# Characterization of the microphysics of ice using CHUVA X-band radar and TMI and MADRAS brightness temperatures

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# Goal

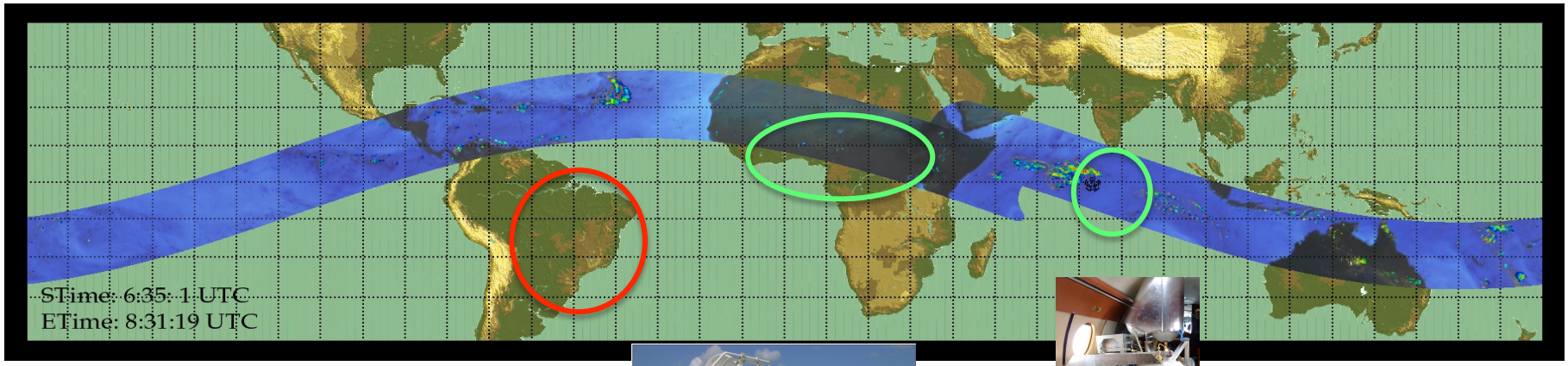
## Correlation between Tb, WC and Particle's Type

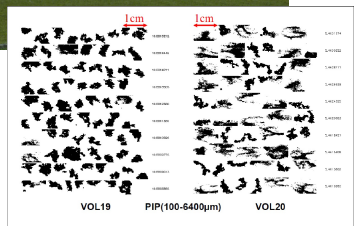
- Large source of uncertainties in ice properties lead to large discrepancies between observed and simulated TBs relevant for BRAIN retrieval,

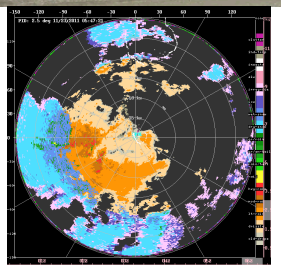
- Find out the ice properties as a function of situation, life cycle of system, region etc…

- Develop a corresponding parameterization to be used in the RTM used to build BRAIN retrieval database.

# The Microphysic Question



CHUVA

The CHUVA campaign offers us an extra dataset, with a wide variety of situation.

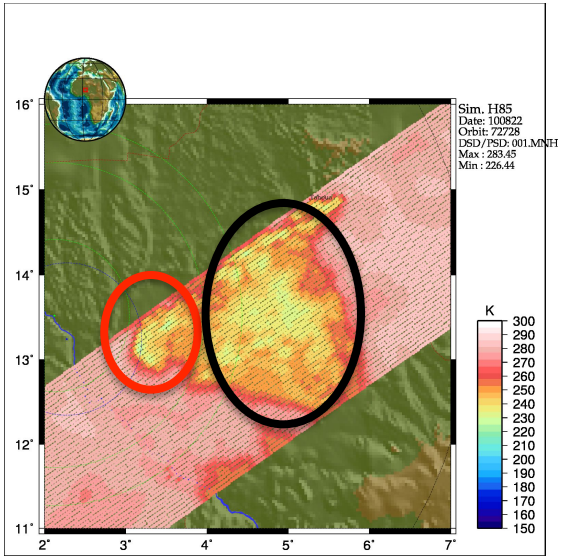
Ground Validation : Niamey 2010 et Dynamo 2011:

Build statistics of ice type distribution within the system, the season or the region of the world

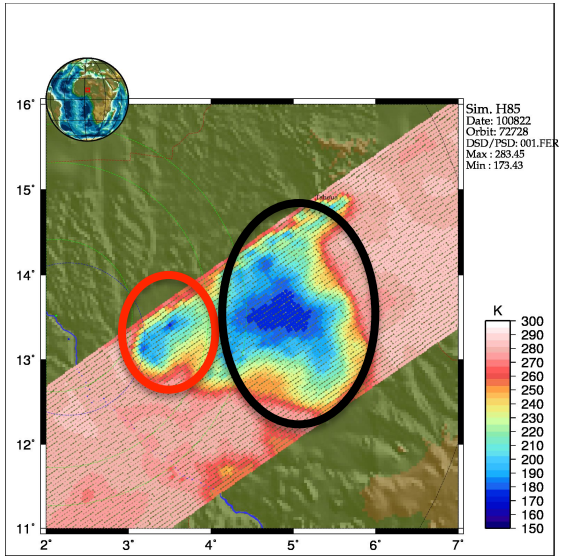
# Brightness Temperatures of TMI (TRMM)

Convective system in Africa

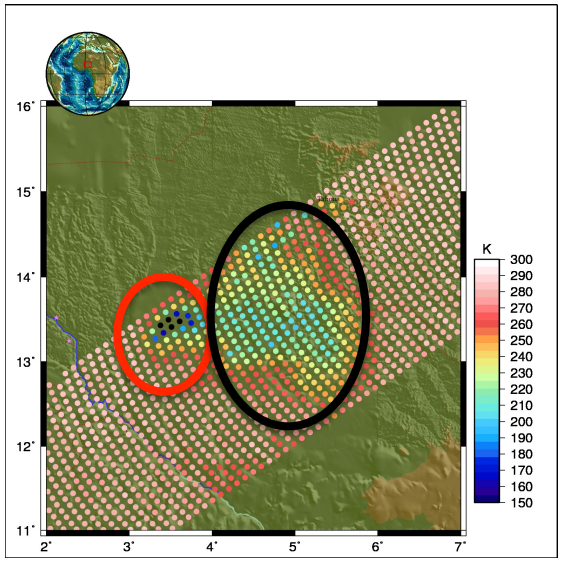
a)




b)




$T_B$ obs




Real TMI $T_B$

Two realisations of TMI according to ice parametrization:

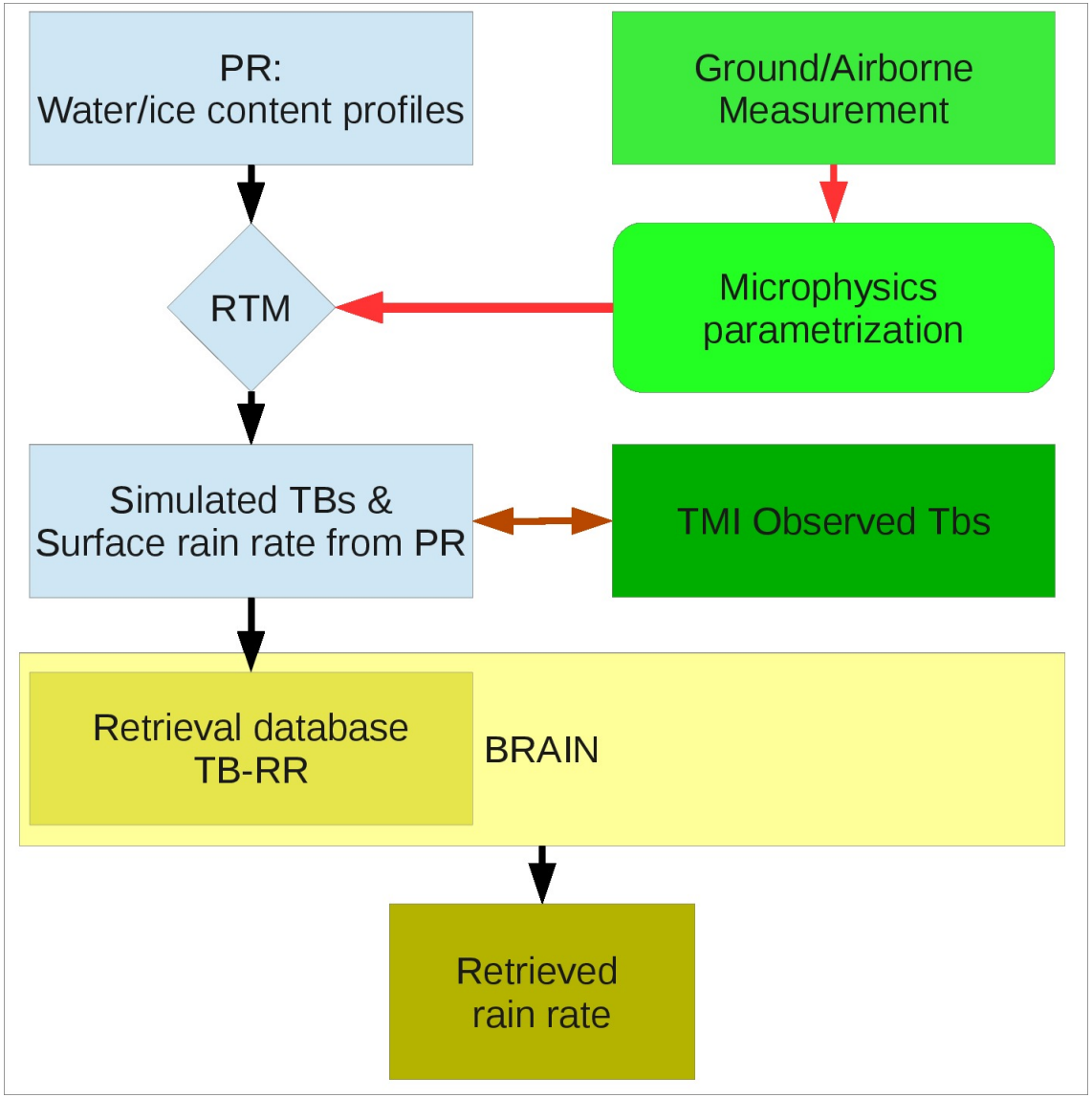
- a) particles densities depends on their diameters
- b) particles densities depends on their type, snow or graupel

The convective values are always underestimated meaning a lack of scattering

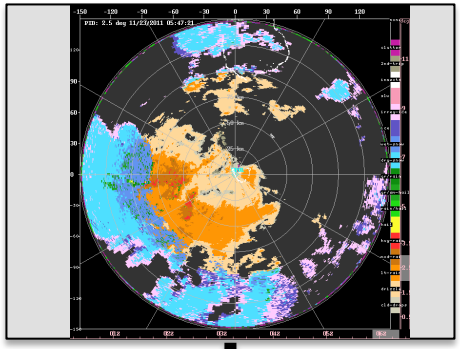
For the stratiform part, the truth is neither of the two parametrization presented here...

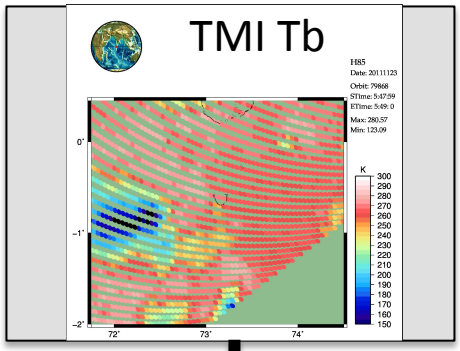
# BRAIN
# General flow-chart diagram

**Bayesian Rain retrieval Algorithm Including Neural network**

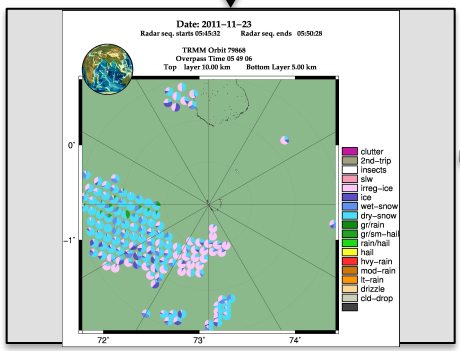


# General Principle

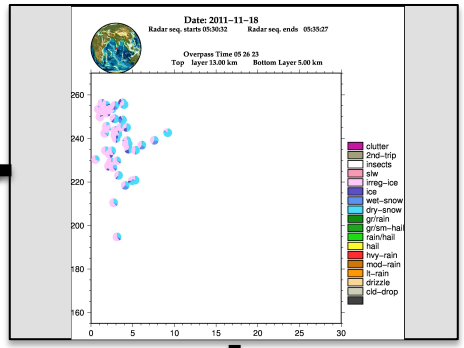




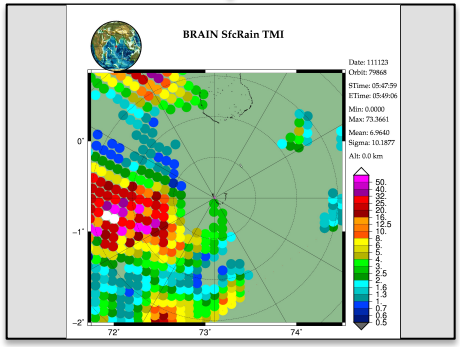

Ground base polarimetric data




Pie-wedges distribution



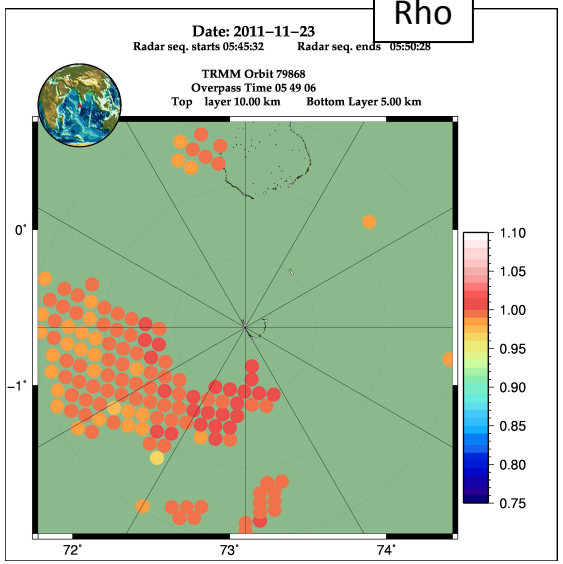

The colour in the circles represent
the proportion of each PID within the pixel



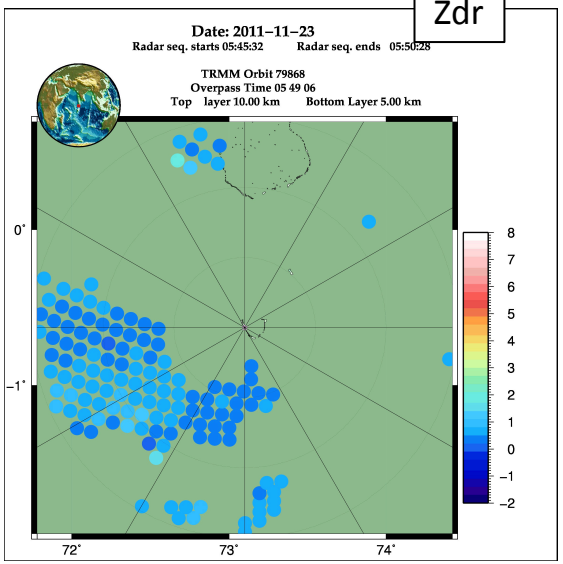
# Choose what information??

Convective Case 23/11/2011 5km-10km

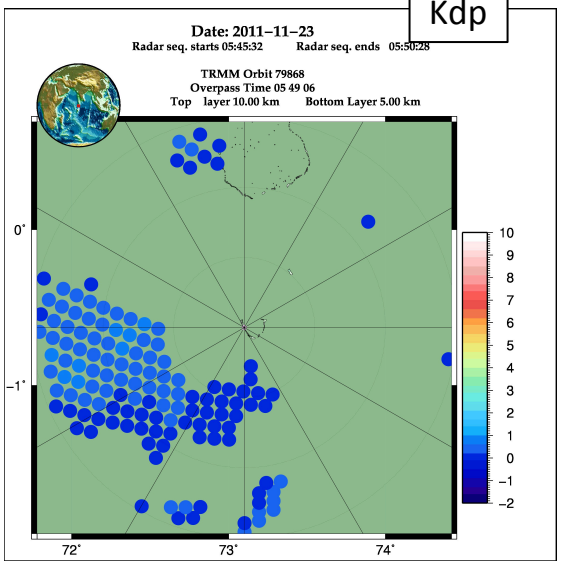
Rho



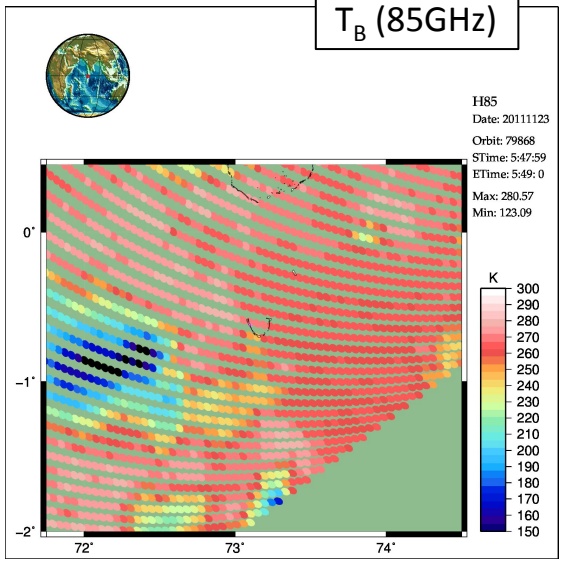

Zdr



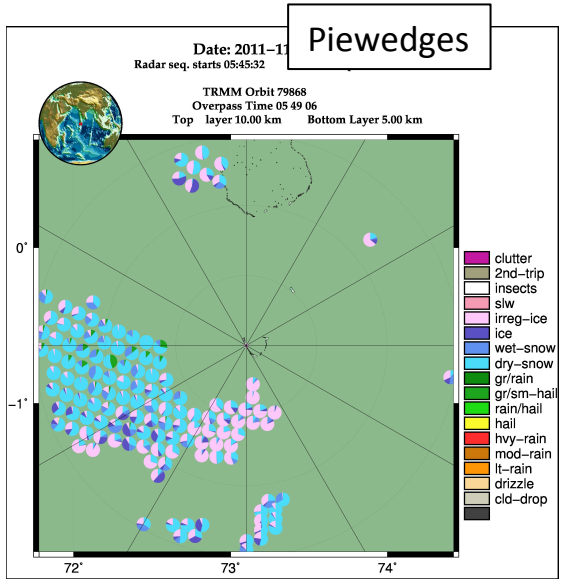

Kdp



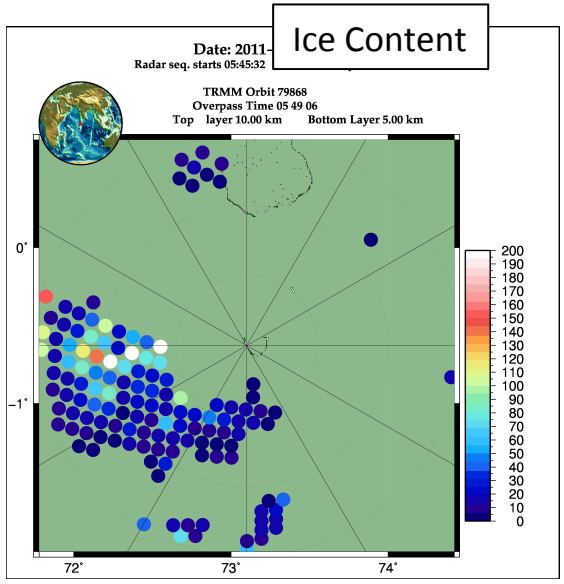

$T_B$ (85GHz)




Piewedges



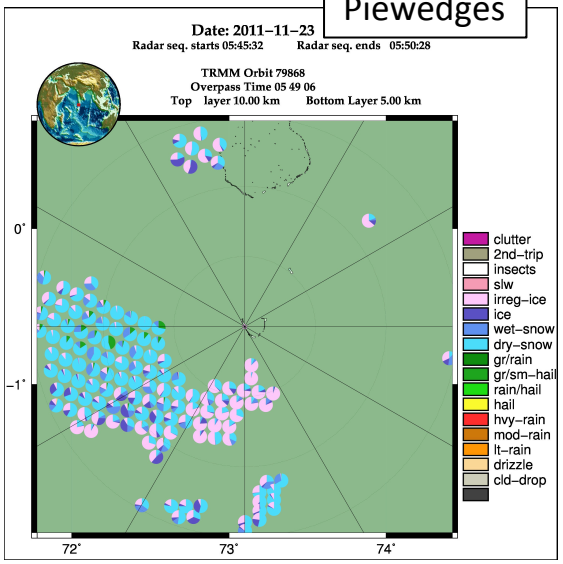

Ice Content



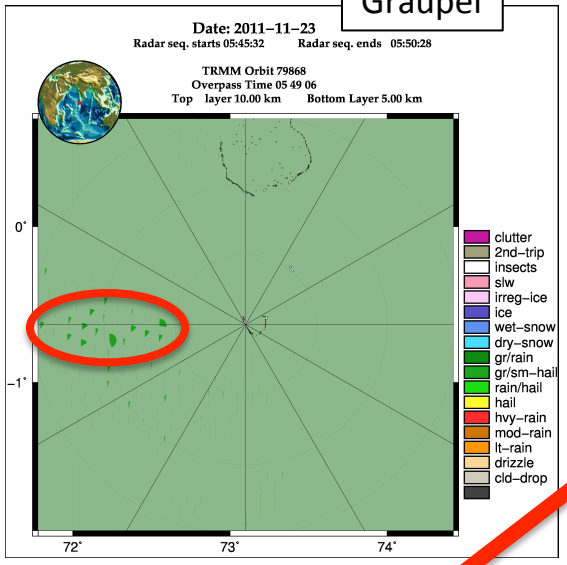
# Correlation between ice content and particule type

Convective Case 23/11/2011 5km-10km

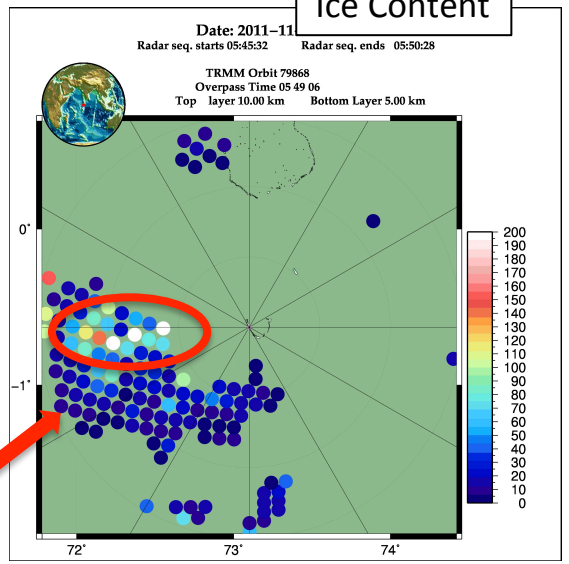
Piewedges



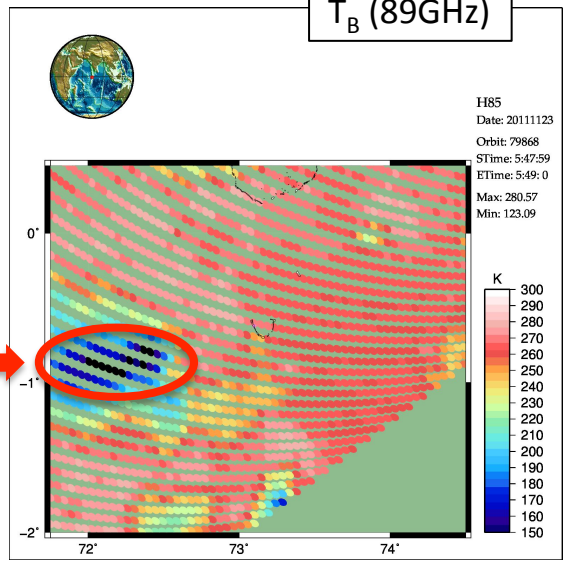

Graupel




Ice Content

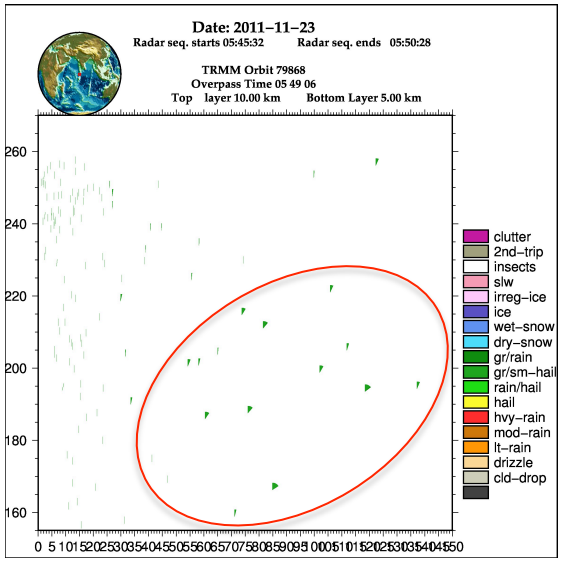



$T_B$ (89GHz)




Area of Lower $T_B$

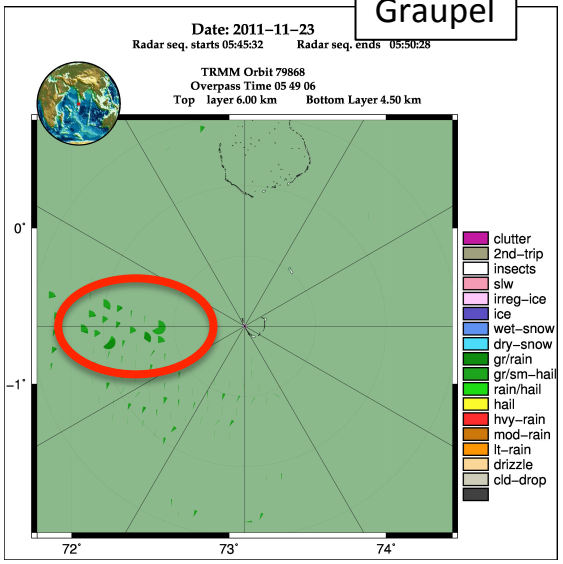
Higher integrated Ice content



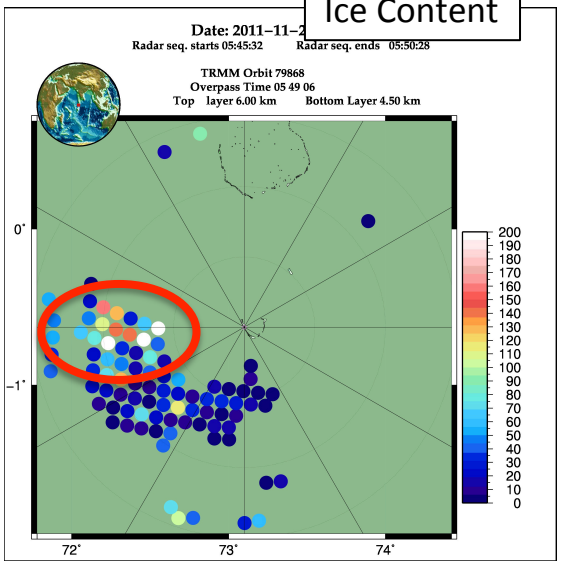
# Correlation between ice content and particule type

Convective Case 23/11/2011 4.5km-6km

Graupel

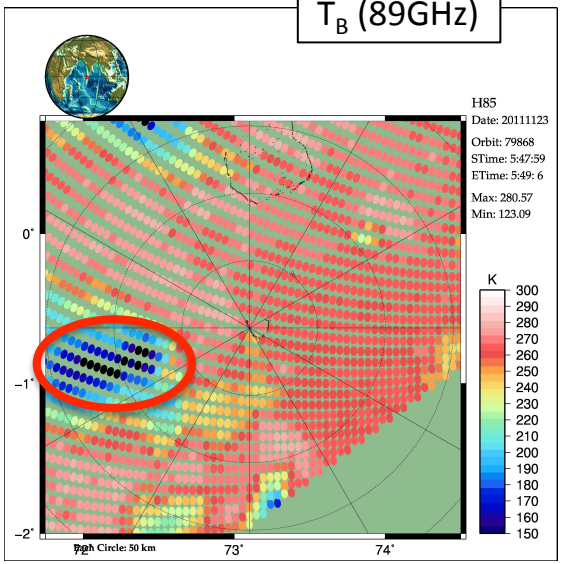


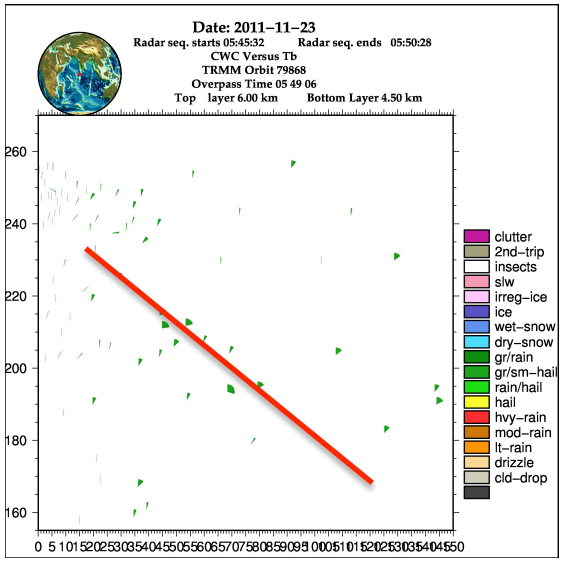

Ice Content




**Increase of Graupels**
**Increase of Ice content**

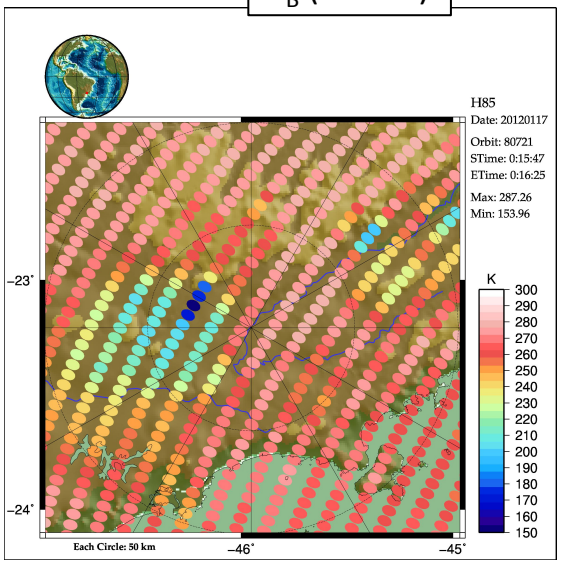
$T_B$ (89GHz)



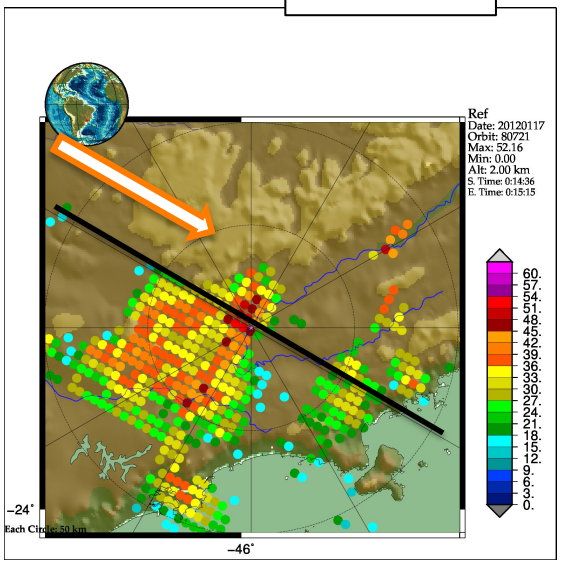



# CHUVA: Case of the 17th January 2012

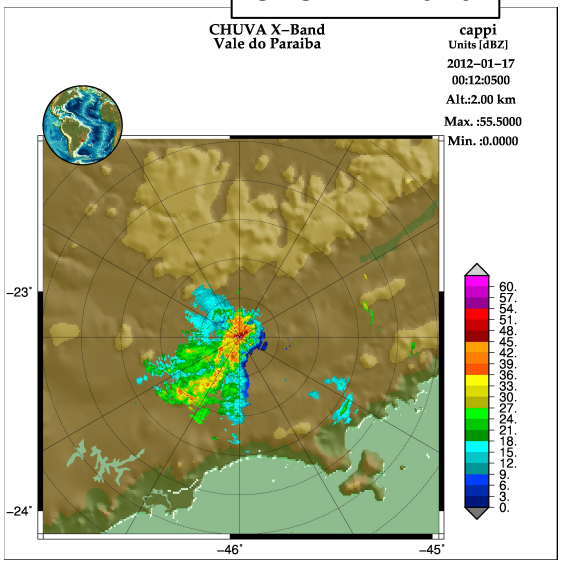
$T_B$ (85GHz)



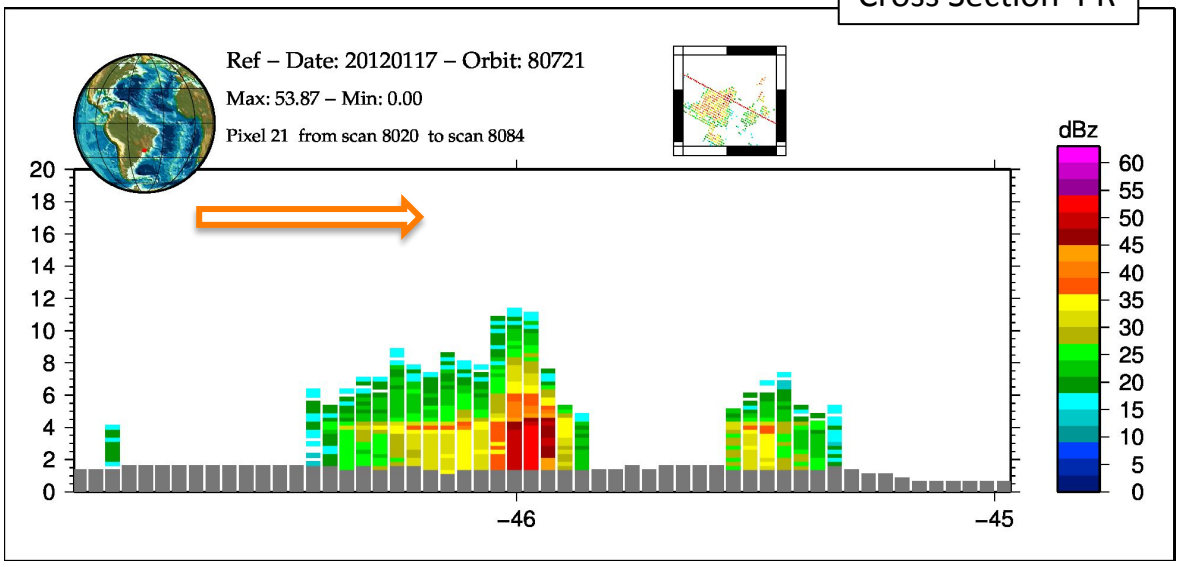

TRMM - PR




CHUVA X-Band



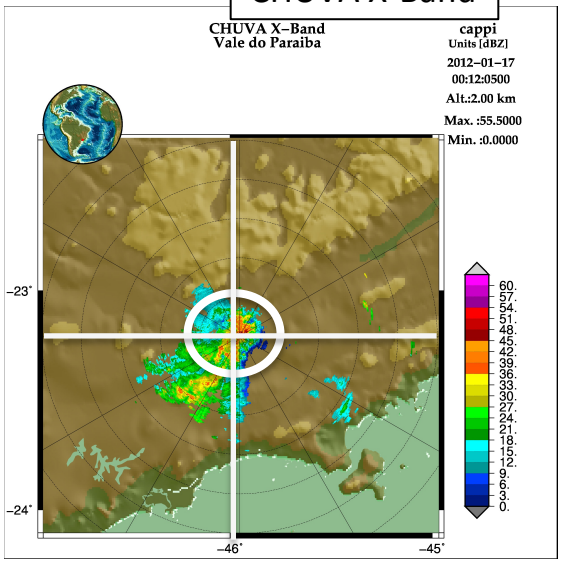

Cross Section PR



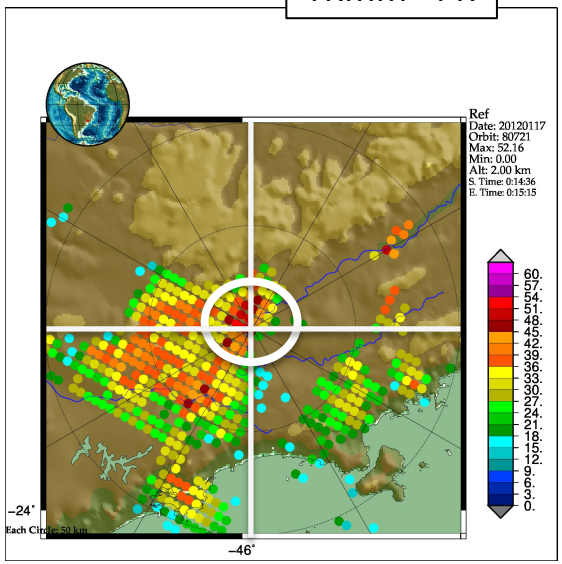

Probably because of the rain over the radar there is a lot of attenuation on the X-Band

# CHUVA: Case of the 17th January 2012

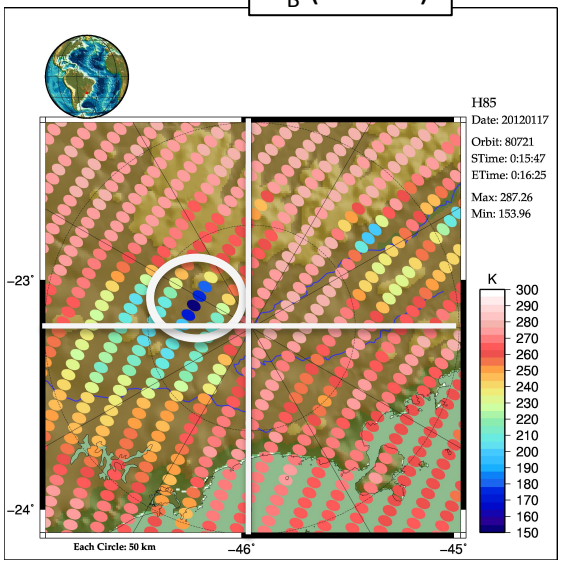
CHUVA X-Band




TRMM - PR




$T_B$ (89GHz)




Gap between the maximum of reflectivity on the 2 left images and the minimum of the brightness temperature

1) Geometry problem or
2) Dynamic of the convective system

# CONCLUSION AND PERSPECTIVES

- Correlation between ice species from the polarimetric radar and the Tbs do exist but with a lot of noise
- The graupel presence seems correlated to the more convective regions and the colder Tbs but the correlation seems very sensitive to the layer definition
- Some geometry problems might still persist
- Species distribution is sensitive to the radar calibration

- Increase the number of cases to consolidate statistics
- We might need to re-work the species definition based on local conditions
- Look at the regional dependency using other CHUVA campaigns