Using the BTD Method for the night GLI precipitation Algorithm

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GLI rain algorithm

The GLI research rain algorithm is planned to fill a gap in the capabilities of the AMSR MW rain detection.

1. Delineation of rain area.
2. Estimation of the rain rate.

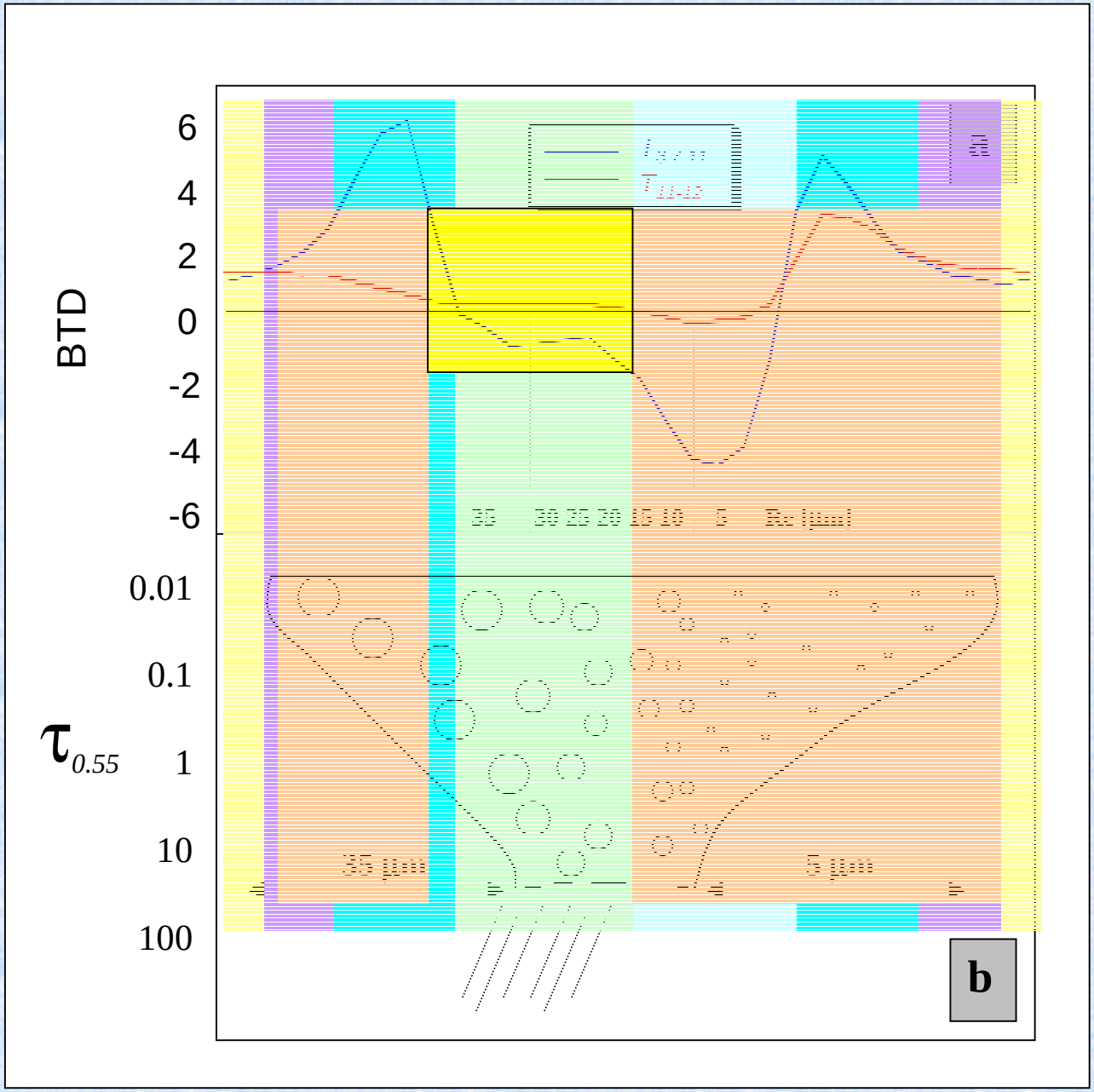
At daytime

- Analyze profiles of the effective radius.

At nighttime

- Analyze profiles of the brightness temperature difference (BTD).

- Reveal the processes in the cloud and its precipitation potential.

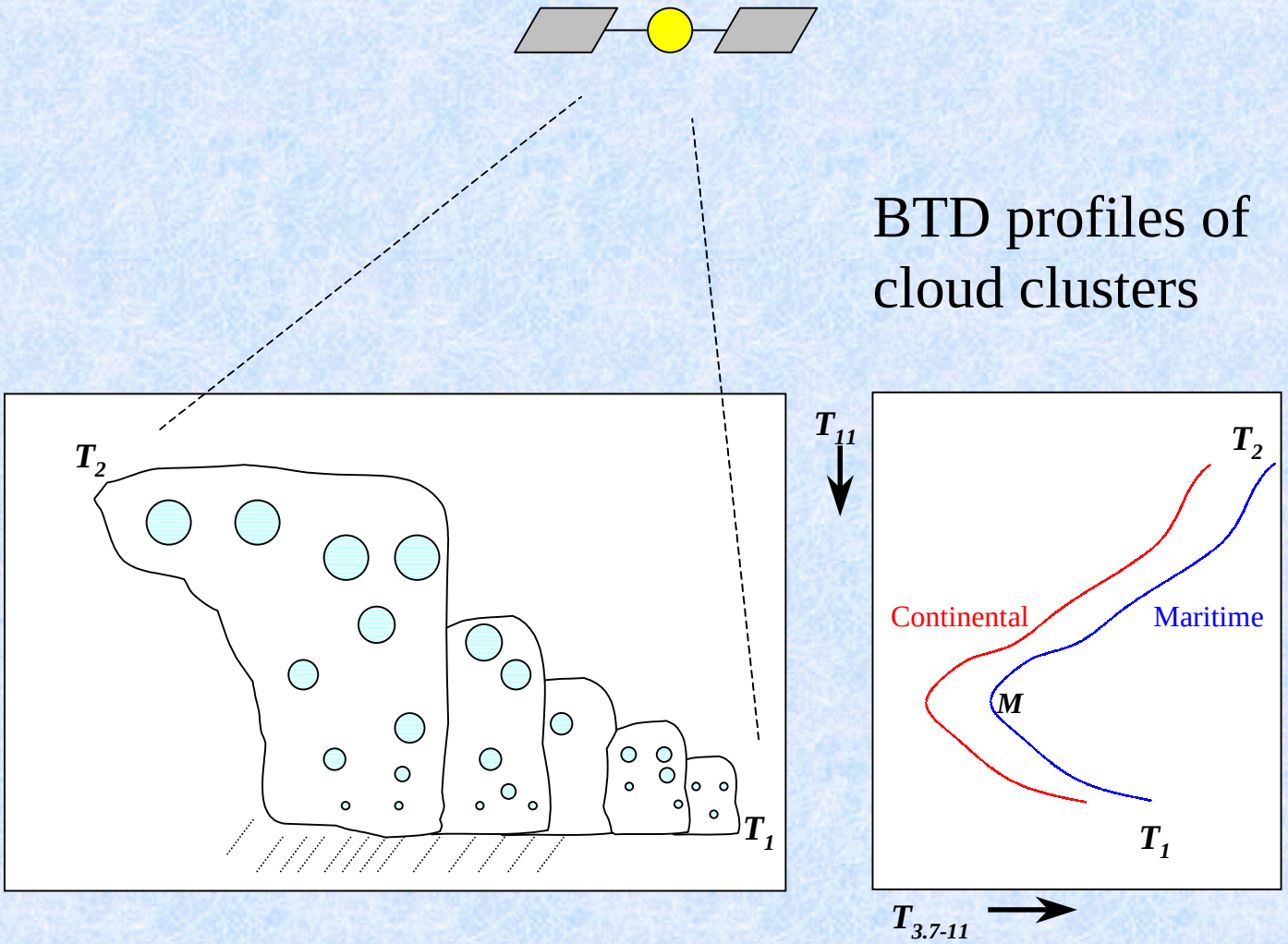


Radiative Transfer model

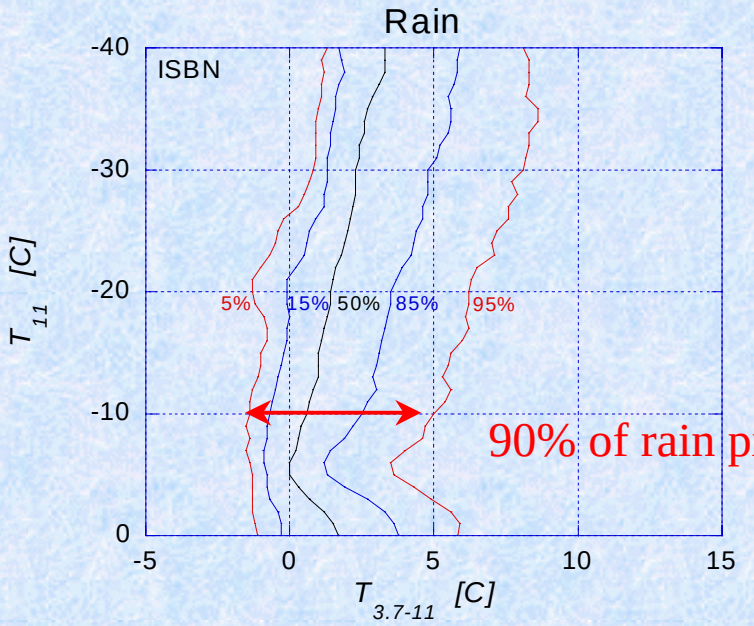
No precipitation
due to:
a. Small droplets and/or thin clouds
b. Thin clouds

Precipitation
due to thick clouds with large droplets

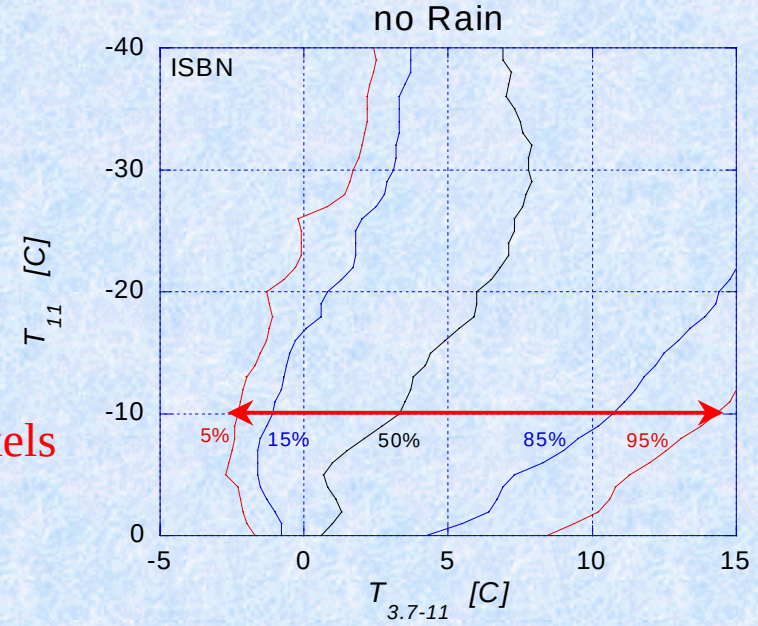
Application to observations



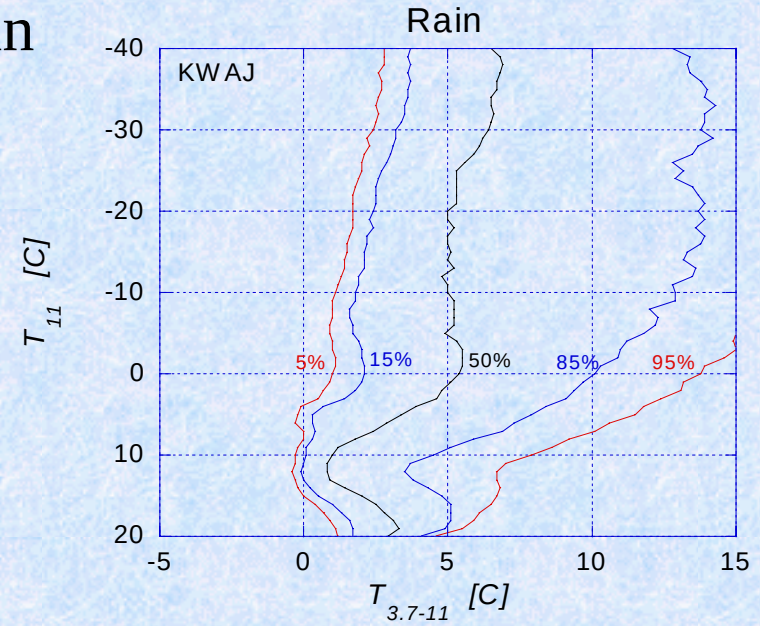
Israel

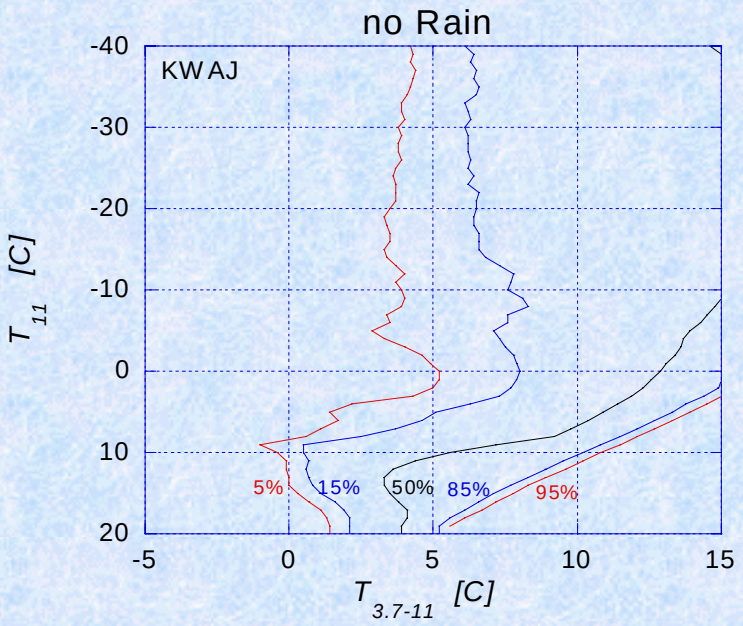


90% of rain pixels

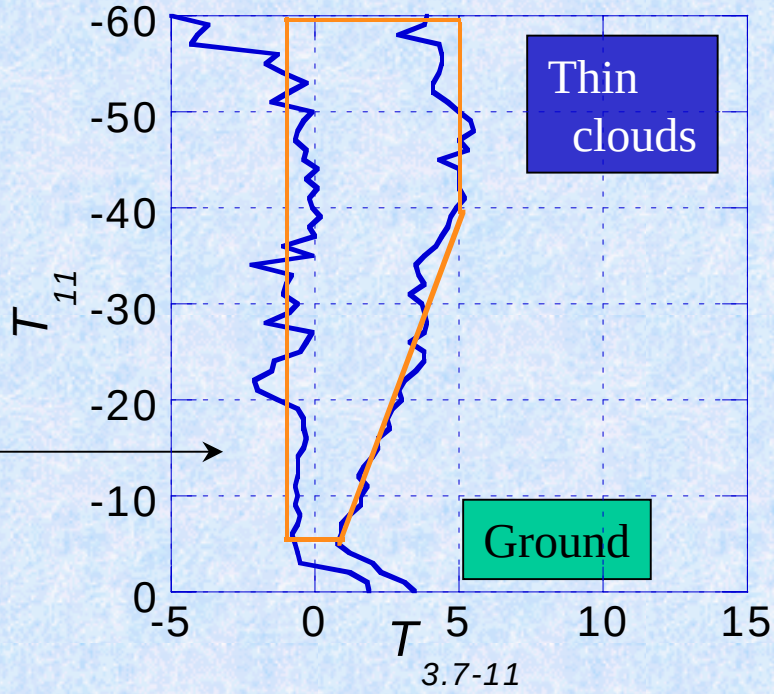


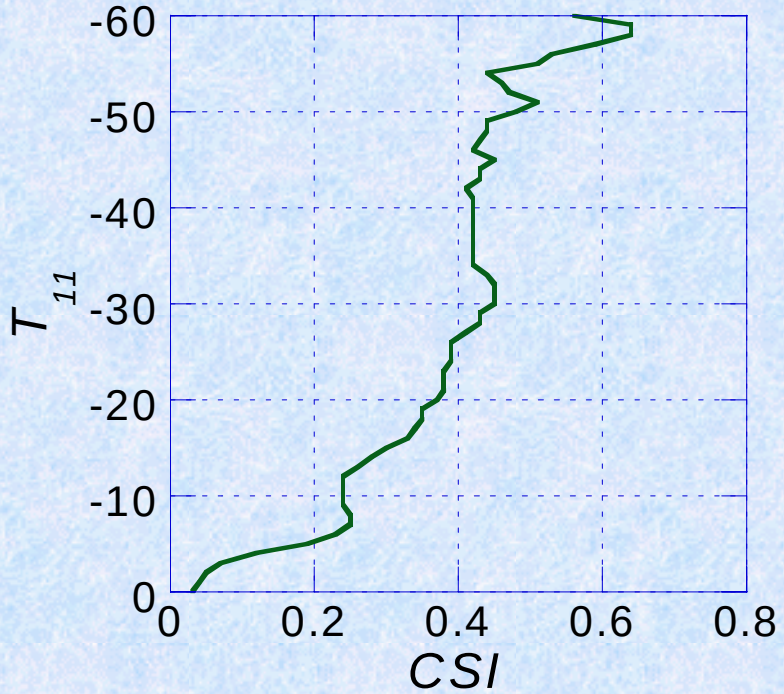
Kwajeilin



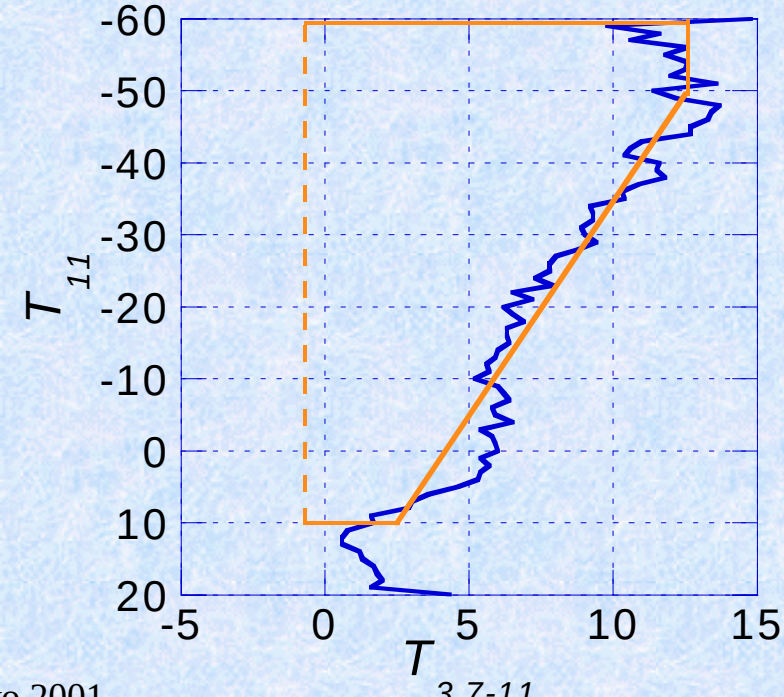


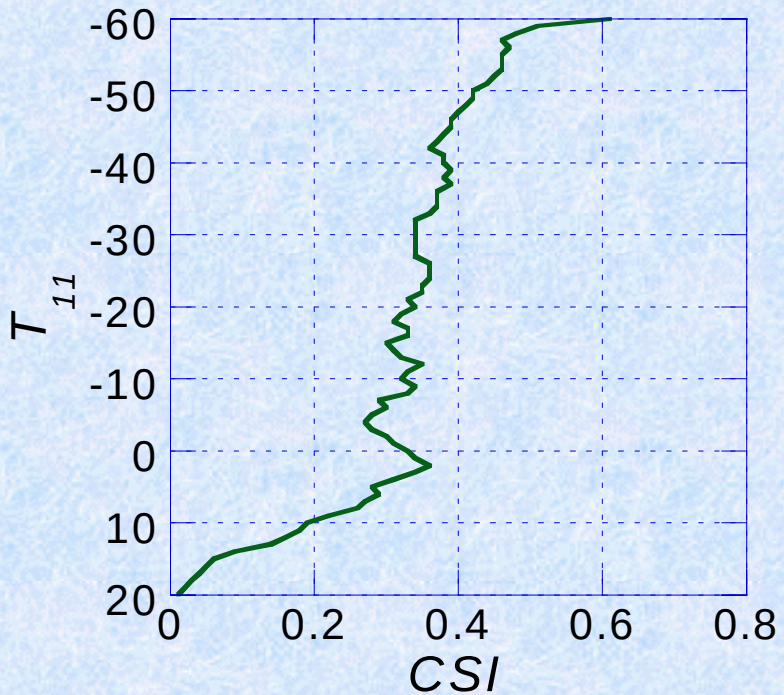
Israel





Kwajeilin



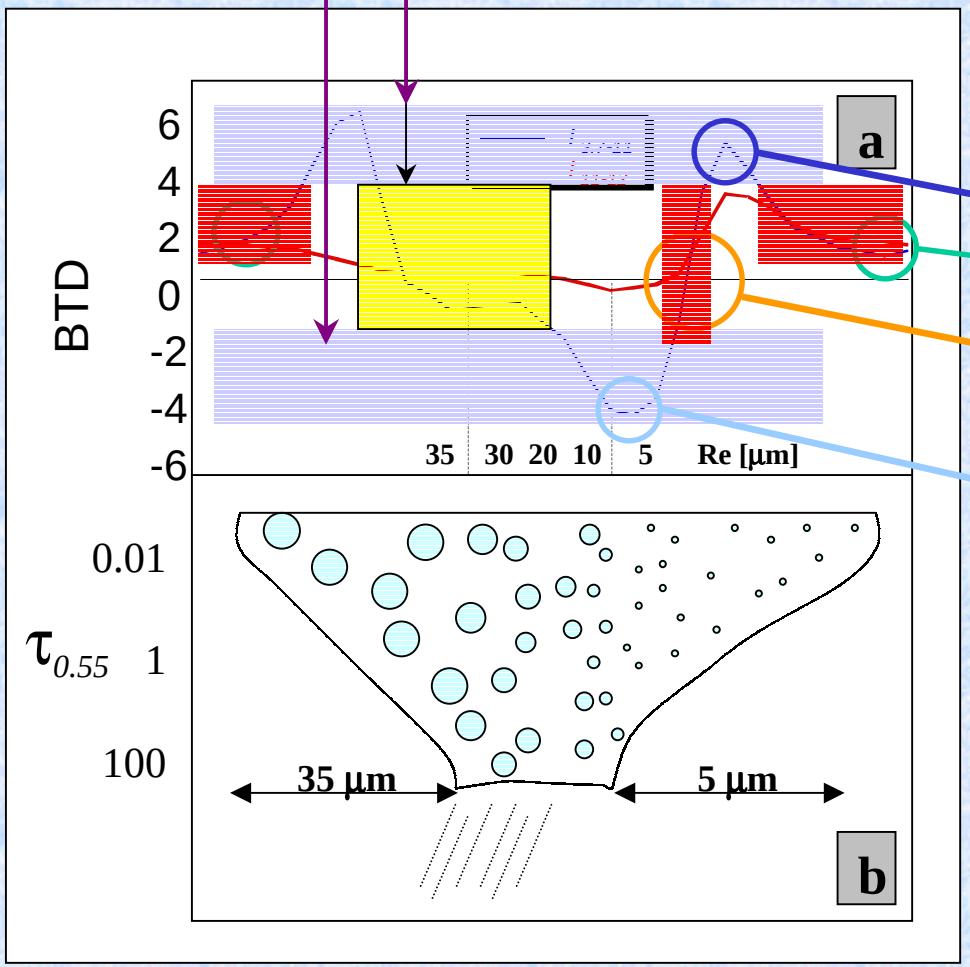


Radiative transfer model perspective

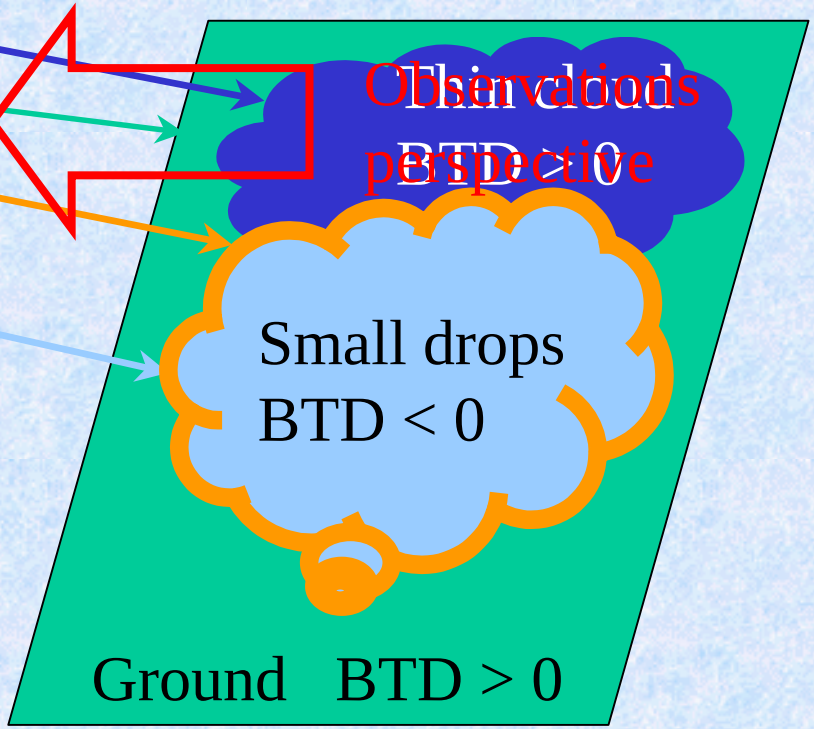
Removing the optically thin clouds

Removing the optically thin clouds

Removing the optically thin clouds



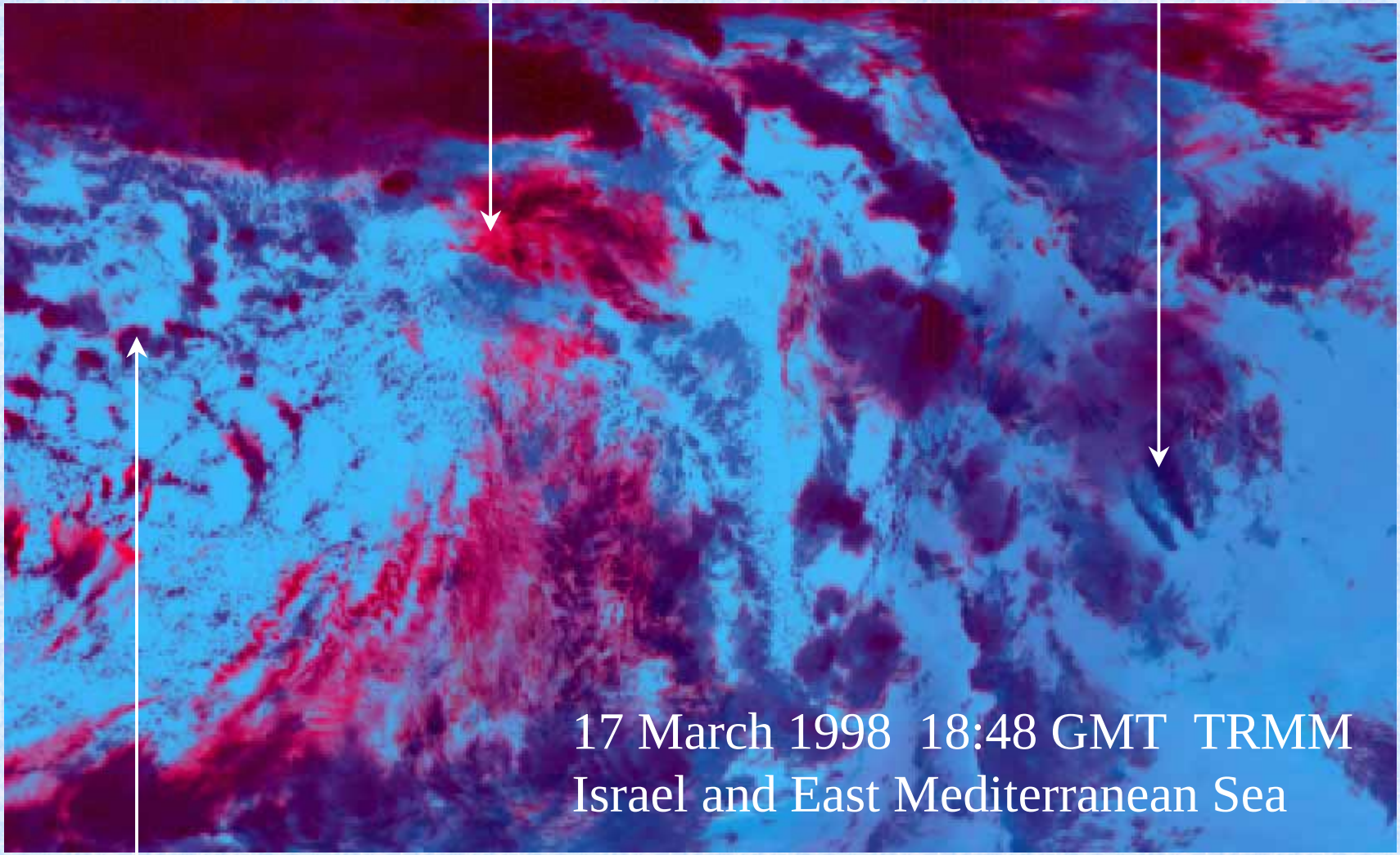
Ambiguous BTD



Observations perspective

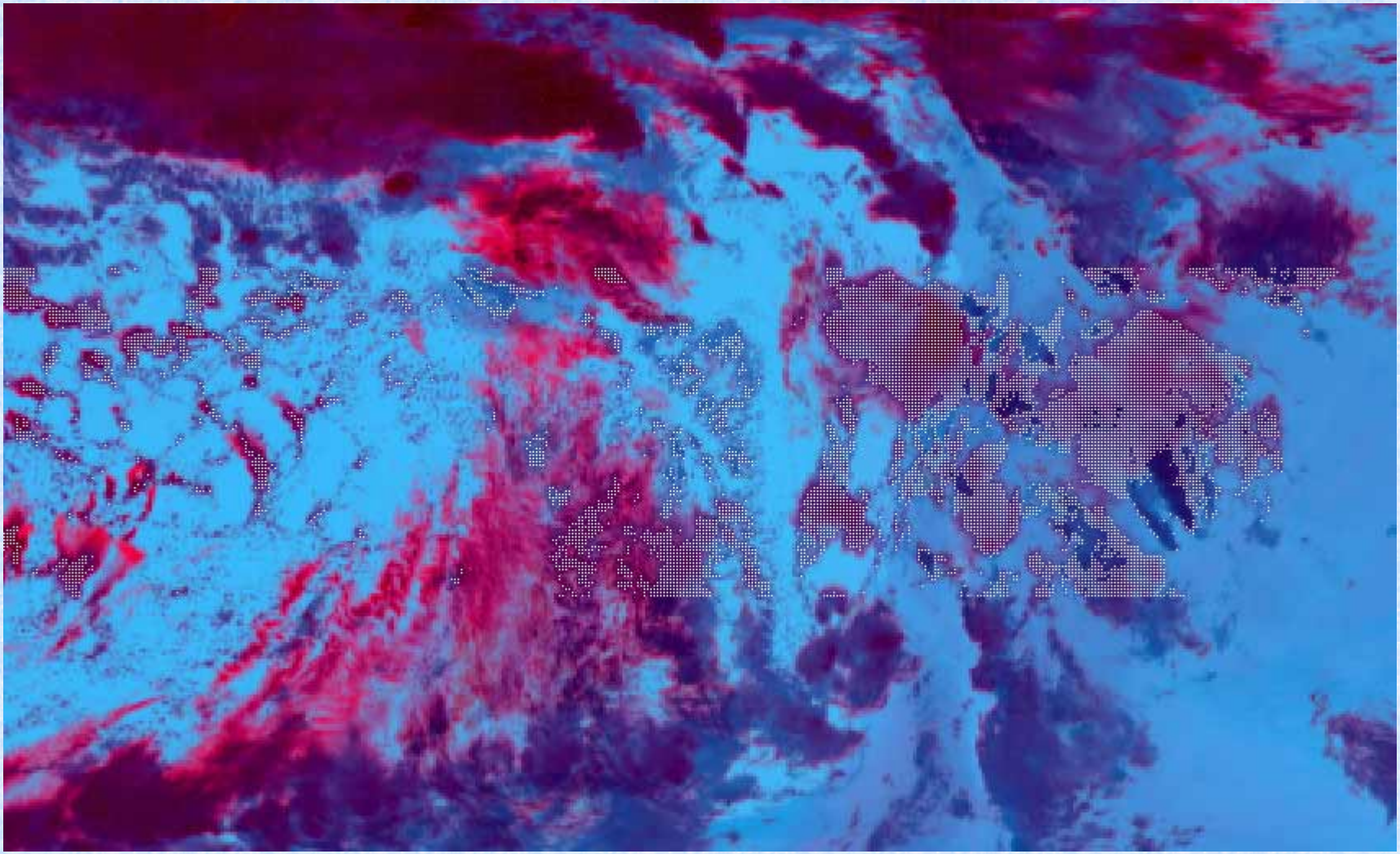
Large BTD (~15°C)
Semitransparent clouds

Negative BTD (~ -3°C)
Clouds with small droplets



Positive BTD (~ 1 - 3°C)
Raining clouds

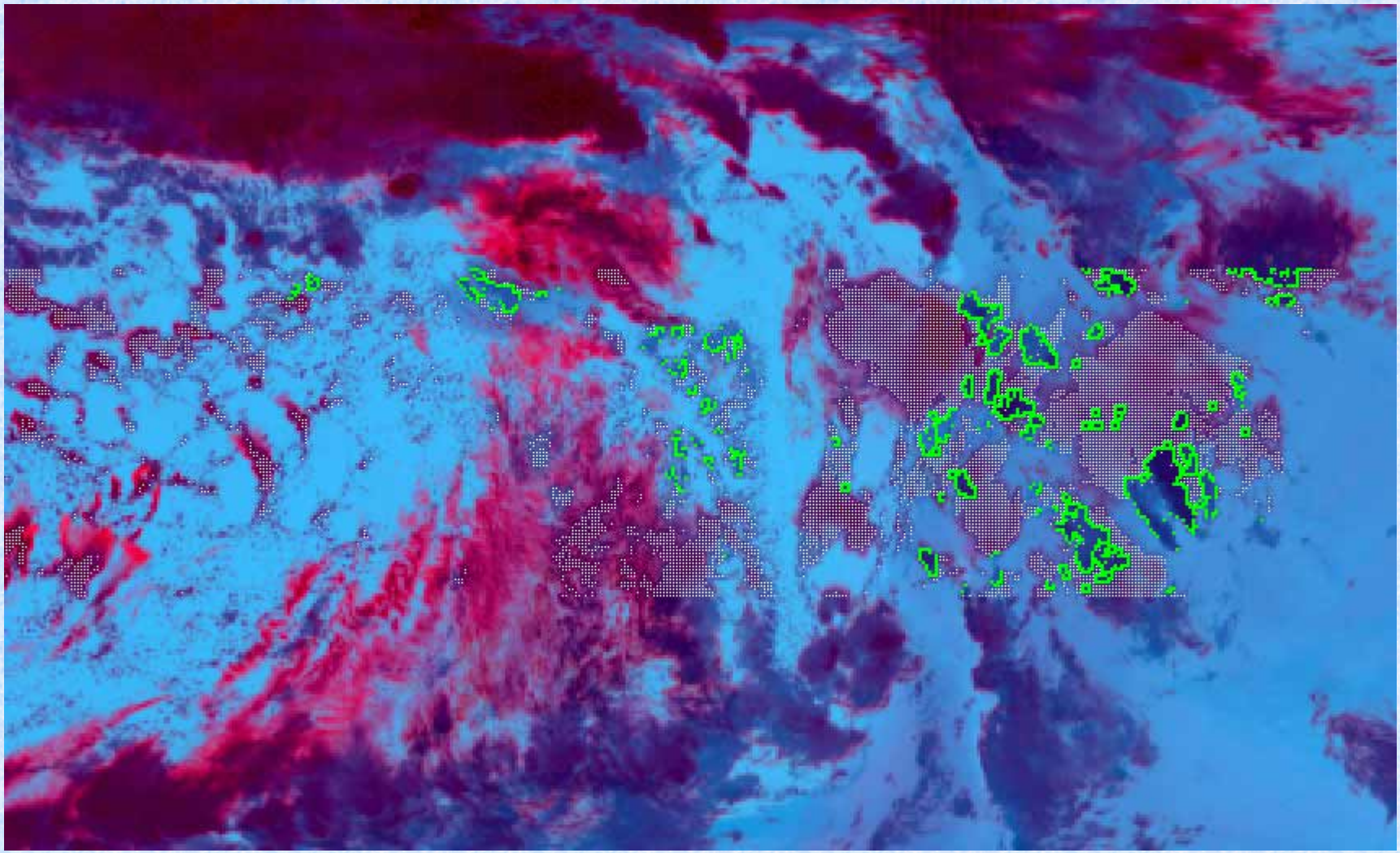
VIRS



The GLI delineation rain algorithm

VIRS

Edges

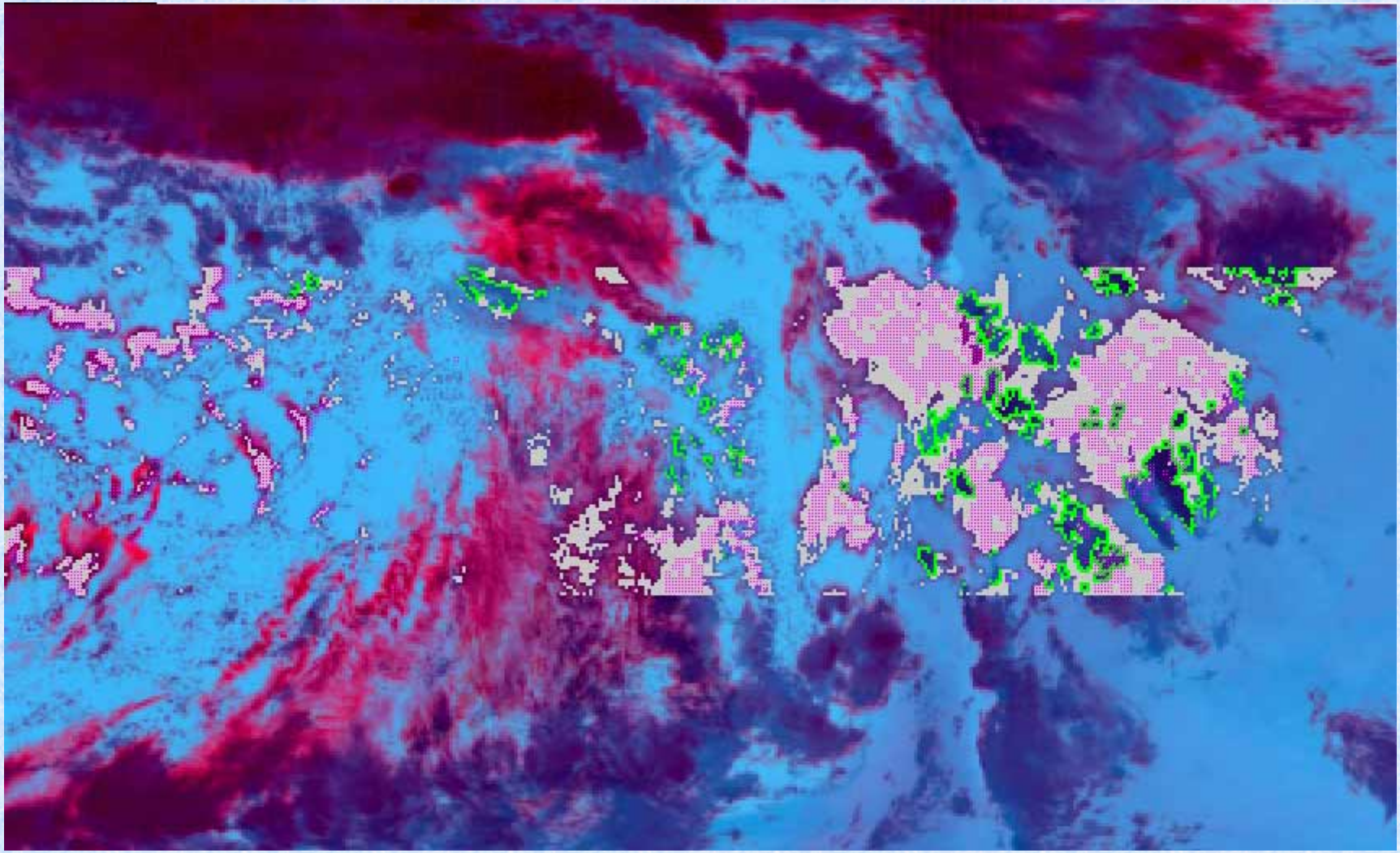


Removal of cloud edges effects

VIRS

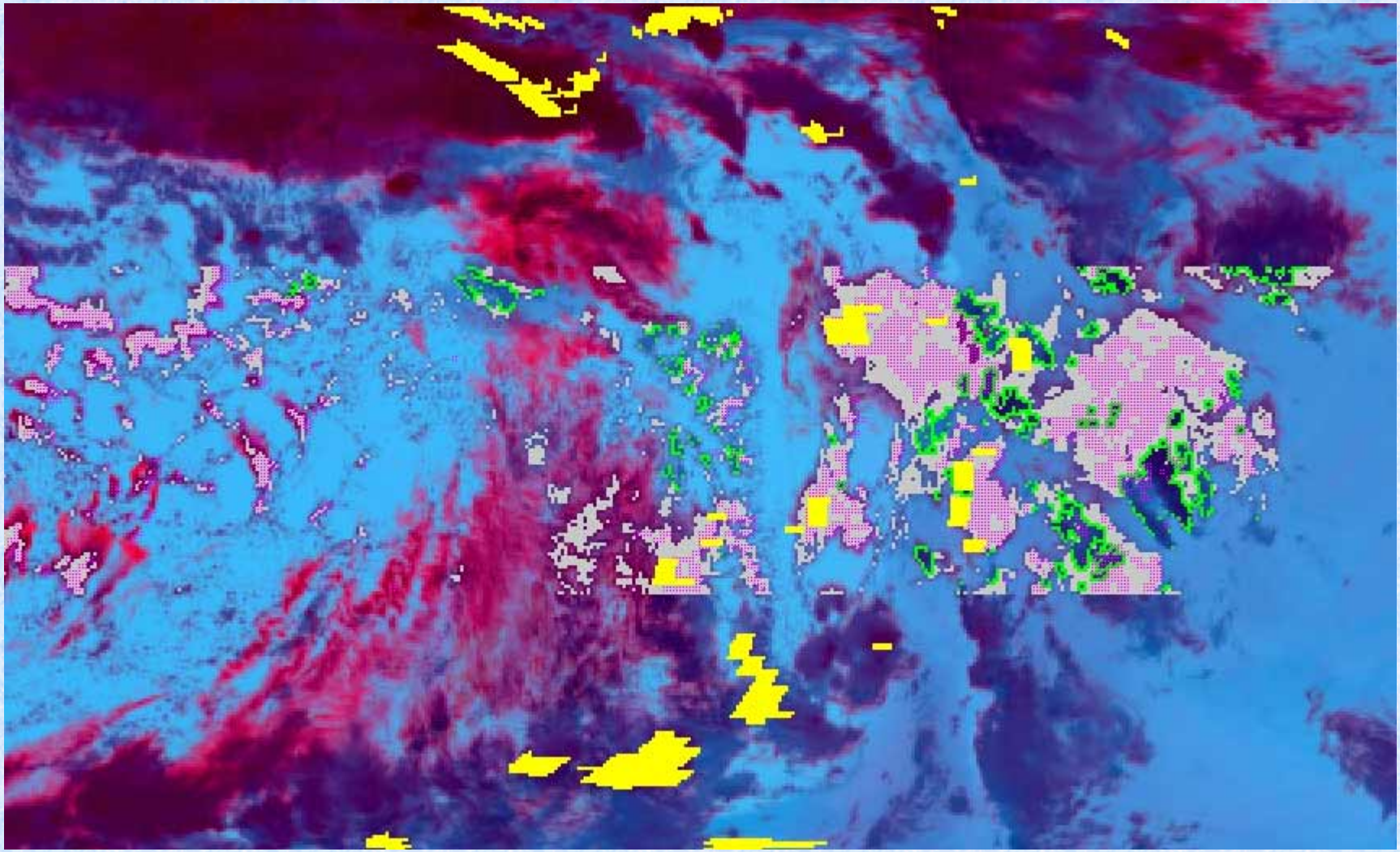
Edges

PR



Validation by Precipitation Radar

VIRS Edges PR TMI

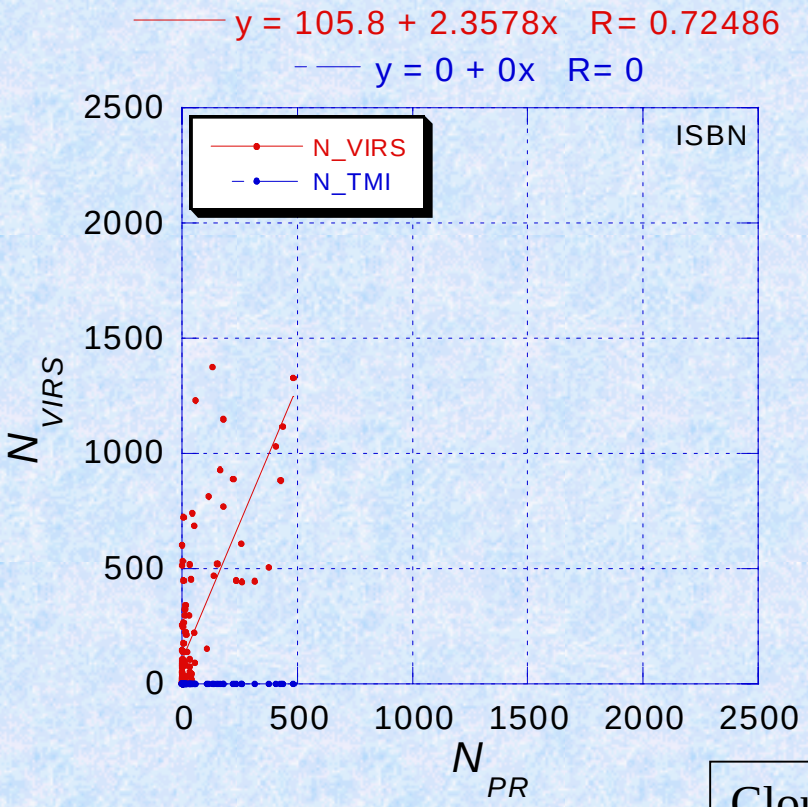


TMI fails to see most of the precipitation from non Cb clouds

Clouds over Israel – Continental

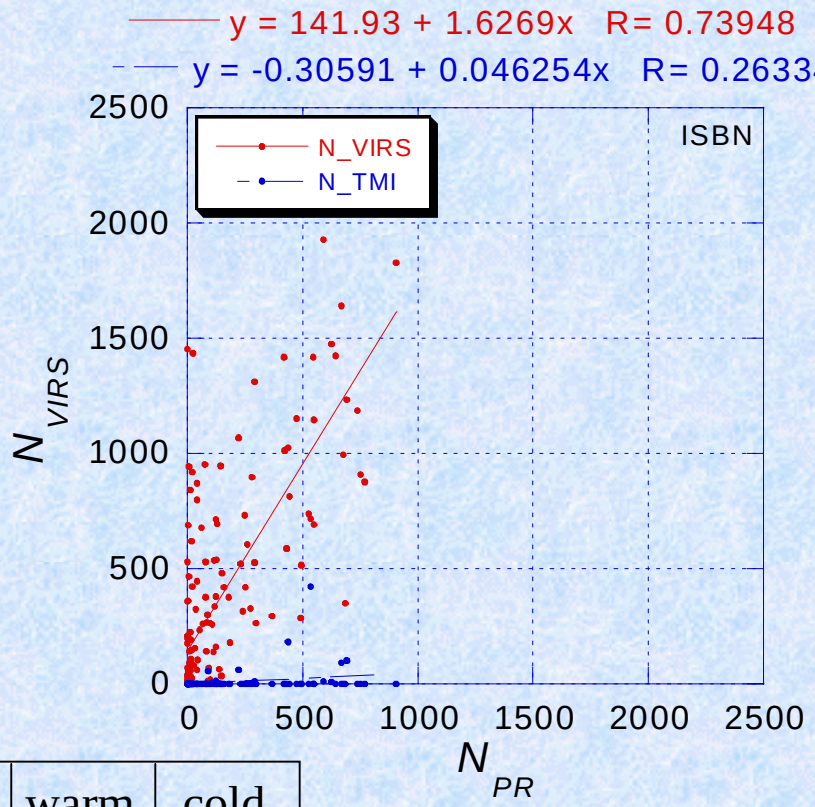
(T > -30°C)

land - warm clouds



(T < -30°C)

land - cold clouds



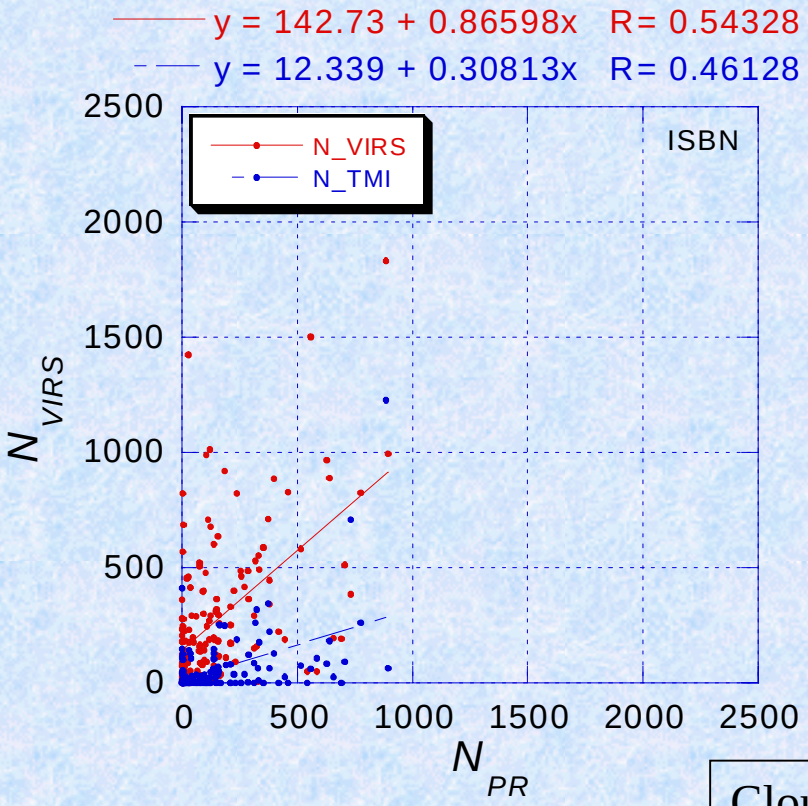
R^2

Cloud tops	warm	cold
VIRS	53	55
TMI	0	7

Clouds over East Mediterranean coast

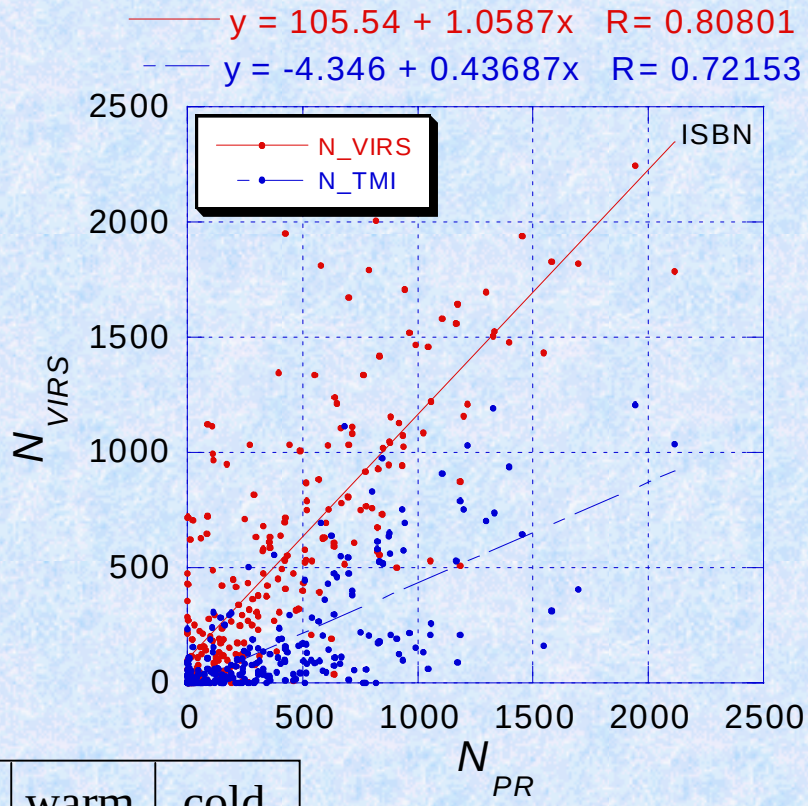
(T > -30°C)

coast - warm clouds



(T < -30°C)

coast - cold clouds



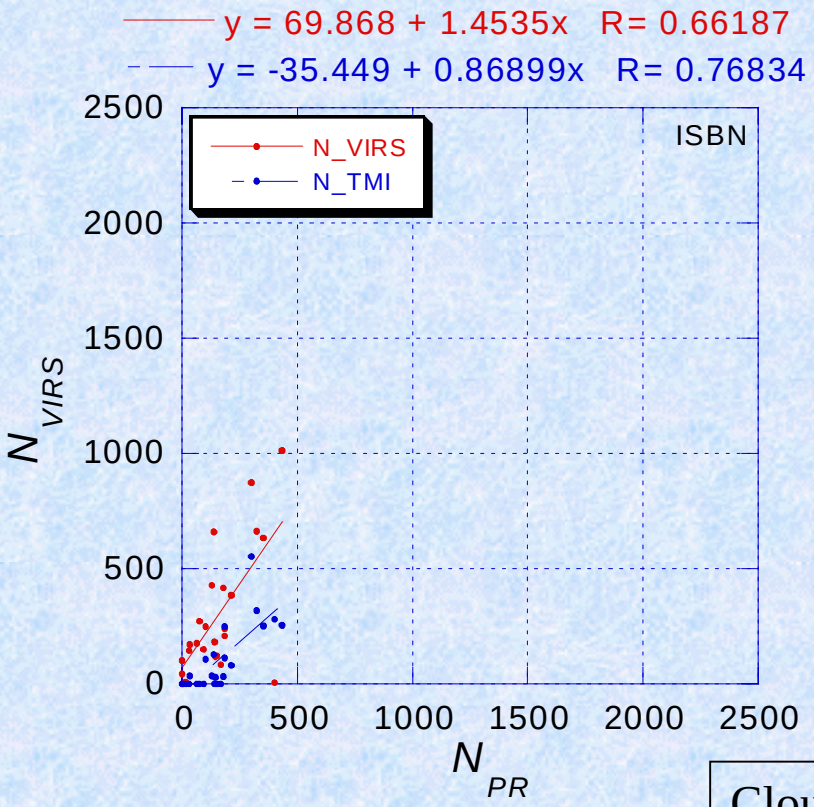
R^2

Cloud tops	warm	cold
VIRS	30	65
TMI	21	52

Clouds over East Mediterranean Sea

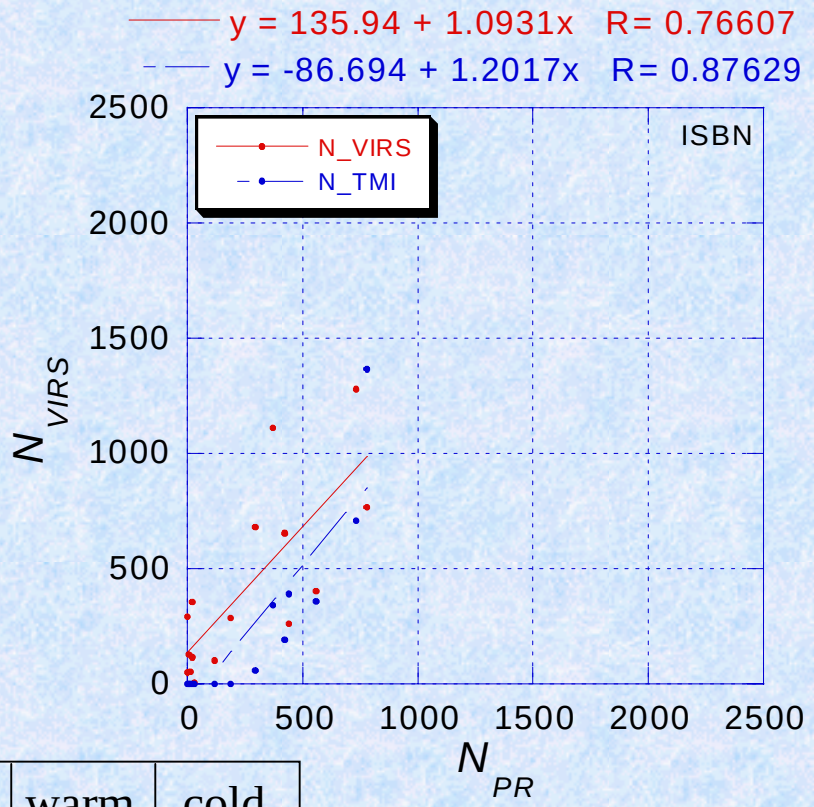
(T > -30°C)

Sea - warm clouds



(T < -30°C)

Sea - cold clouds



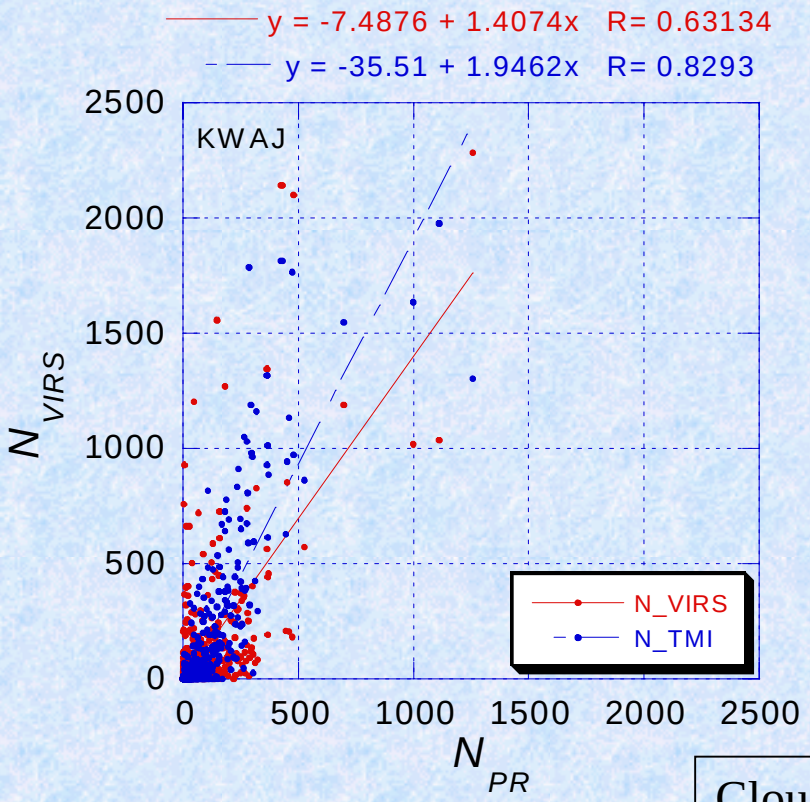
R^2

Cloud tops	warm	cold
VIRS	44	59
TMI	59	77

Clouds over Kwajeilin – Extreme Maritime

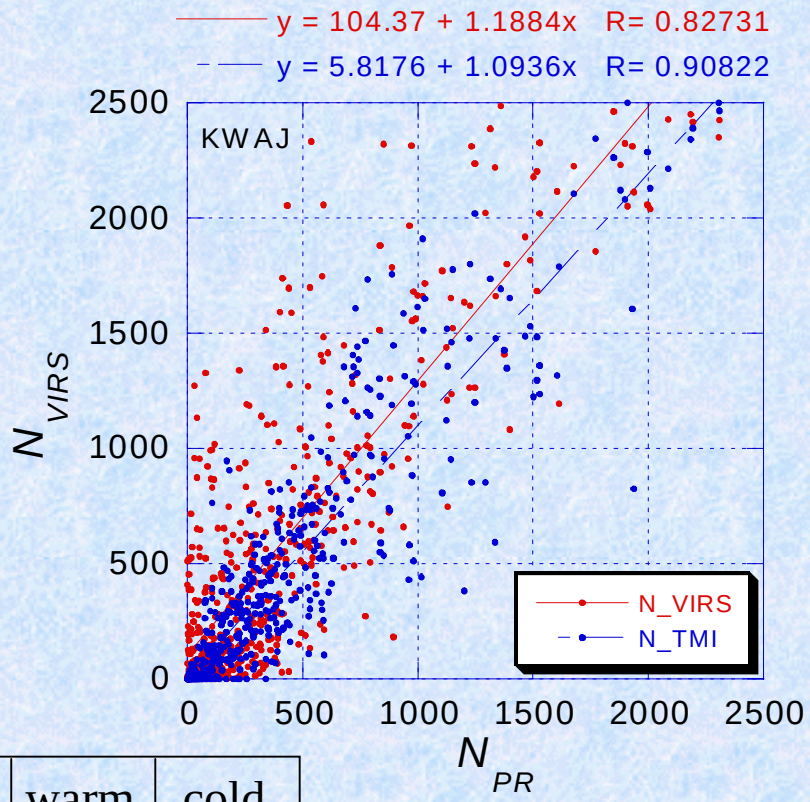
(T > -30°C)

warm clouds



(T < -30°C)

cold clouds



R^2

Cloud tops	warm	cold
VIRS	40	69
TMI	69	82

Preliminary decision tree For clouds over land and warm clouds

GLI / AMSR	RAIN	NO RAIN
RAIN	RAIN	RAIN
NO RAIN	RAIN	NO RAIN

Summary

- The delineation part of the GLI rain algorithm is complete.
- We are now developing the rain intensity for the delineated rain.
- We have to build a decision tree when to use: GLI or AMSR