Scientist's idealism vs. user's realism to ortho-rectify polarimetric R-2 and simulated compact RCM data

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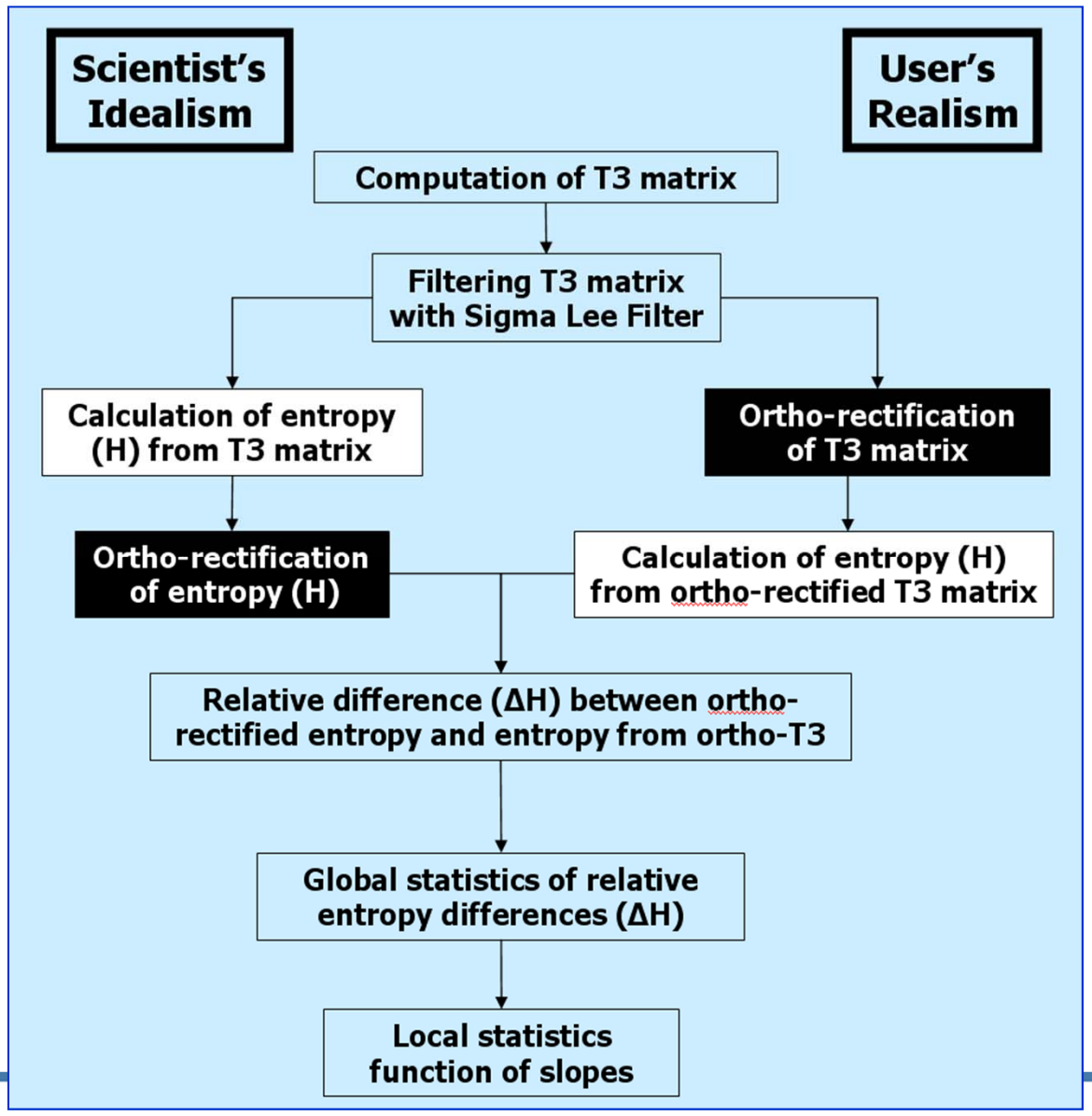
Research objectives

Evaluate the ortho-rectification impact with DEM on full & compact polarimetric data

- Scientist's idealism (image-space method)
  Polarimetric before geometric processing
- User's realism (ground-space method)
  Geometric before polarimetric processing
- Comparison of both methods
  Using a representative polarimetric parameter

Polarimetric radargrammetry



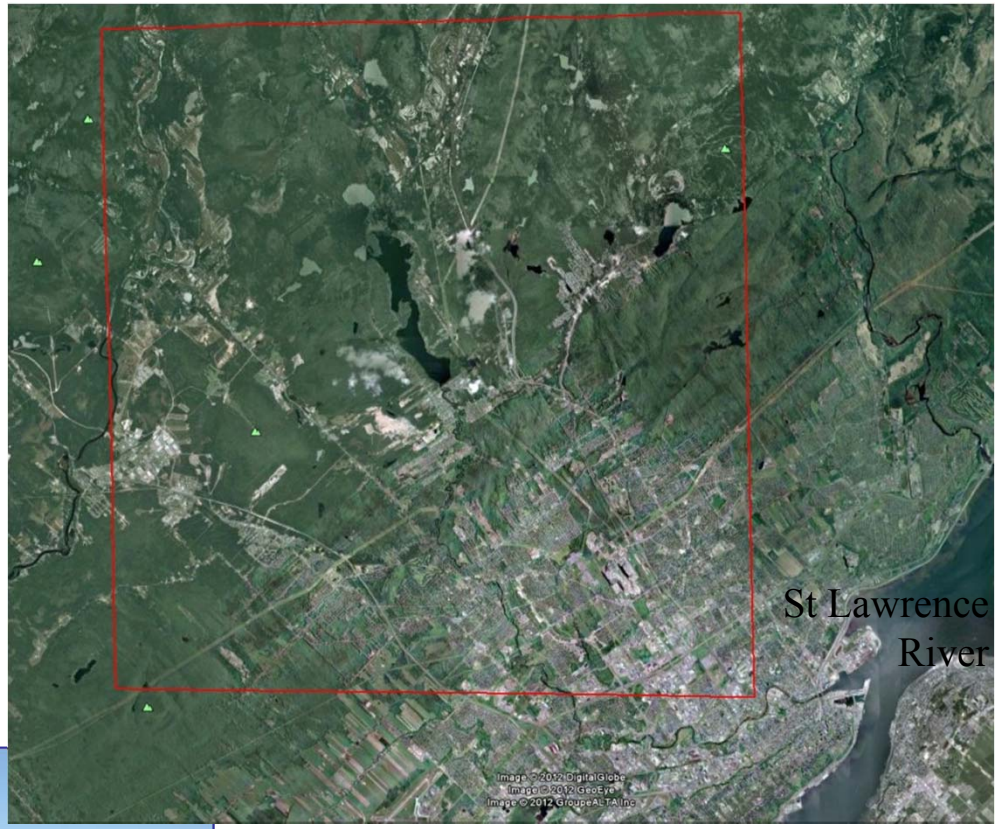
- Alpha, significant variation in the order of 10°, does not well discriminate small polarimetric variations

- Anisotropy, complementary parameter, measuring the 2nd and 3rd eigen values

☺ Entropy H, combine the 3 eigen values, well measure the "disorder" !!!

Study site

Beauport, Québec (47ºN, 71º30'W)



Québec City

North: forest, hilly topography (slopes of 5°-25°)

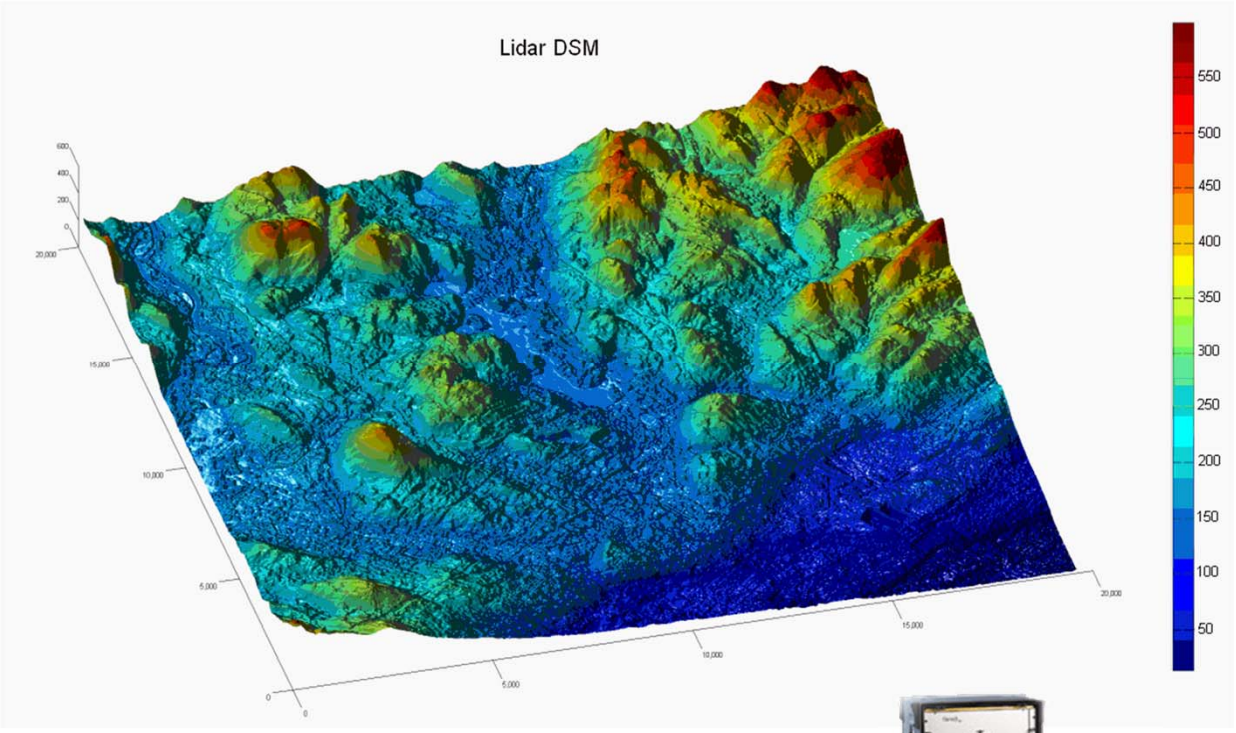
South: cities, small topography (slopes of 0°-5°)

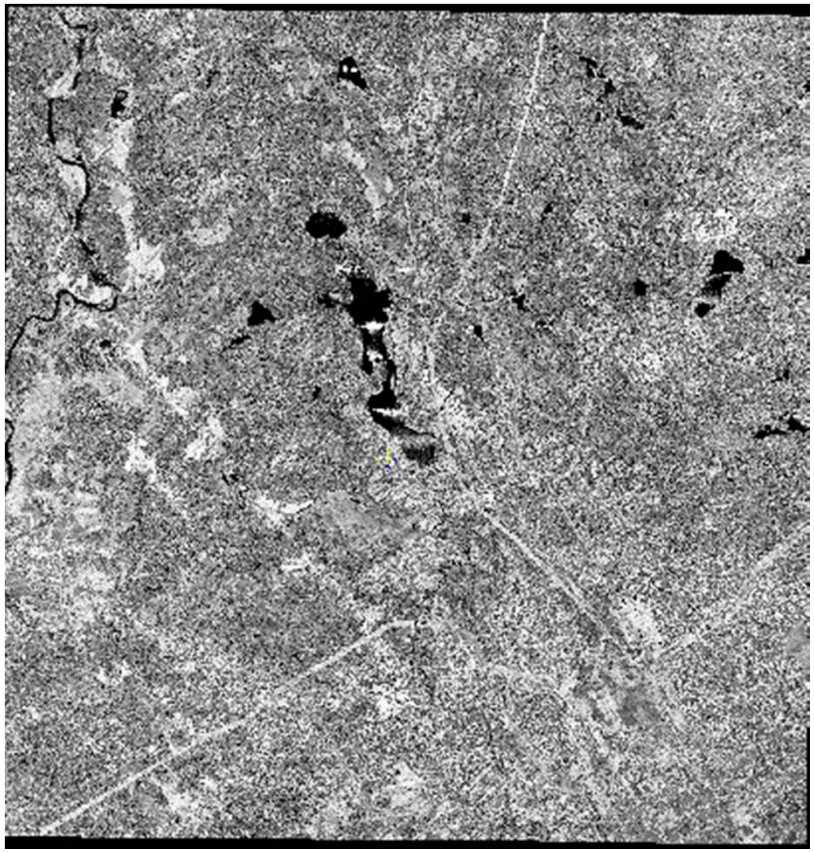
Données cartographique

Lidar: DSM, DEM, intensity,

20 km x 20 km: ΔZ of 550 m;

1-m pixel; 3D accuracy of 20-30 cm



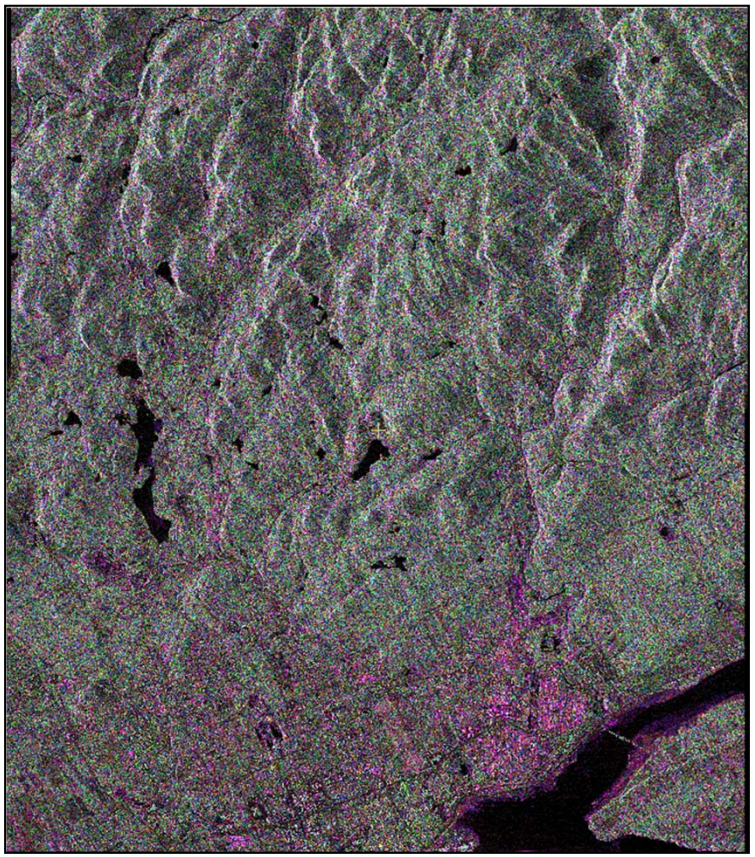


dGPS

3D accuracy of 10 cm

R-2 FQ Data

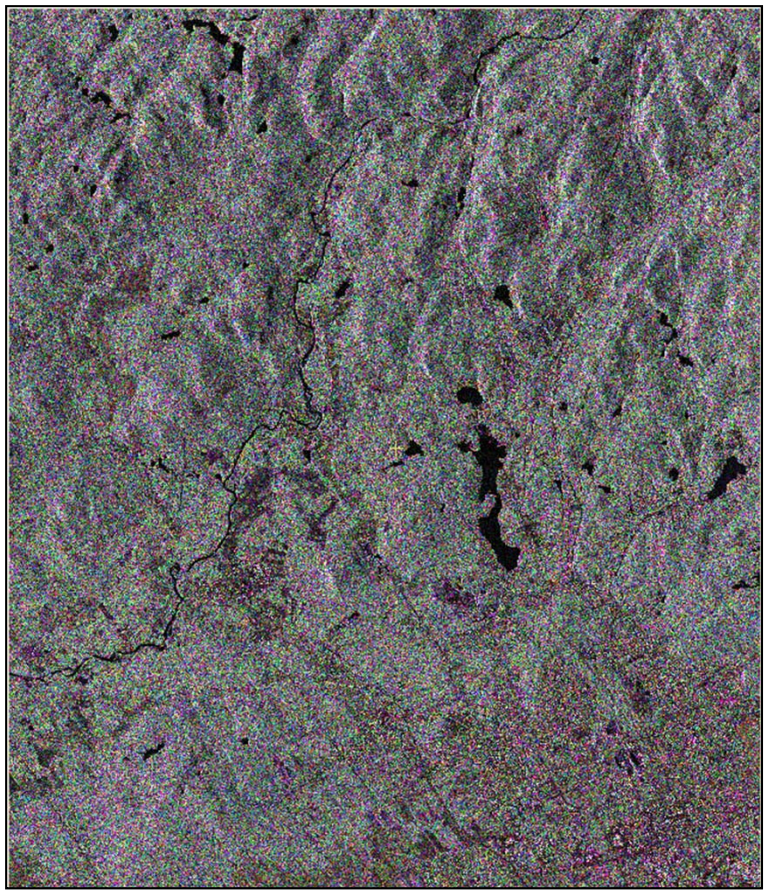
HH HV VV



Single-look
25 x 25 km
5.4 x 8 m resolution
4.7 x 5.1 m pixel

1x2 Multi-look
25 x 25 km
5.4 x 8 m resolution
4.7 x 10.2 m pixel

HH HV VV



FQ5 (23.4°-25.3°)

(FQ11: 23.4°-25.3°)

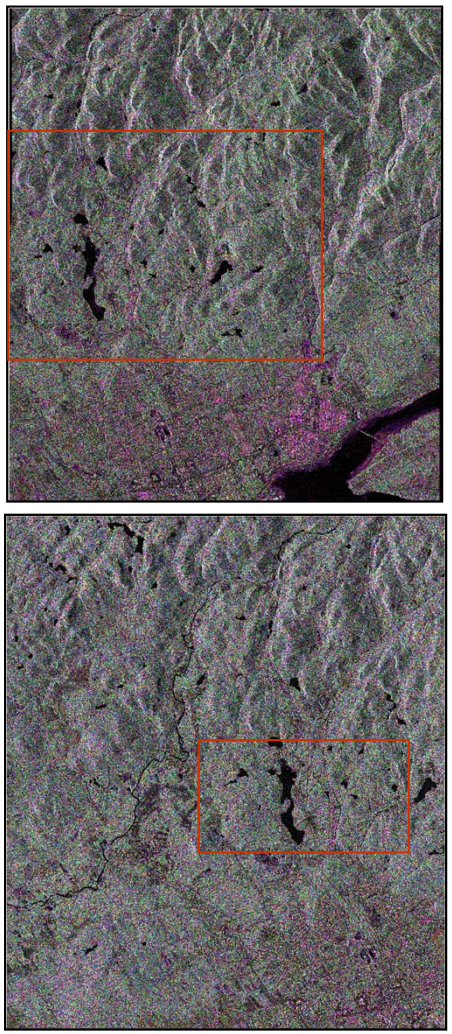
FQ18 (37.4°-38.9°)

R-2 to Simulated RCM Data

FQ5

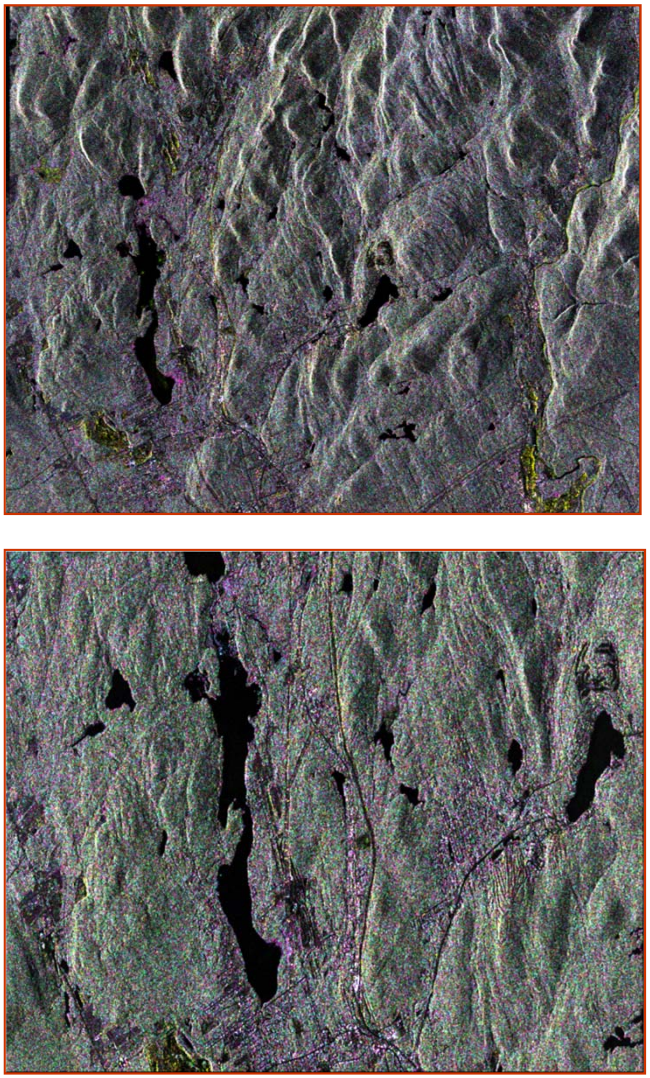
(FQ11)

FQ18



Simulation

1. Compact mode:
   RH, RV, RR, RL
2. Oversampling:
   3-m resolution
   1.3-m pixel
3. Noise floor: -17dB



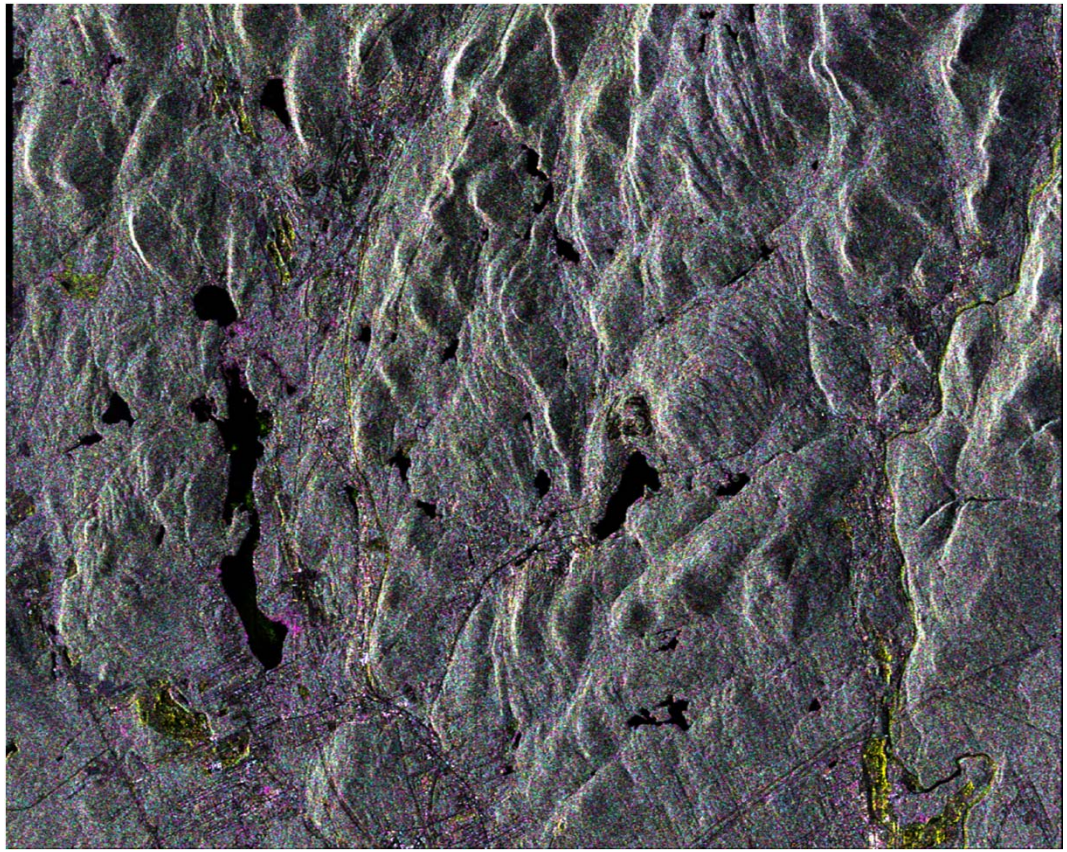
VHR5

(VHR11)

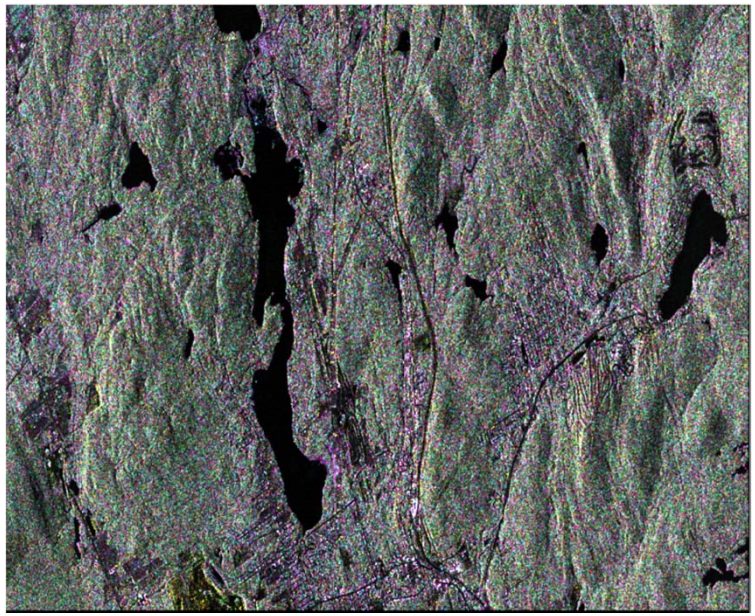
VHR18

Simulated RCM VHR Data

VHR5: RH RV RR



VHR18: RH RV RR

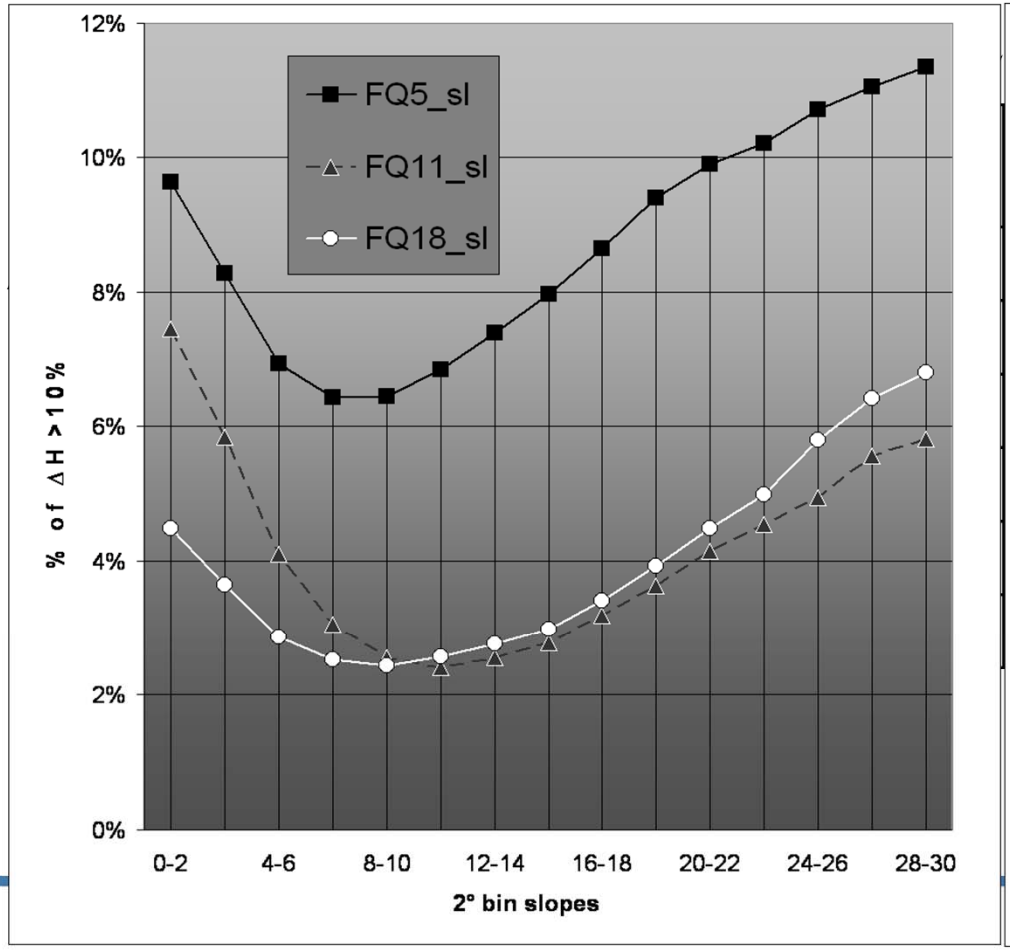


Single-look; 3-m resolution; 1.3-m pixel

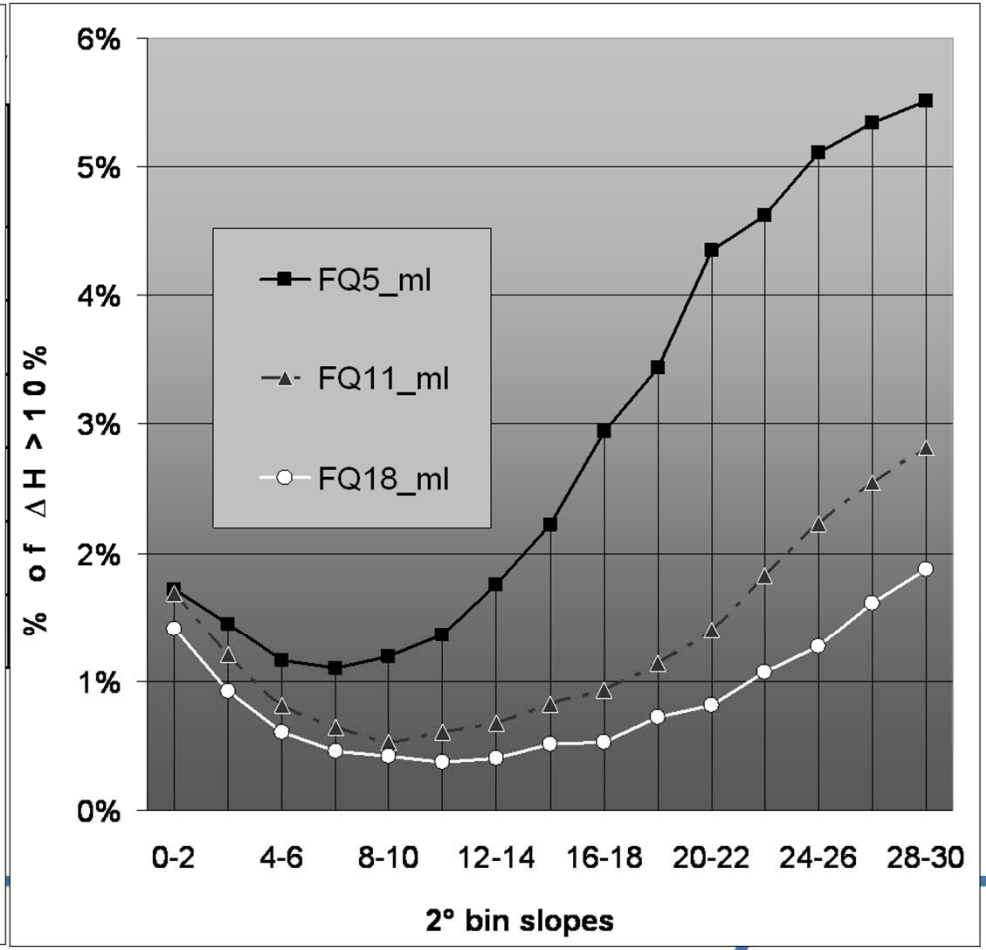
Relative ΔH with R-2

Only $\Delta H \geq 10\%$ is locally computed as fonction of terrain slopes

Single look R-2 data

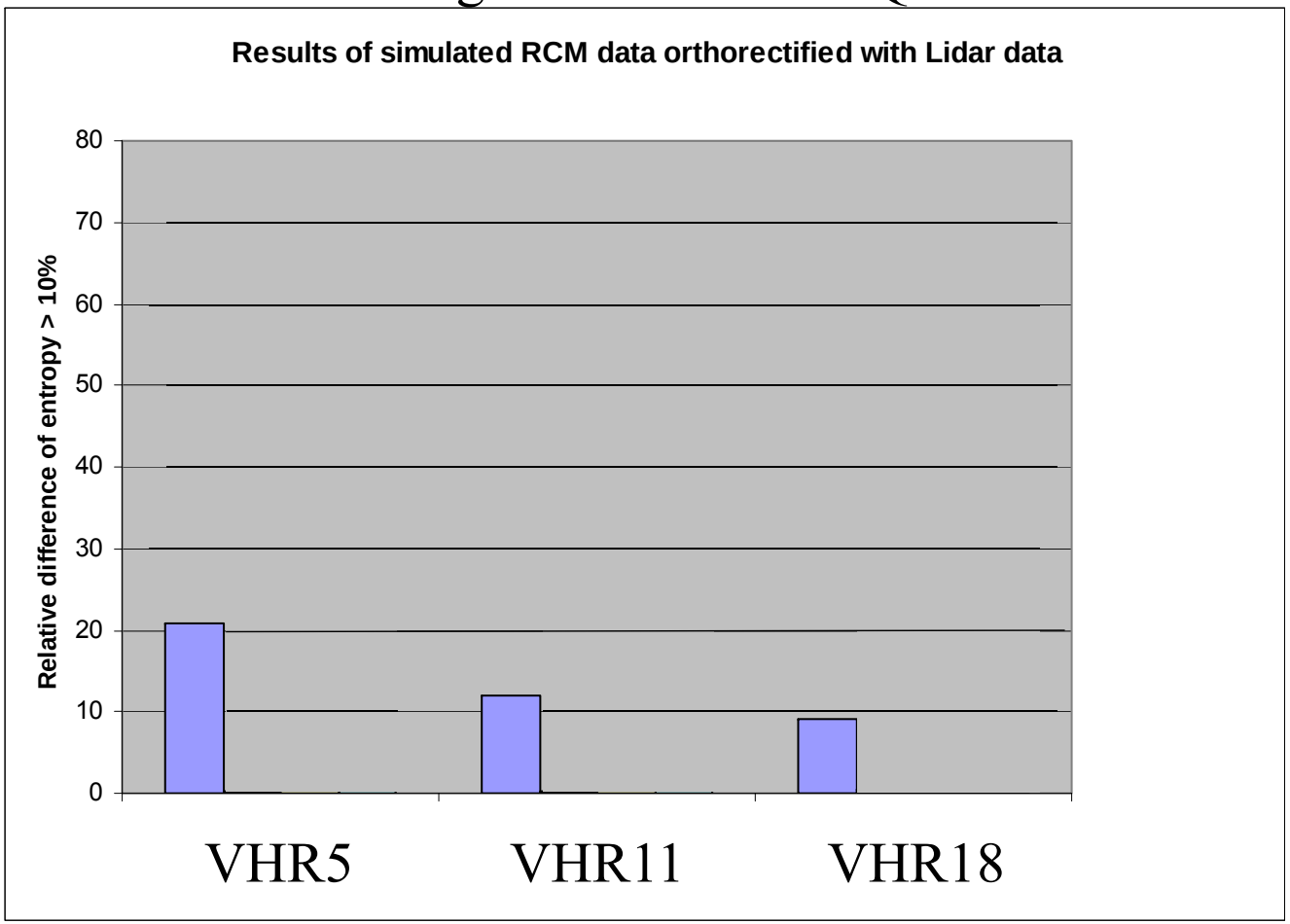


Multi- look R-2 data



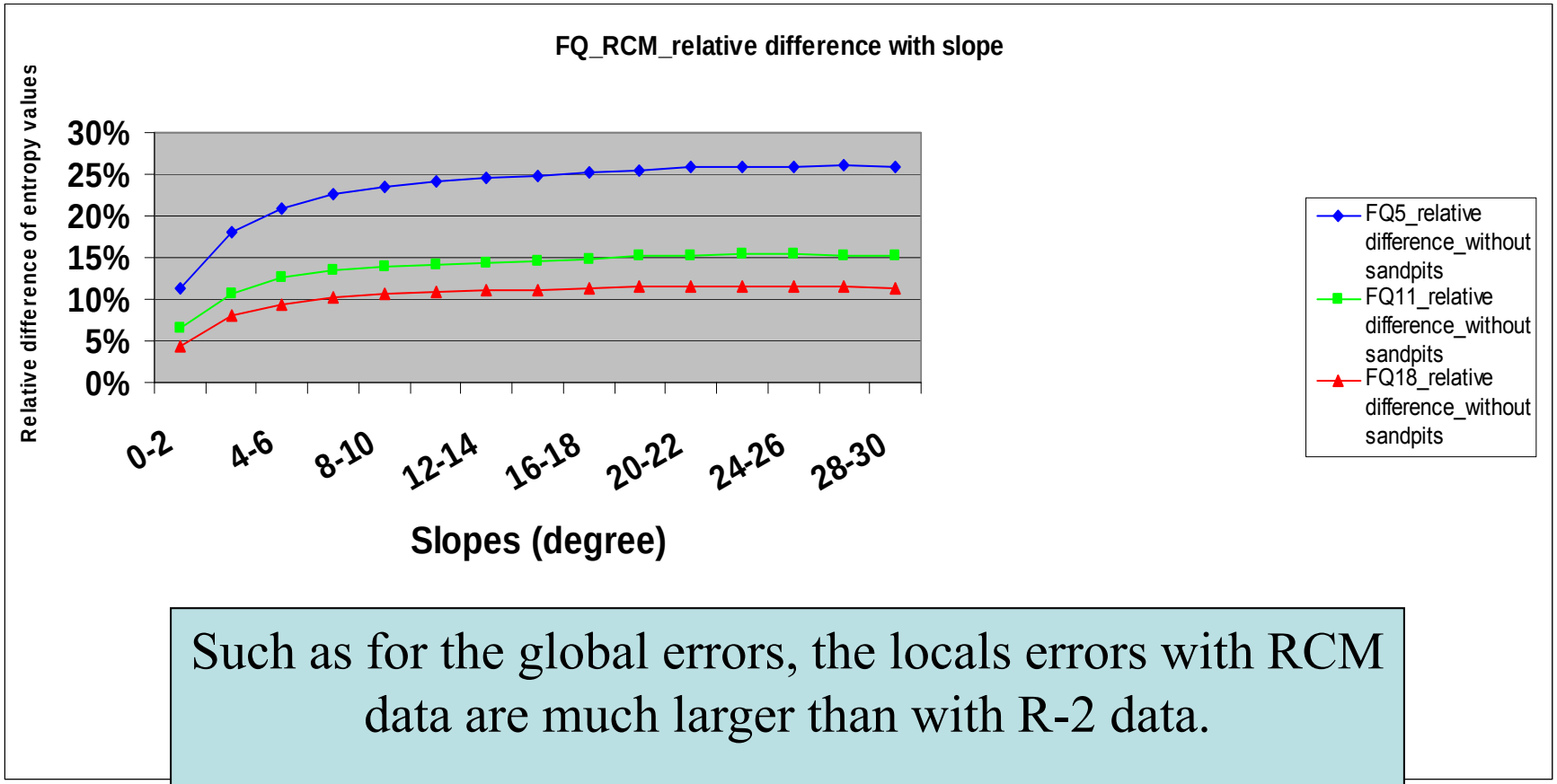
Relative ΔH with simulated RCM

Relative difference of $\Delta H \geq 10\%$ for the full images are much larger than for R-2 FQ data



Relative ΔH with RCM

Only $\Delta H \geq 10\%$ is computed as fonction of terrain slopes

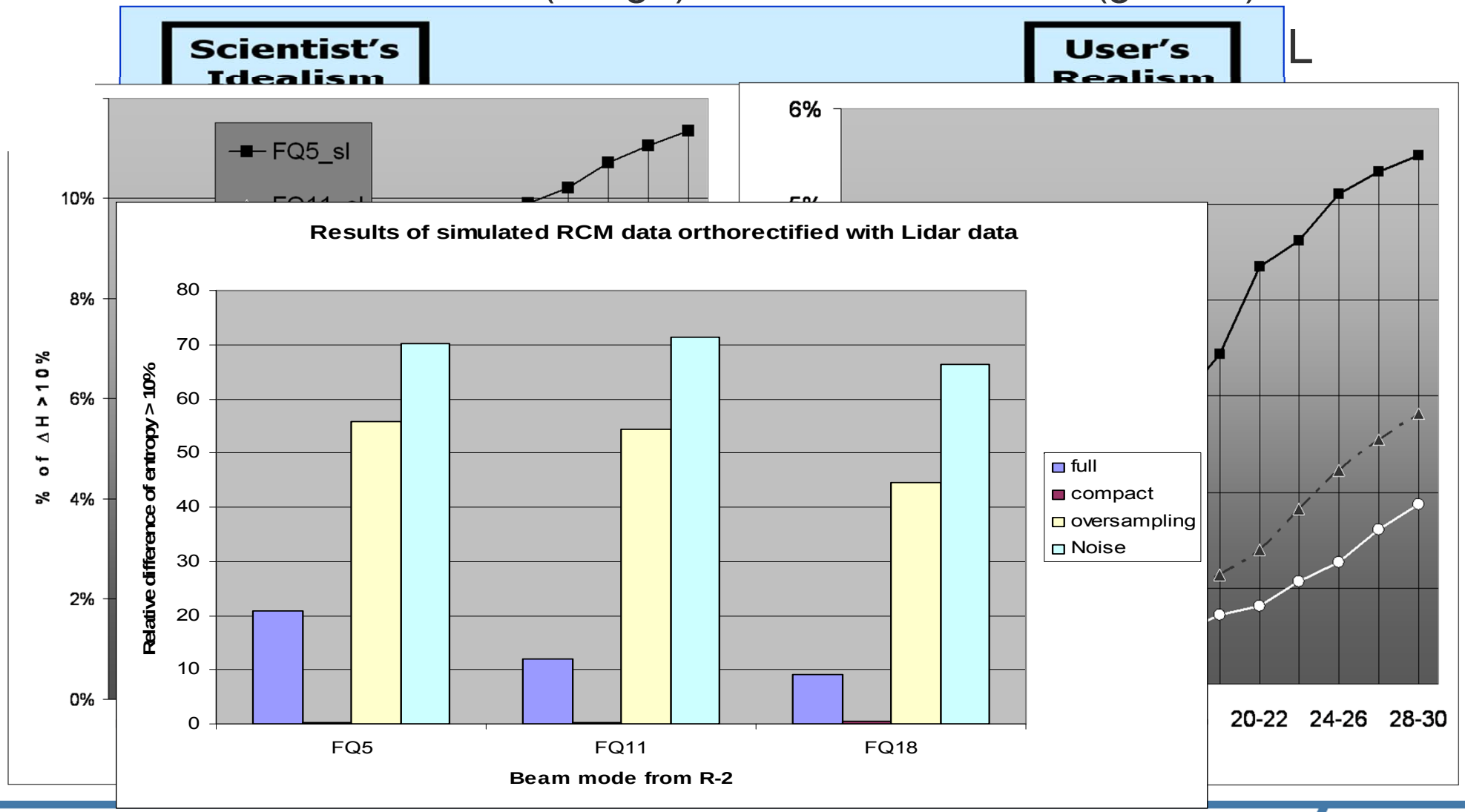


Such as for the global errors, the locals errors with RCM data are much larger than with R-2 data.

Consequently the ground-space method cannot be applied without large losses in polarimetric information

Conclusions

- Scientist's idealism (image) vs. User's realism (ground)



Μερχι...

Questions for ?