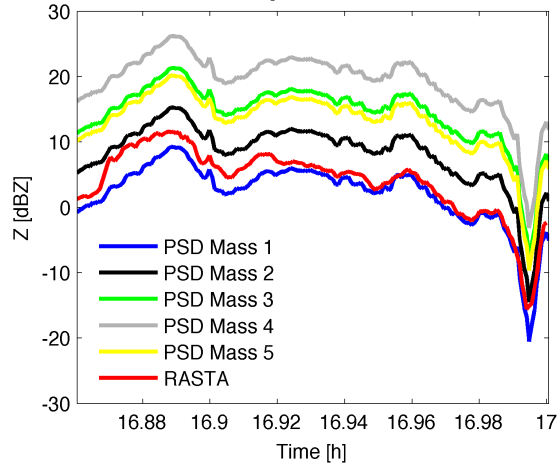
20100806-F15-16.86-17.00



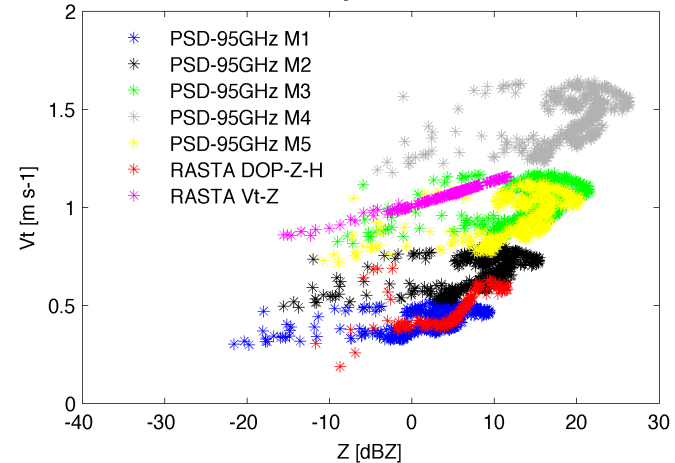
RASTA: Terminal fall (V_t) speed from Doppler @ nadir



Heuristic look up for the best $M(D)$



Heuristic look up for the best Z- V_t



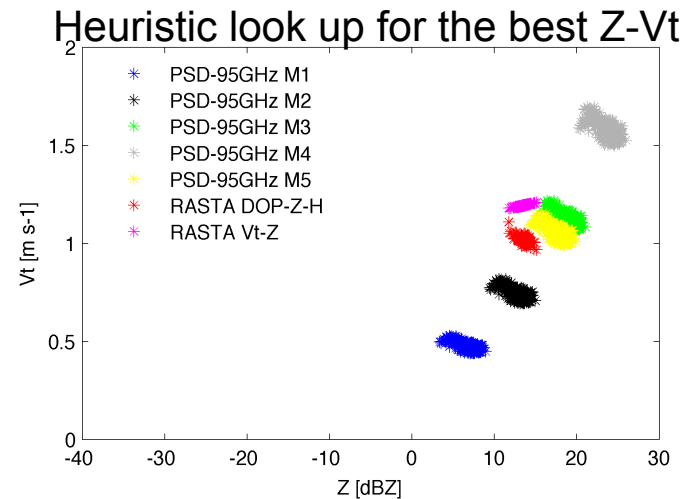
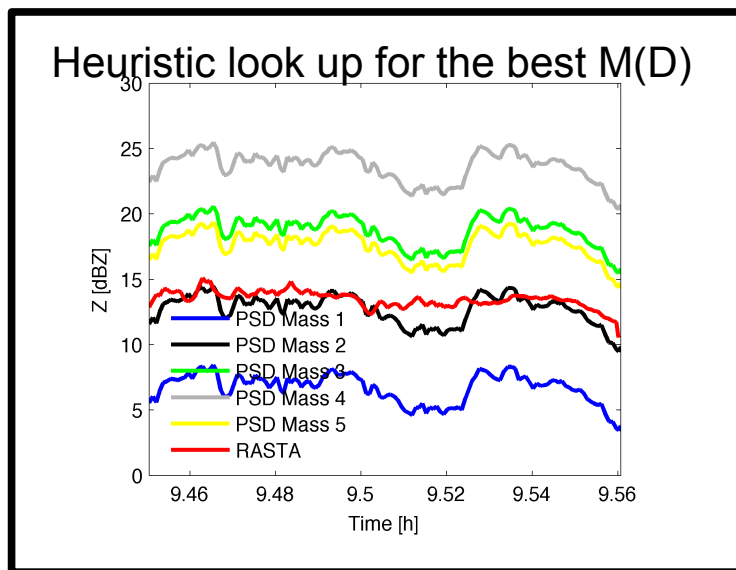
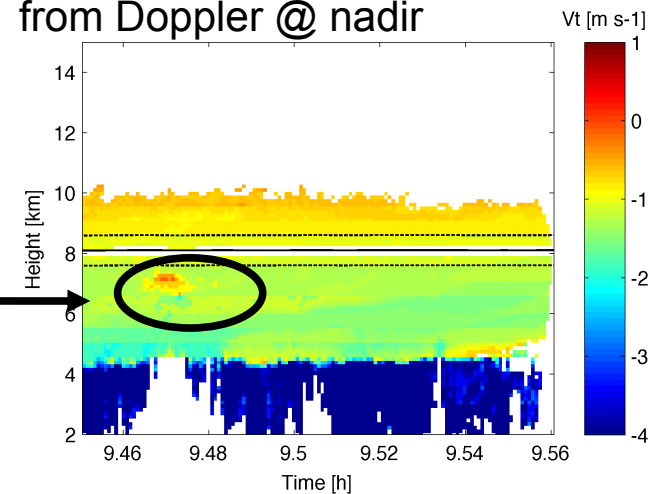
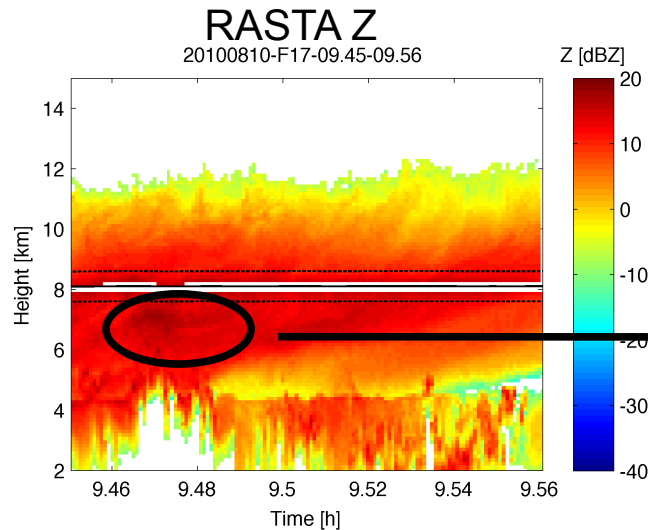
Courtesy N. Viltard et al.

Algorithm Validation

First results



“unexpected” case when best match is more like $m(D) = 4 \cdot 10^{-6} D^{2.2}$
 RASTA: Terminal fall (V_t) speed from Doppler @ nadir



Courtesy N. Viltard et al.

Summary and conclusions

Schedule of events



Fall 2011

Commissioning

Participation to DYNAMO

campaign and aircraft operations

microphysics and algorithm validation

Early january 2012

L1 and up to the International Science Team

Calibration phase

Small workshop on « Methods for validation »

Bangalore, early May

Summer 2012

L1 and up « widely open »

Start of the NRT stream

Participation to CTCZ 2012 (India)

West African Campaign

Rainfall and water vapor profile

Winter 2012-2013

First international scientific conference

WEB site <http://megha-tropiques.ipsl.polytechnique.fr>

Join our email list , send me a message



Thanks !

Extra



Une mission tropicale mais globale !

Un science team international !

