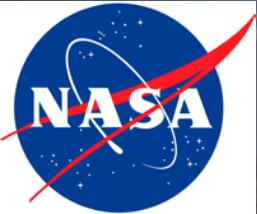
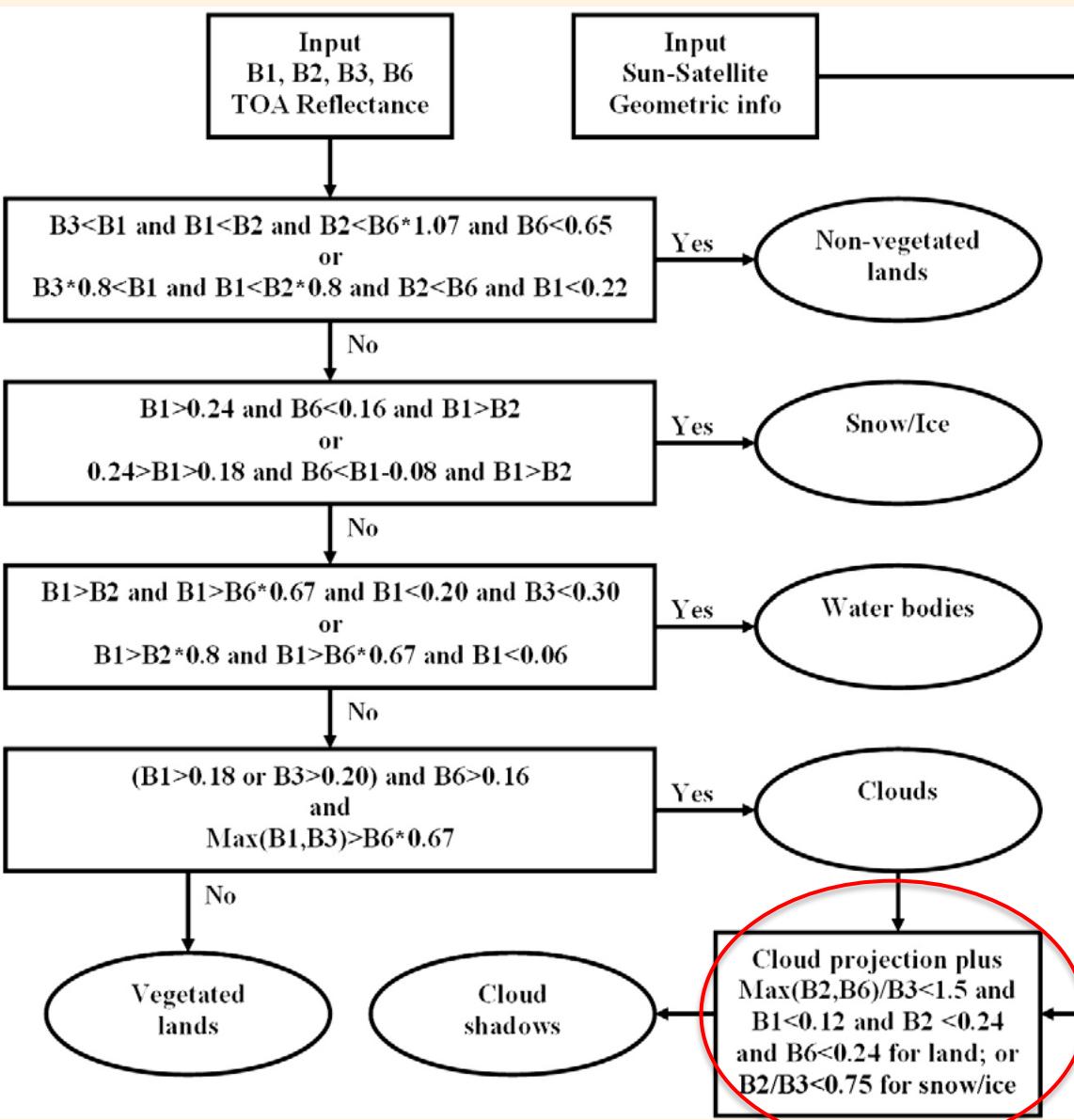


Implementation on Landsat data of a simple cloud mask algorithm developed for MODIS land bands

Lazaros Oreopoulos (NASA-GSFC)
and
Mike Wilson (UMBC-GEST)



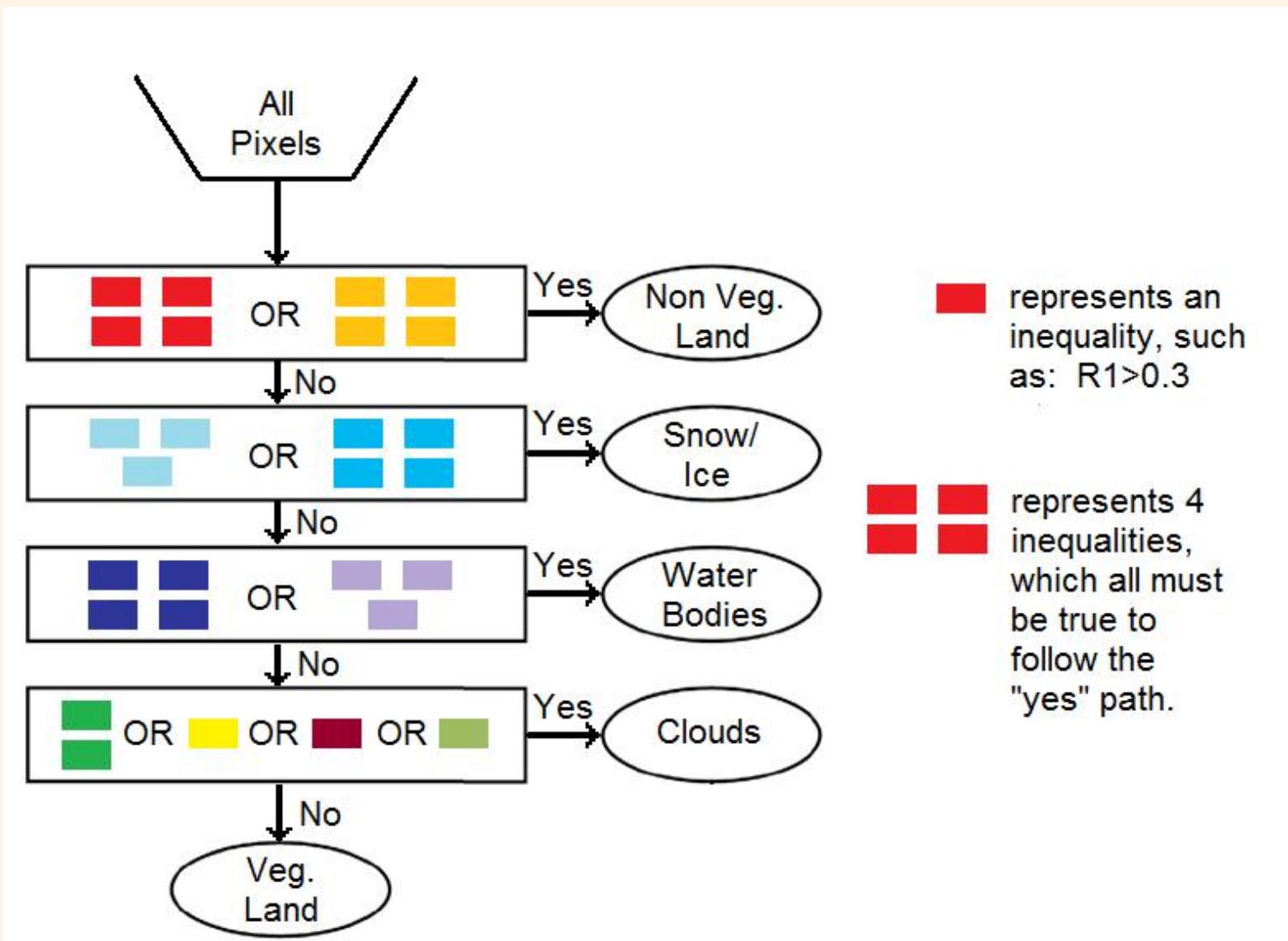
The Luo et al. (2008) scheme



- Developed for use with 250 m and 500 m MODIS bands to create clear-sky composites over N. America
- Meant to be clear-sky conservative
- Has also a shadow detection component

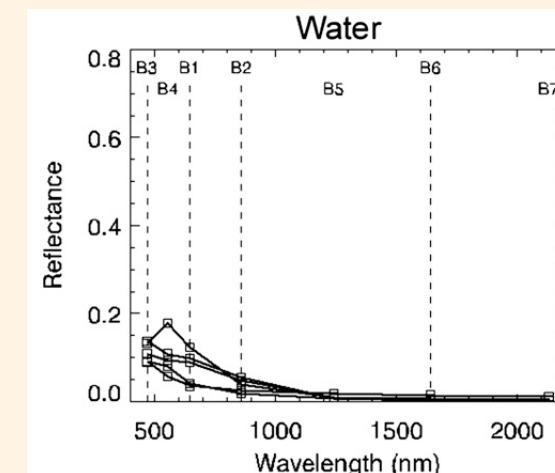
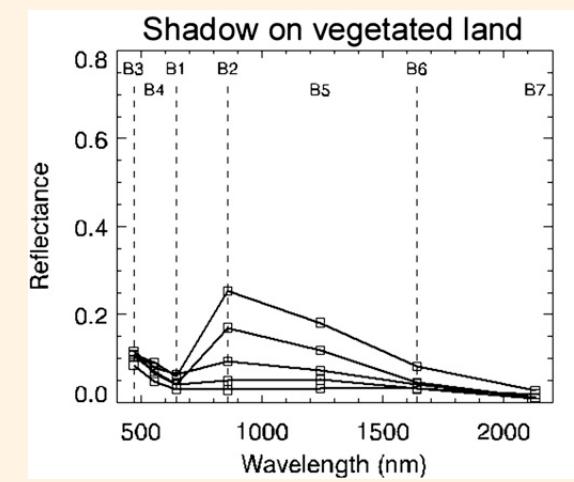
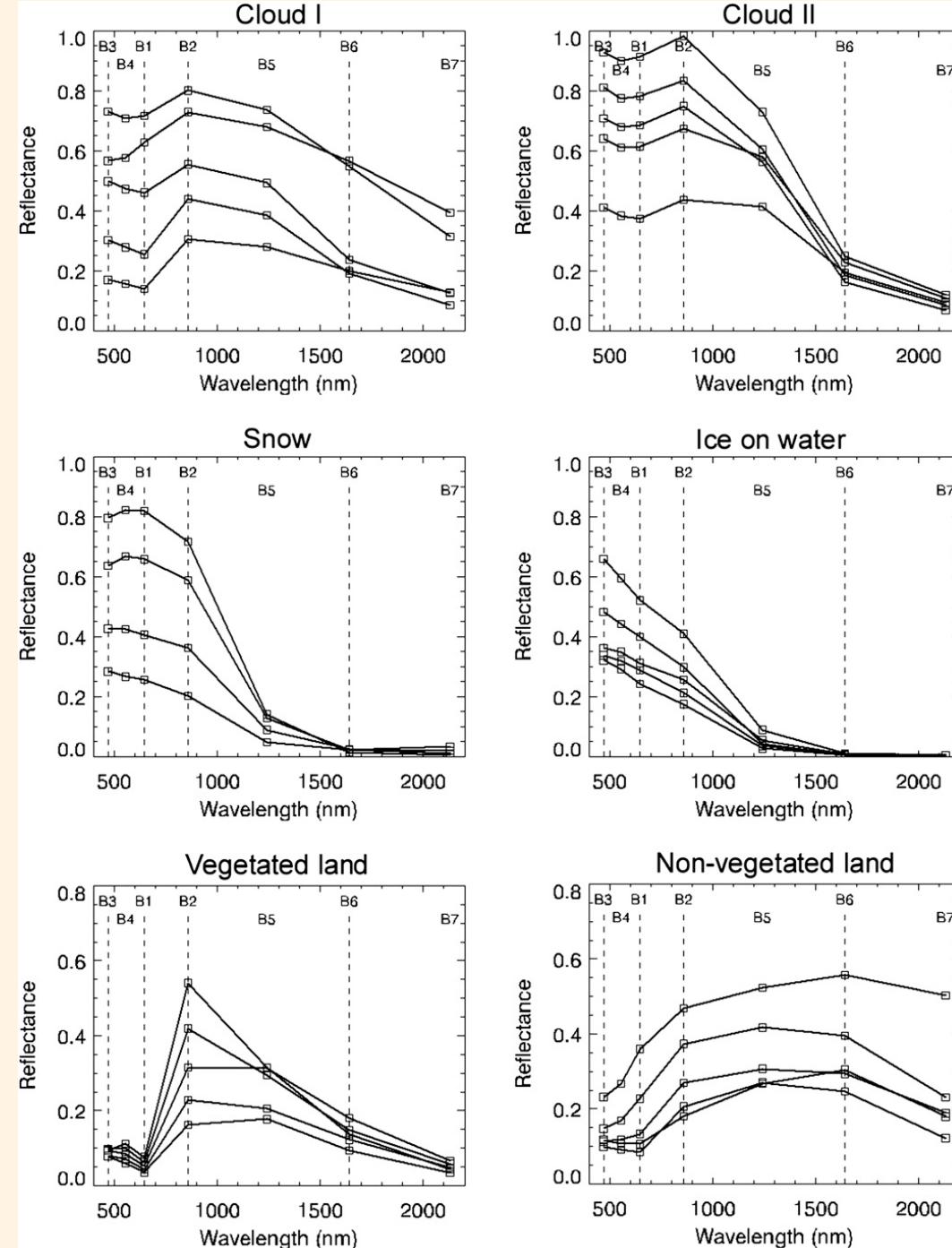
Will apply on 156 (142) Irish scenes with credible manual mask

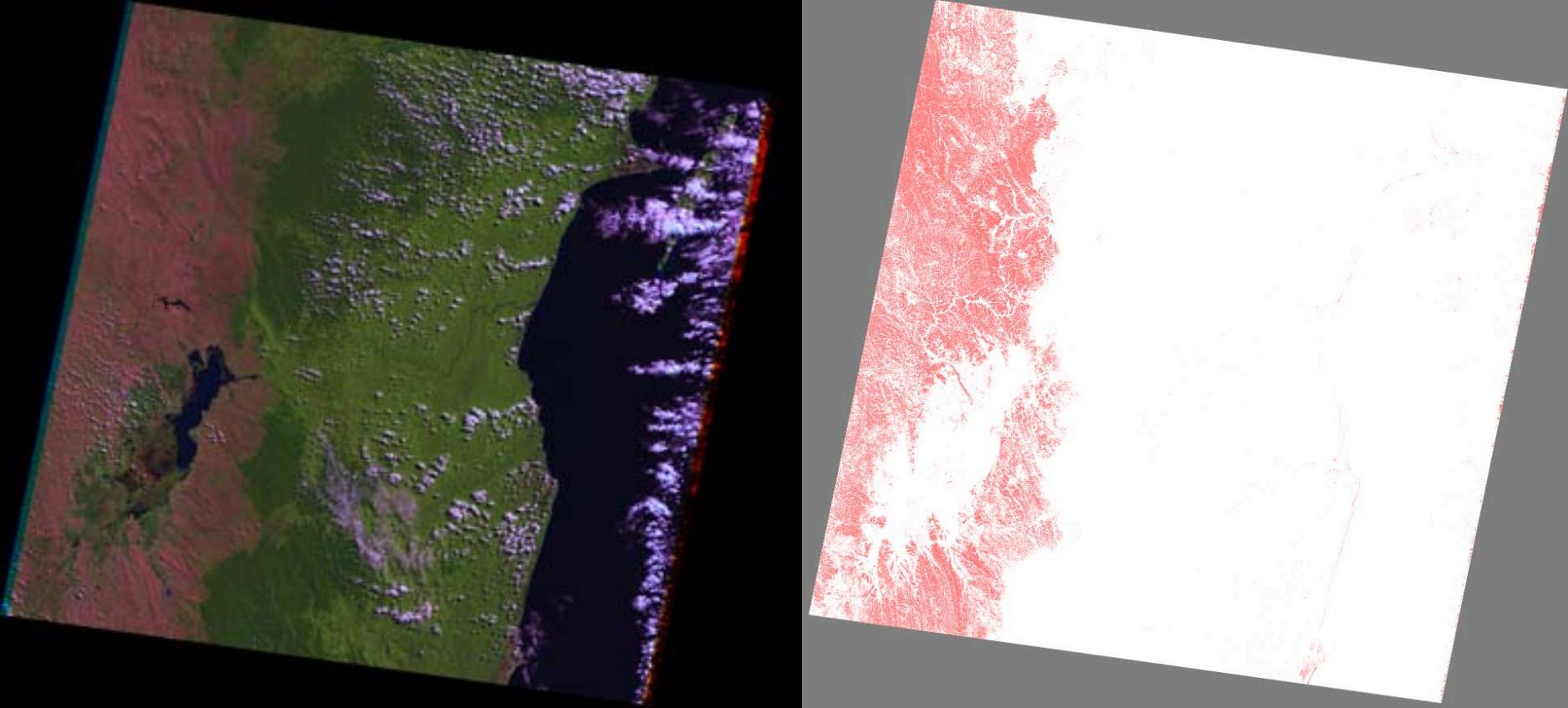
Simplified view of the Luo et al. (2008) scheme



Luo et al. (2008) scheme underlying physical basis

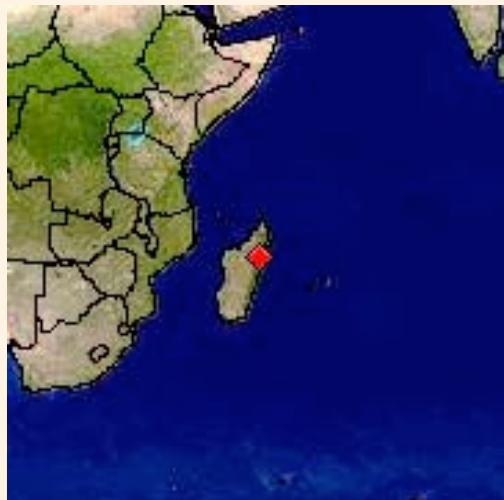
Observed spectral variability
of various surface types,
clouds and shadows





Example

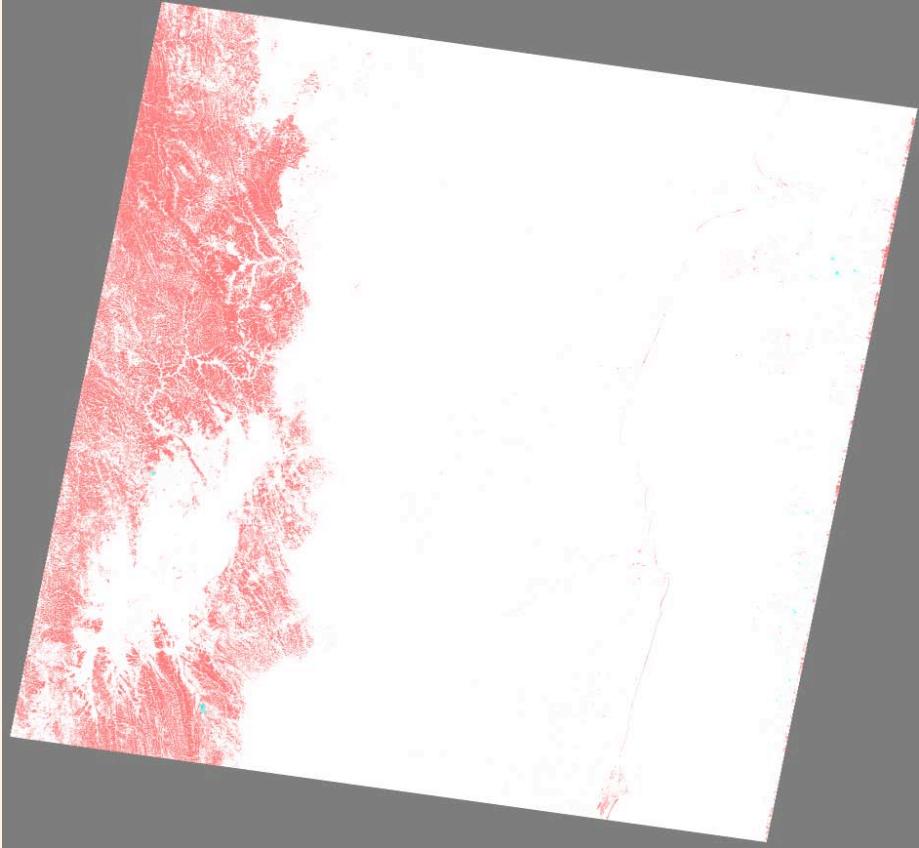
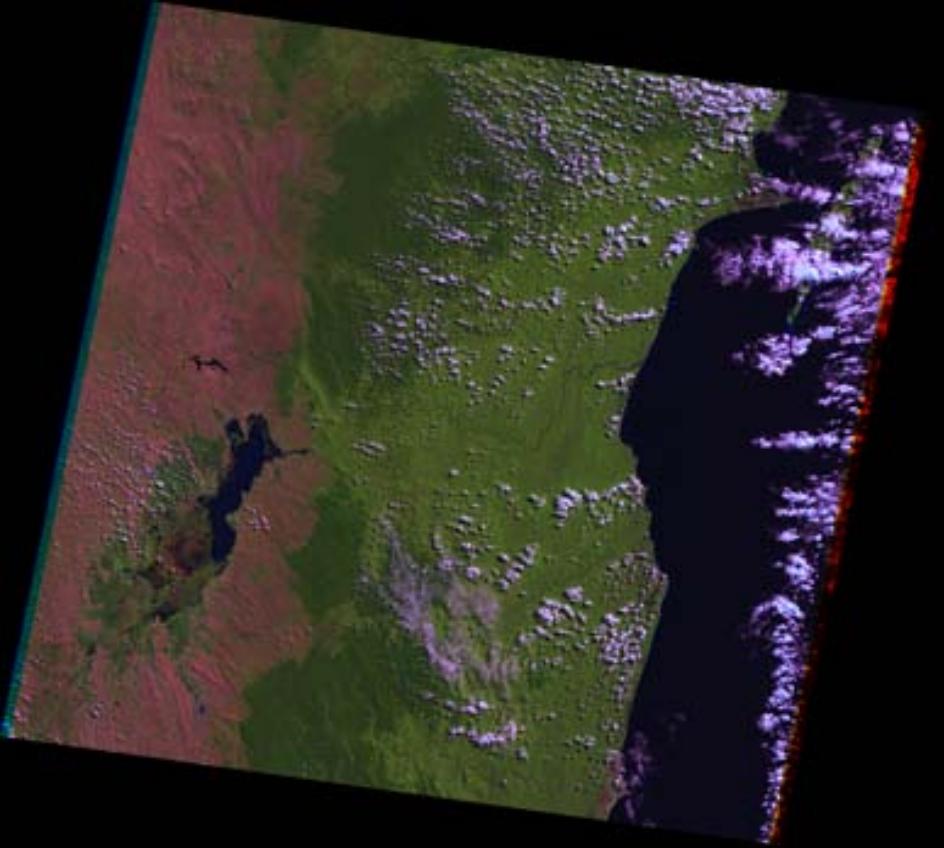
Subtropical South
P158_r72_4



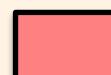
Non-Vegetated Lands



Undecided



Subtropical South
P158_r72_4



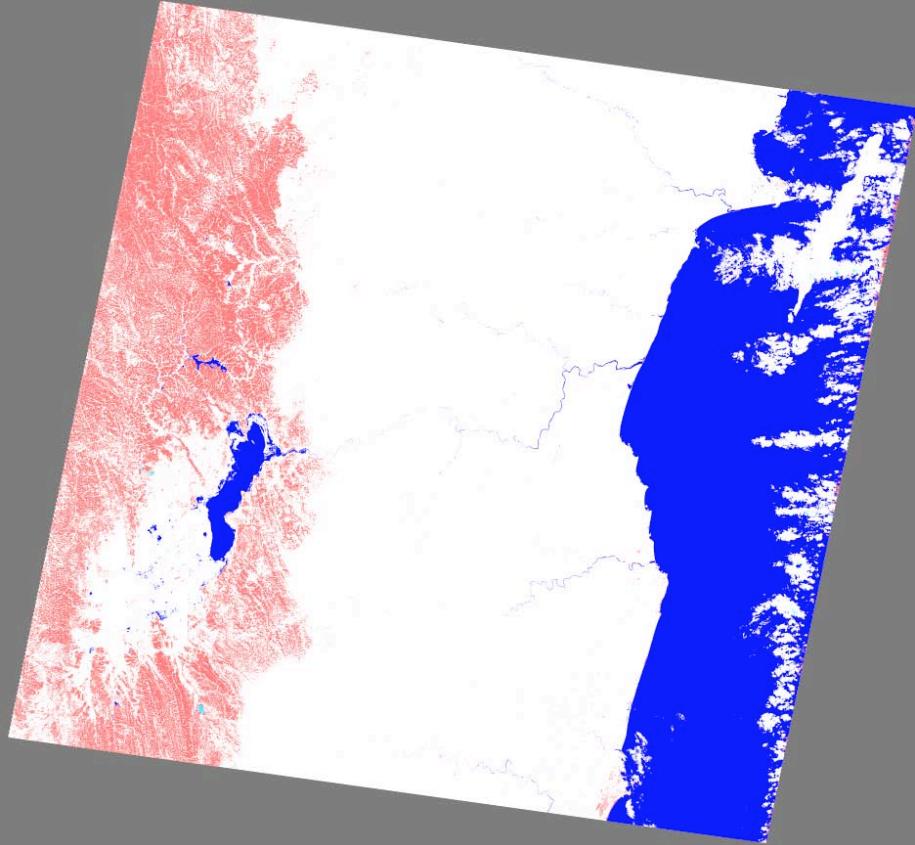
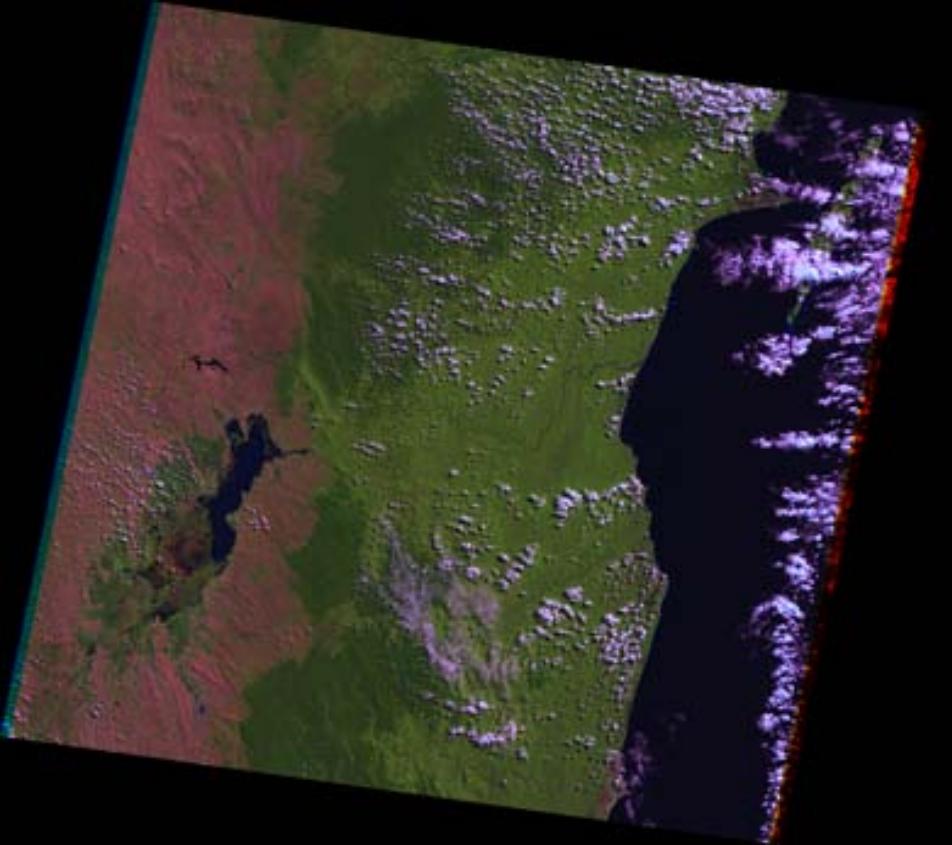
Non-Vegetated Lands



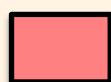
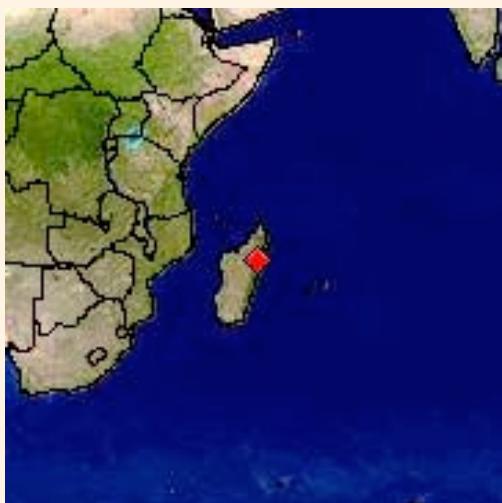
Snow/Ice



Undecided



Subtropical South
P158_r72_4



Non-Vegetated Lands



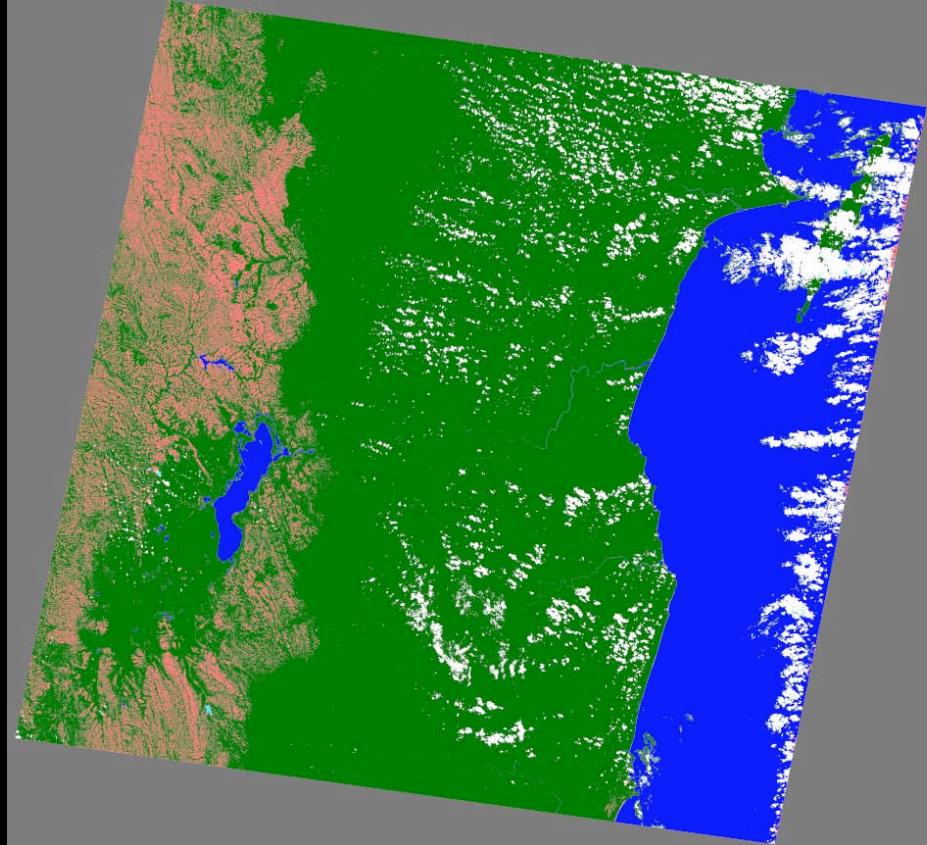
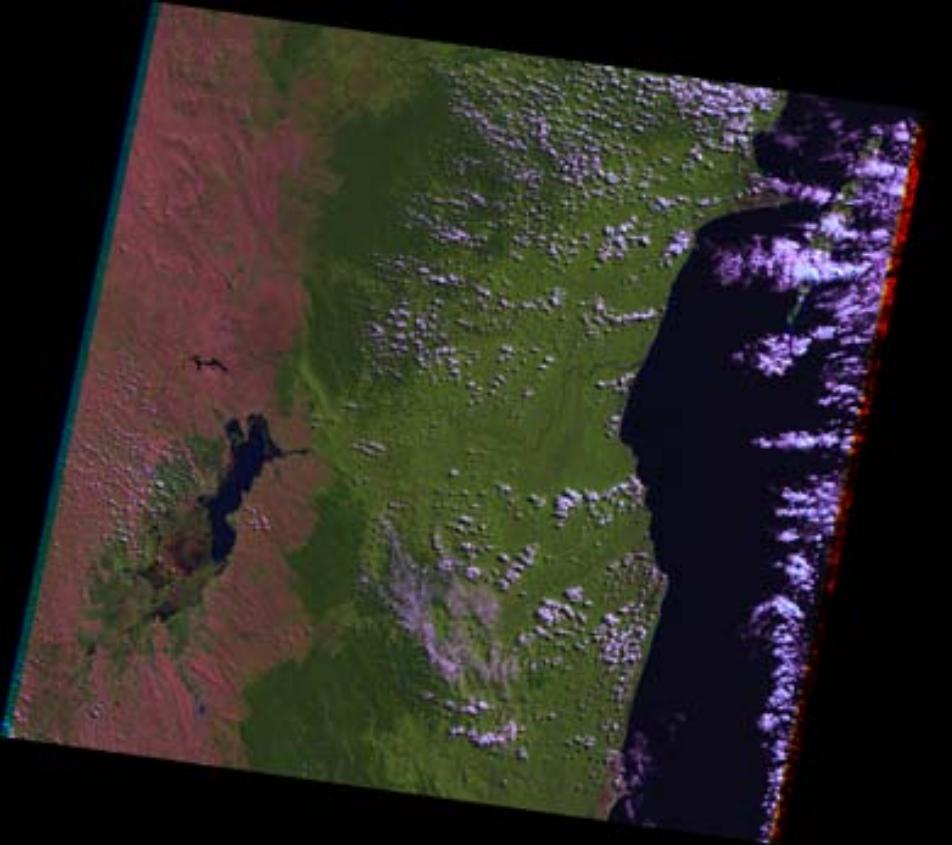
Snow/Ice



Water Bodies

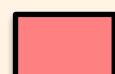
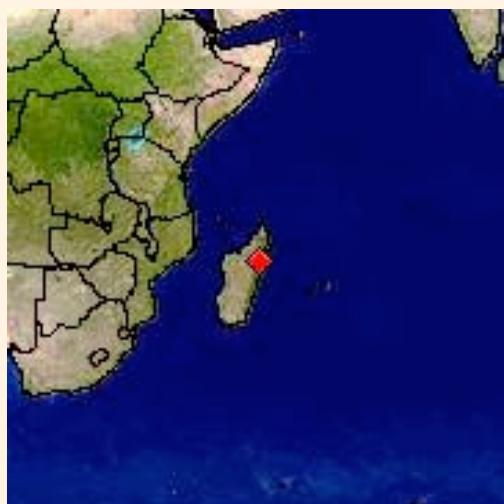


Undecided



Subtropical South
P158_r72_4

ACCA agreement 95.4%
Luo agreement 91.5%



Non-Vegetated Lands



Snow/Ice



Water Bodies

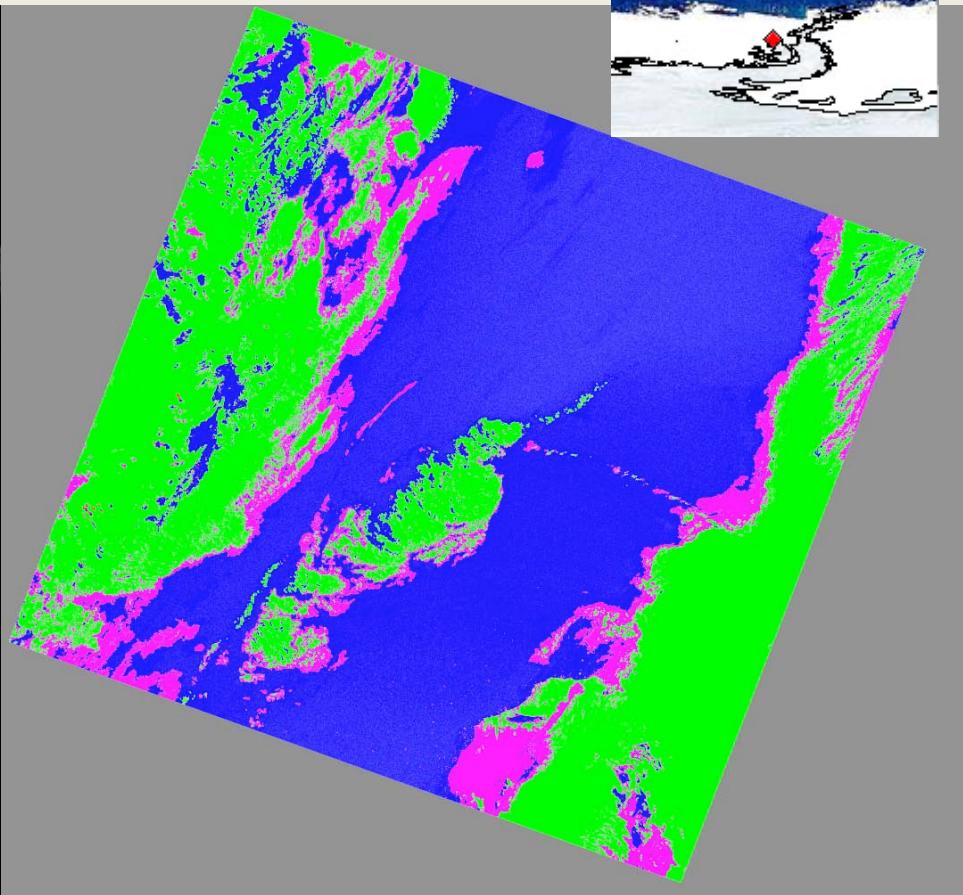
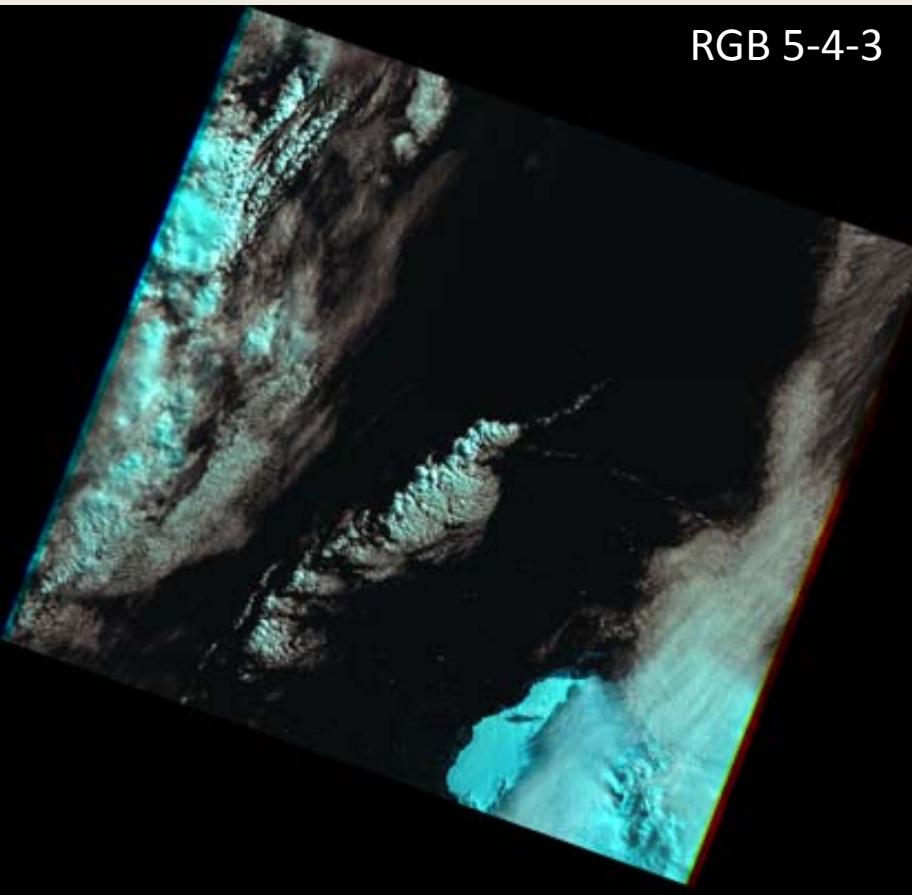


Vegetated Lands



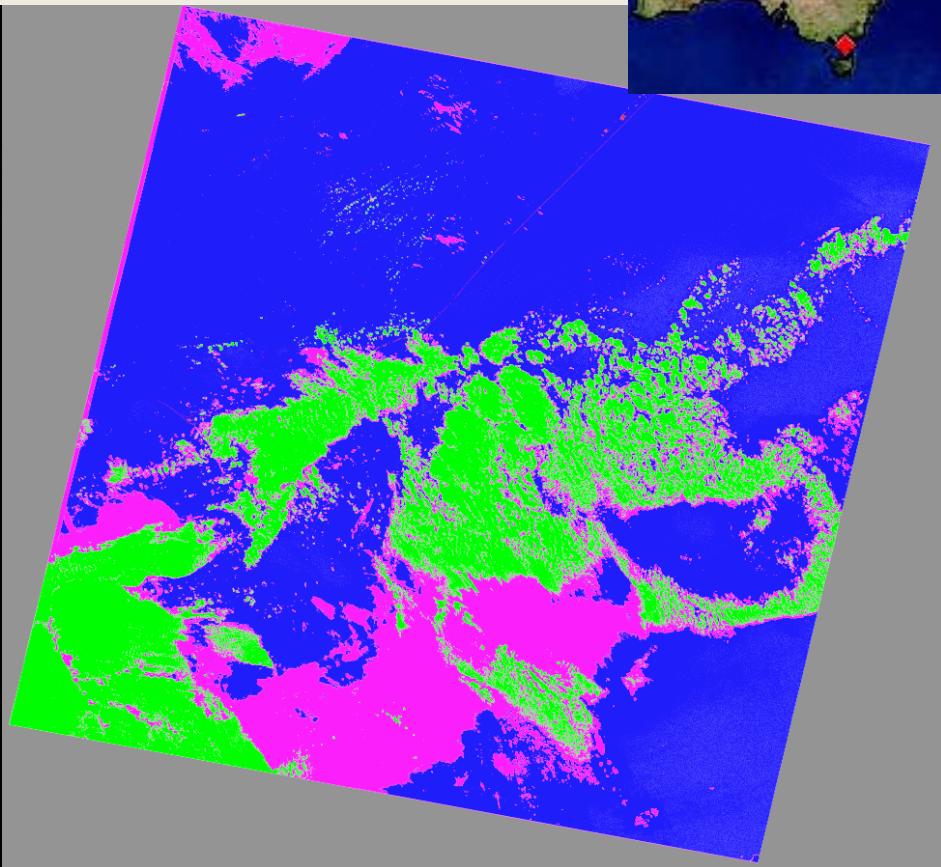
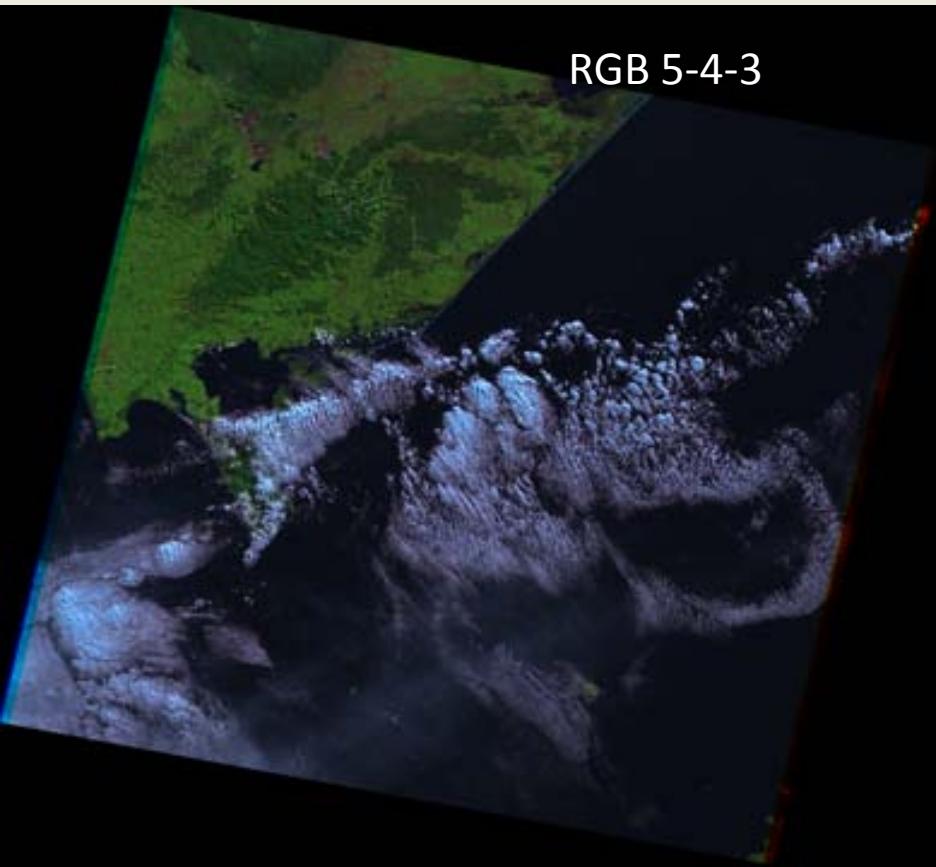
Cloud

Polar south, p222_r108



both cloudy	Luo: clear manual: thin cloud	Luo: clear manual: thick cloud	Luo: cloudy manual: clear	both clear	Luo and manual both cloudy	Luo clear, manual cloudy
36.78%	11.42%	2.03%	0.28%	49.50%	Luo and manual both clear	Luo cloudy, manual clear

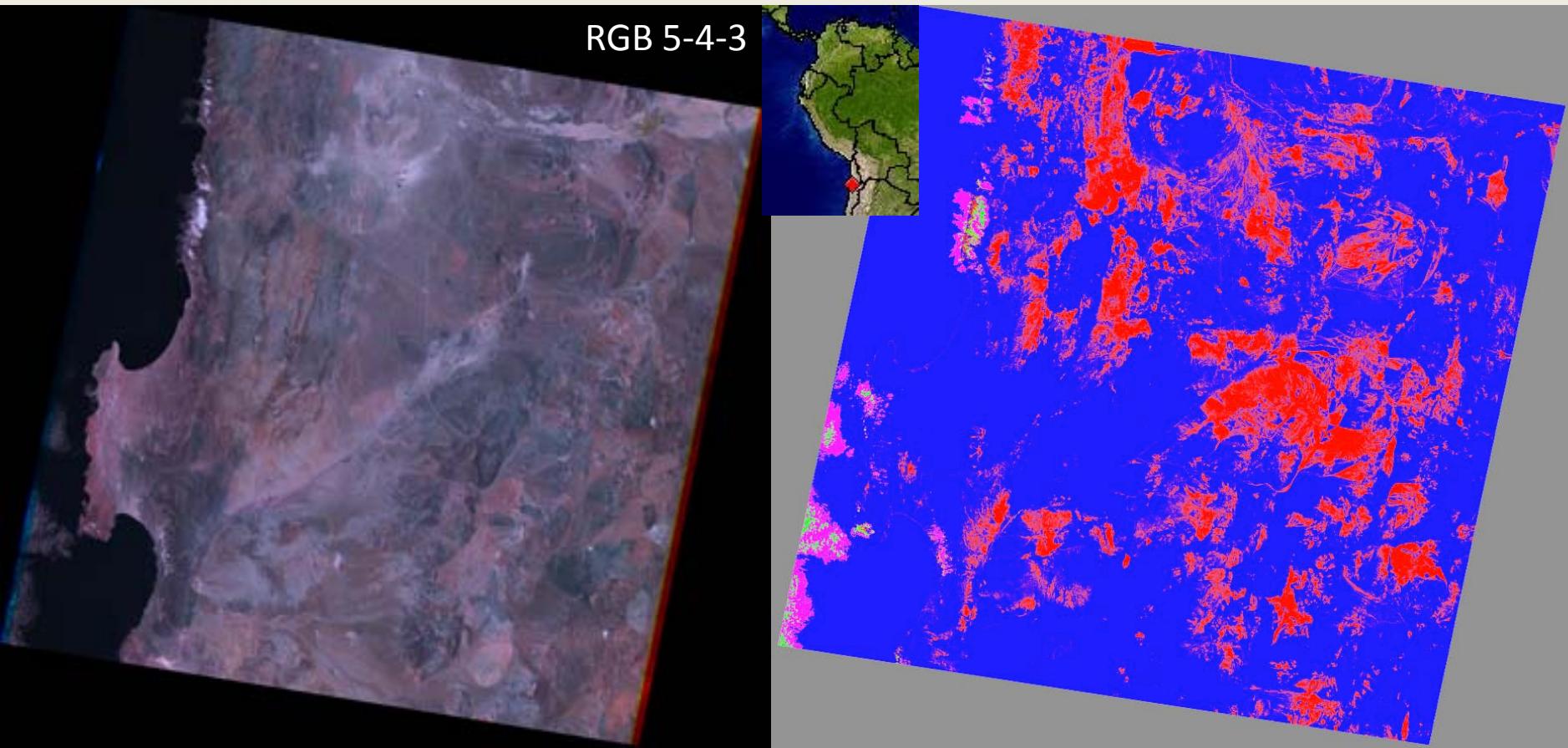
Mid-Latitude S, p91_r87_2



both cloudy	Luo: clear manual: thin cloud	Luo: clear manual: thick cloud	Luo: cloudy manual: clear	both clear
18.71%	15.18%	4.17%	0.03%	61.91%

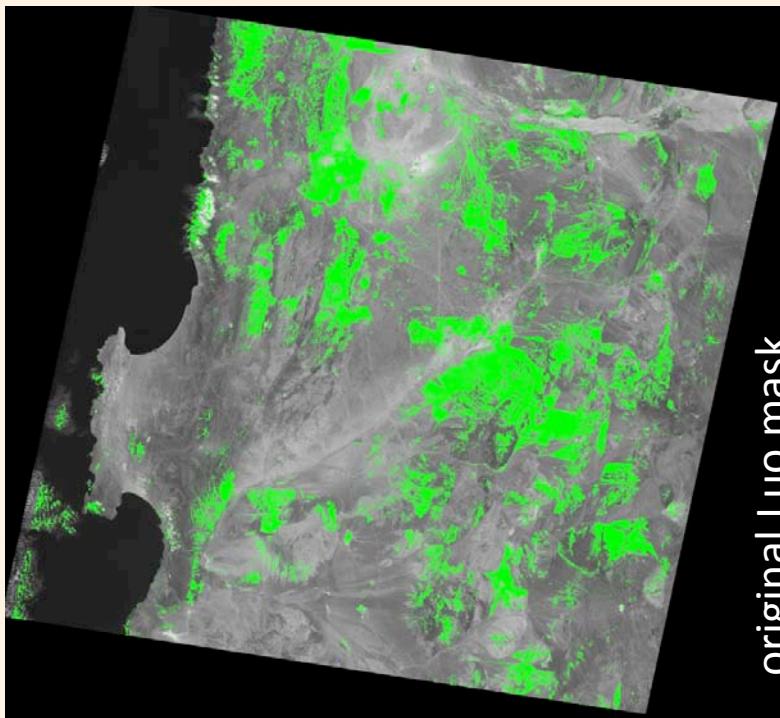
Luo and manual both cloudy	Luo clear, manual cloudy
Luo and manual both clear	Luo cloudy, manual clear

Subtropical S, p1_r76

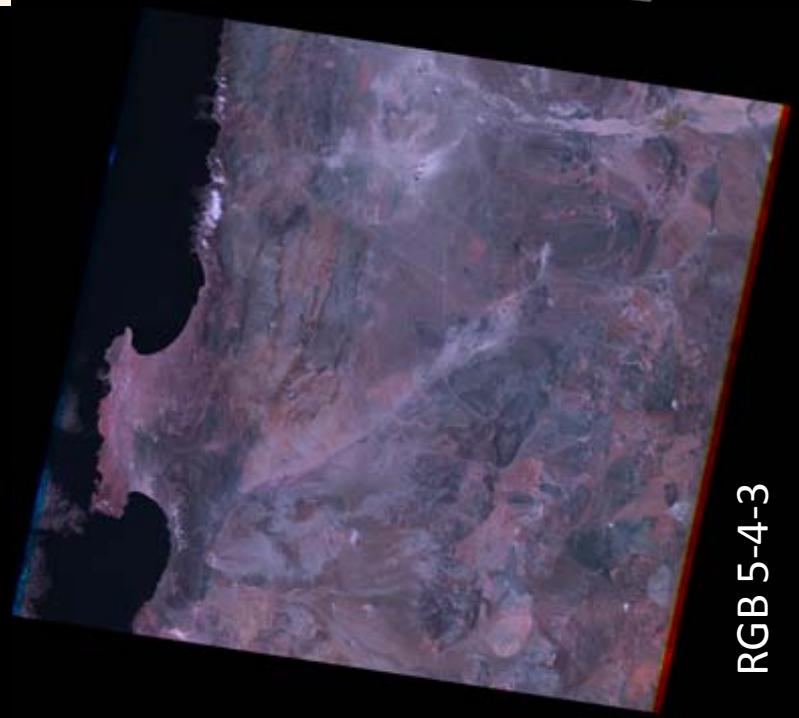


both cloudy	Luo: clear manual: thin cloud	Luo: clear manual: thin cloud	Luo: cloudy manual: clear	both clear	Luo and manual both cloudy	Luo clear, manual cloudy
0.21%	1.18%	0.20%	14.01%	84.40%	Luo and manual both clear	Luo cloudy, manual clear

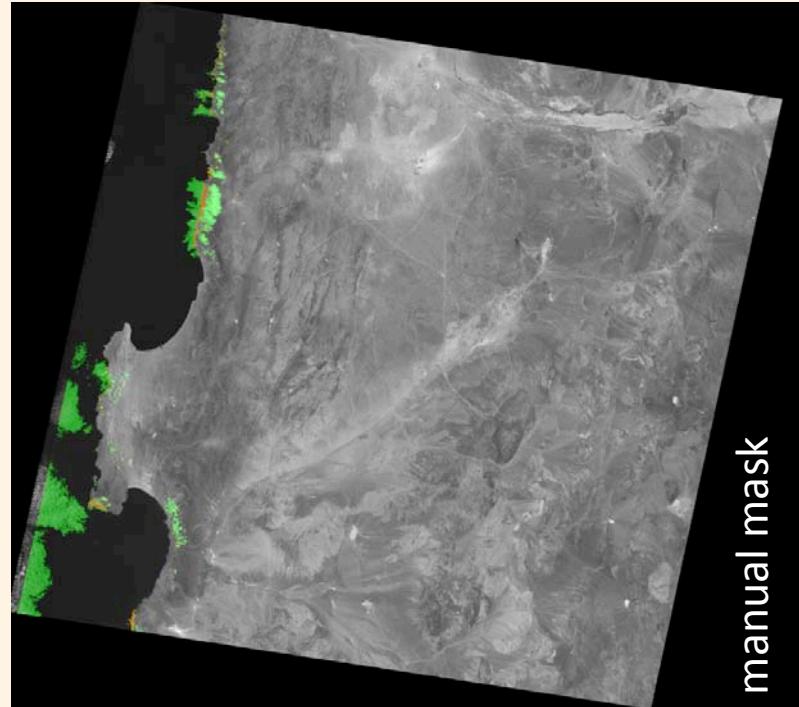
Subtropical S
p1_r76



original Luo mask



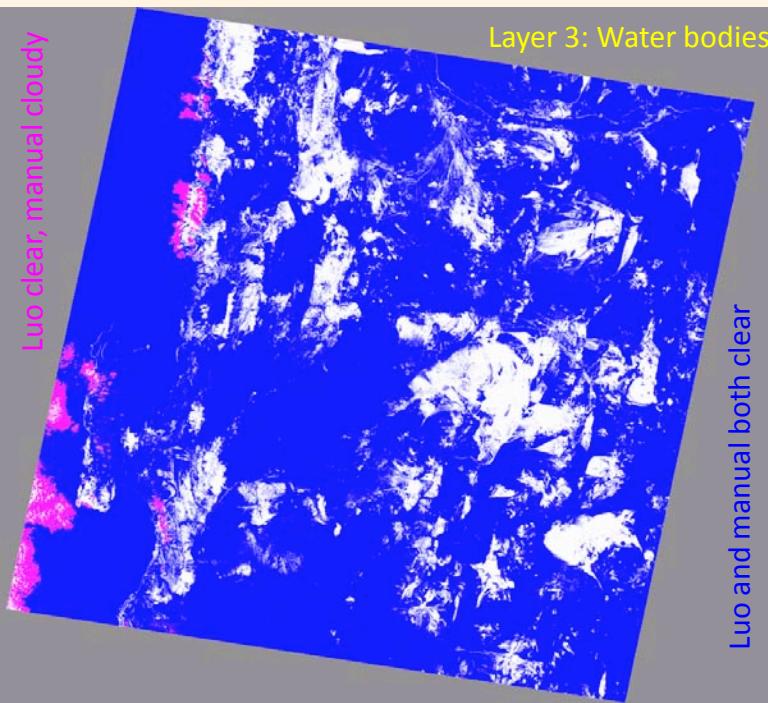
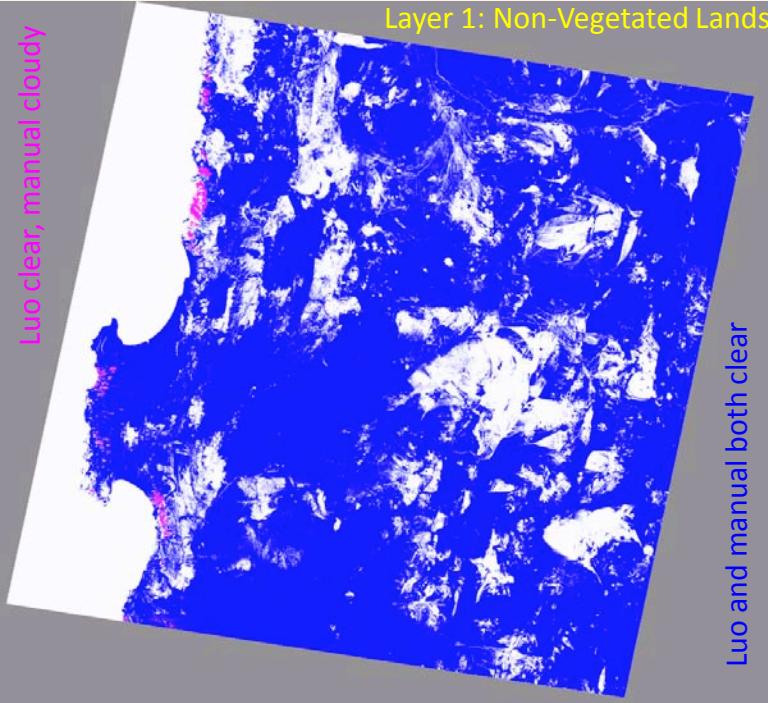
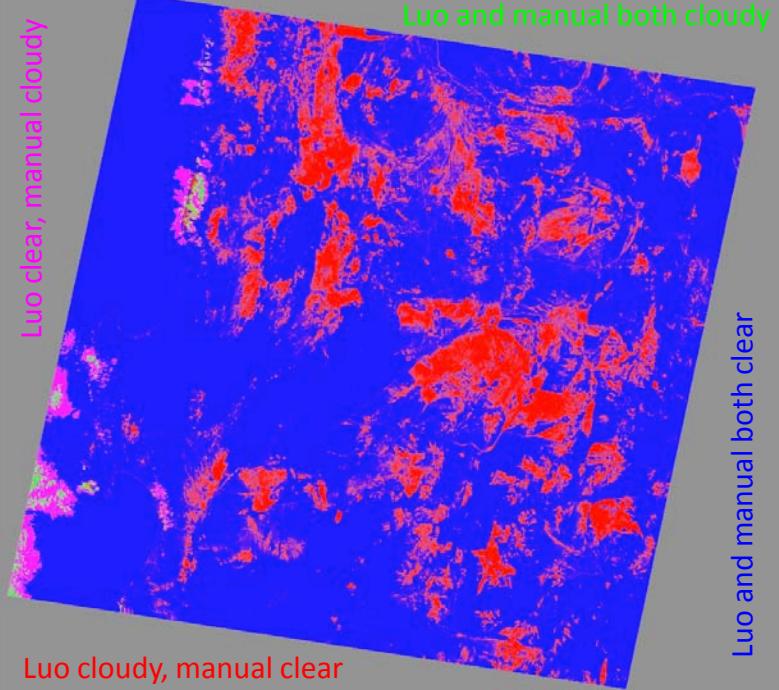
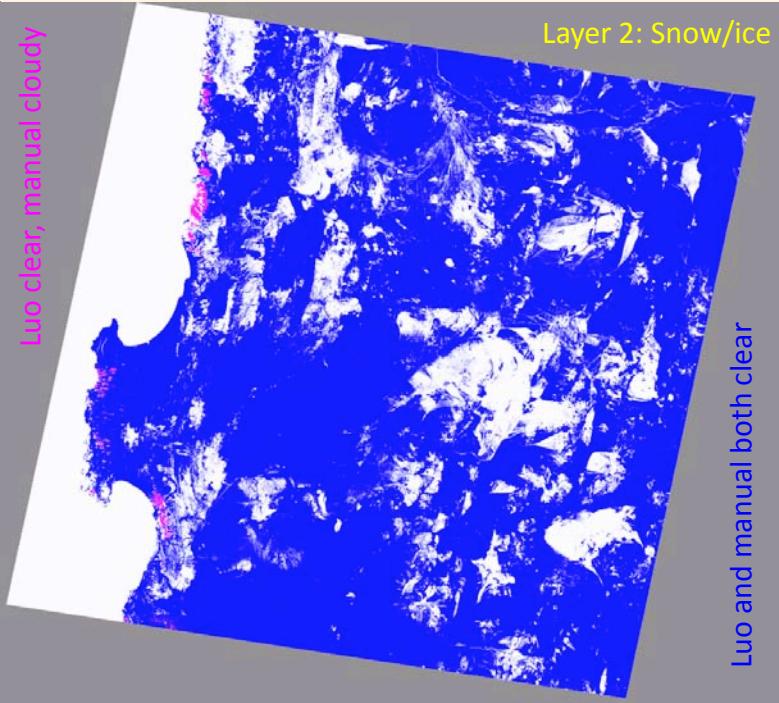
RGB 5-4-3



manual mask

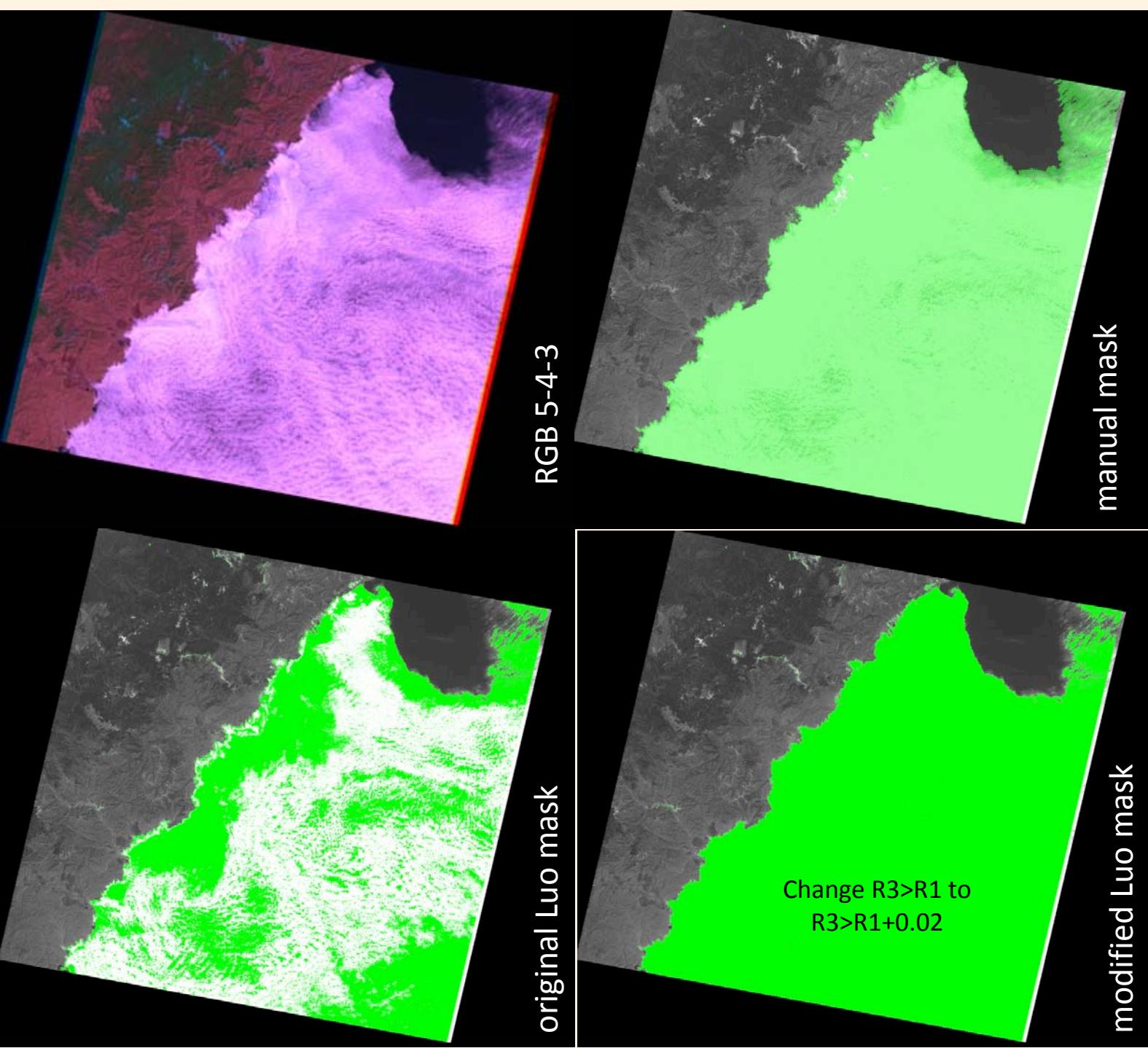
white is undecided

Subtropical S
p1_r76

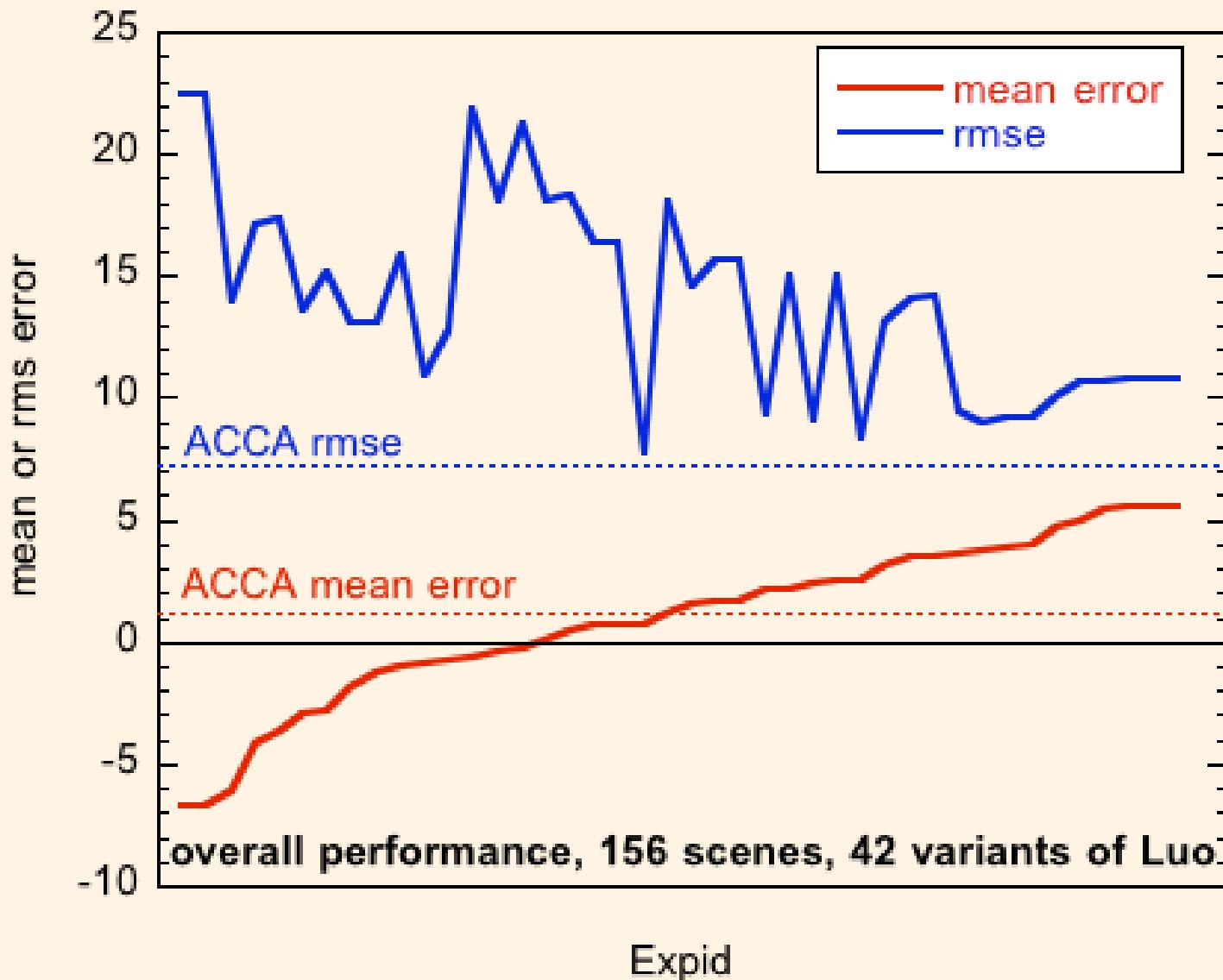




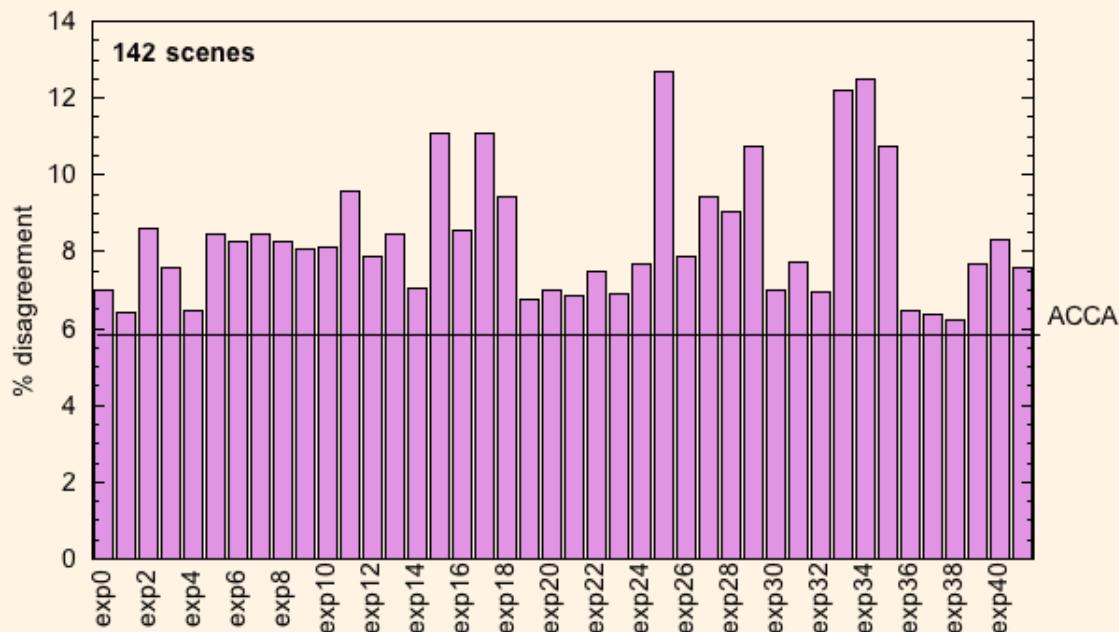
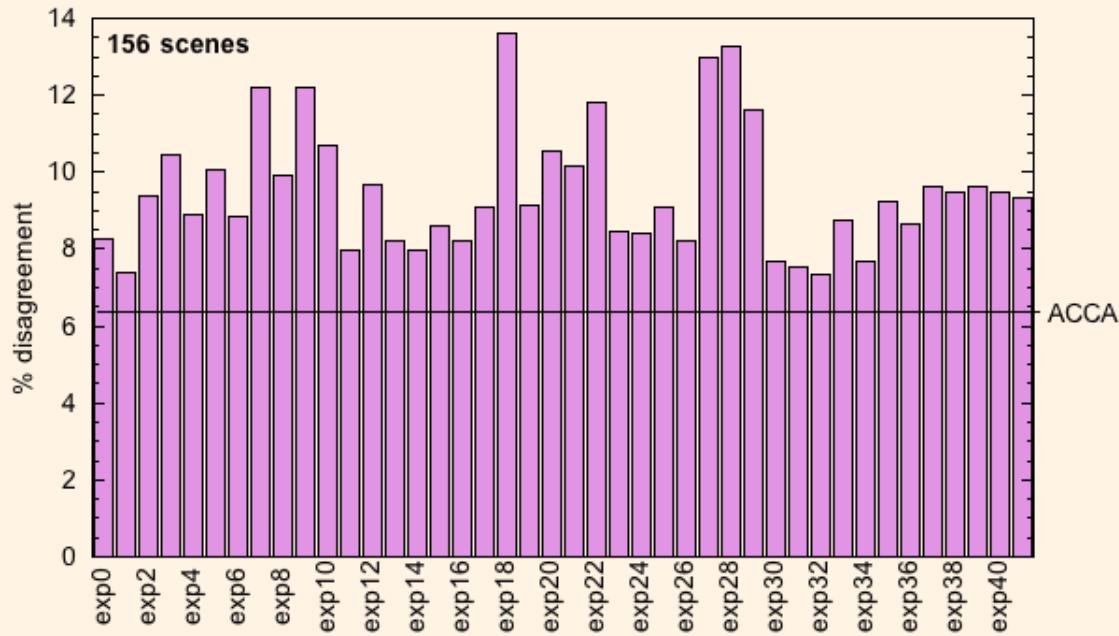
Mid-Latitude N
p111_r29



Scheme performance, scene cloud fraction

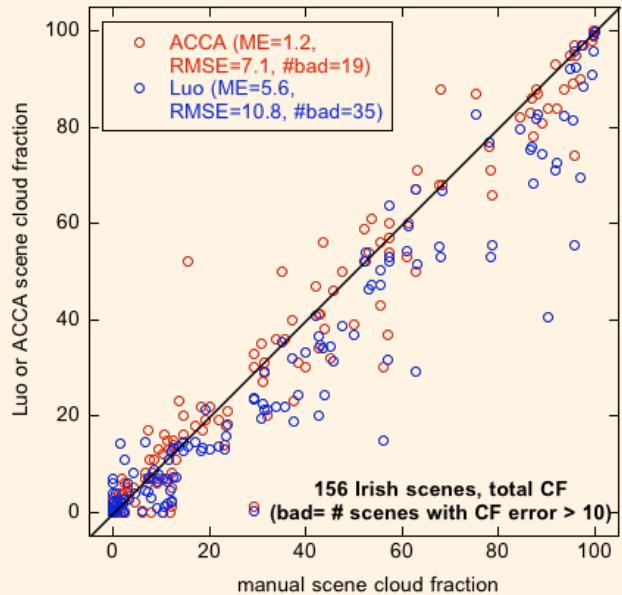


Scheme performance, pixel-level (dis)agreement

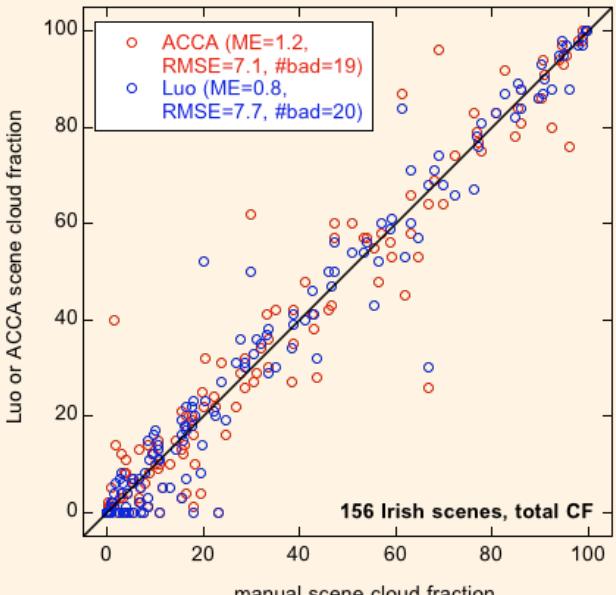


Scene cloud fraction scores

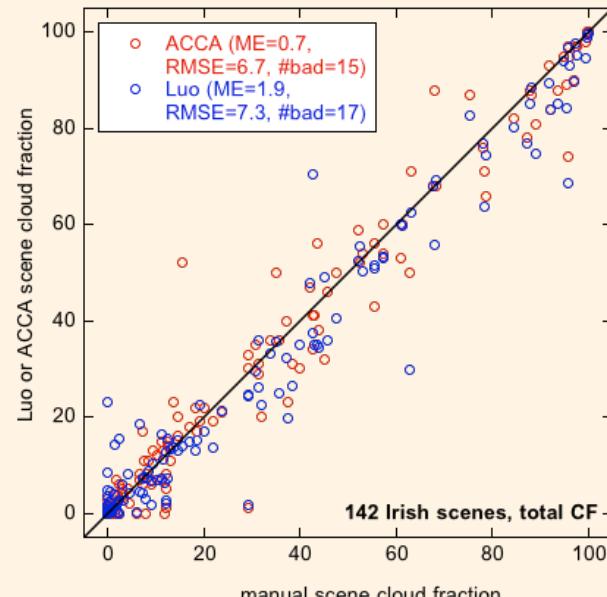
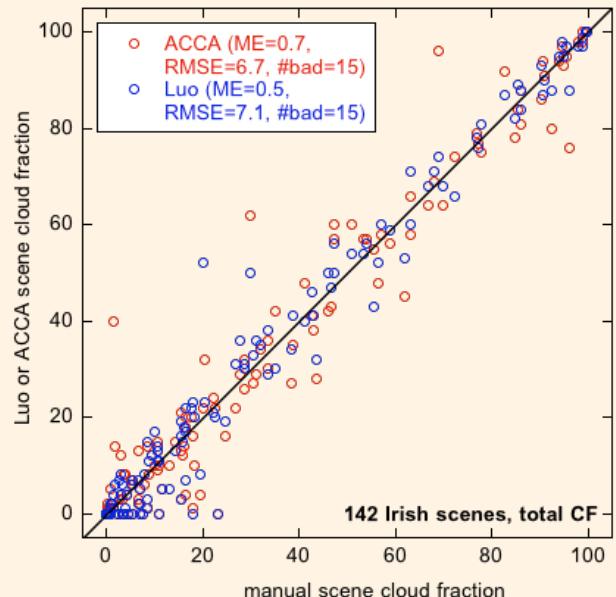
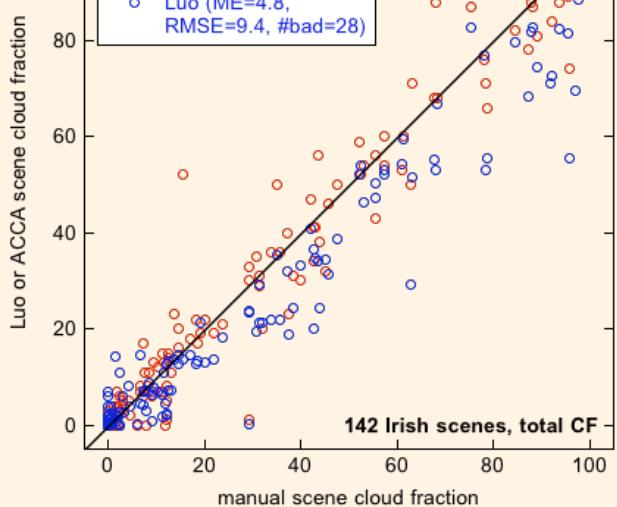
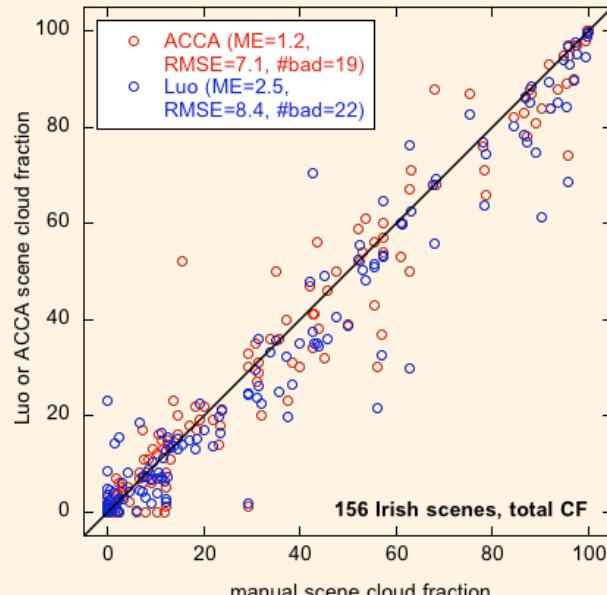
exp0



exp1

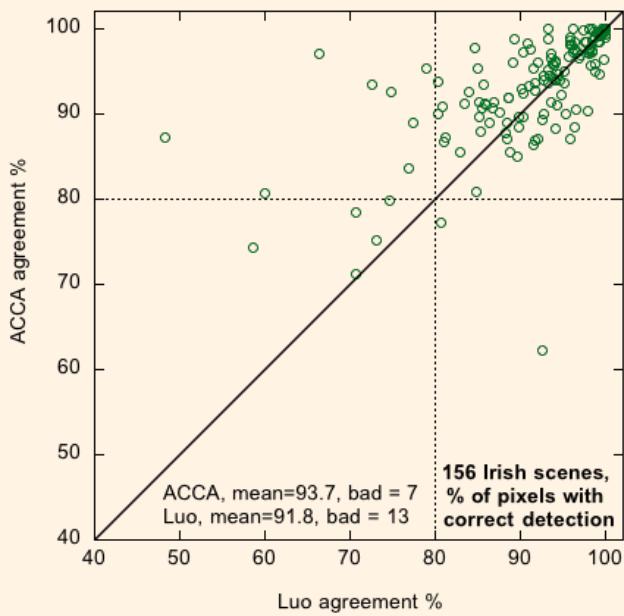


exp38

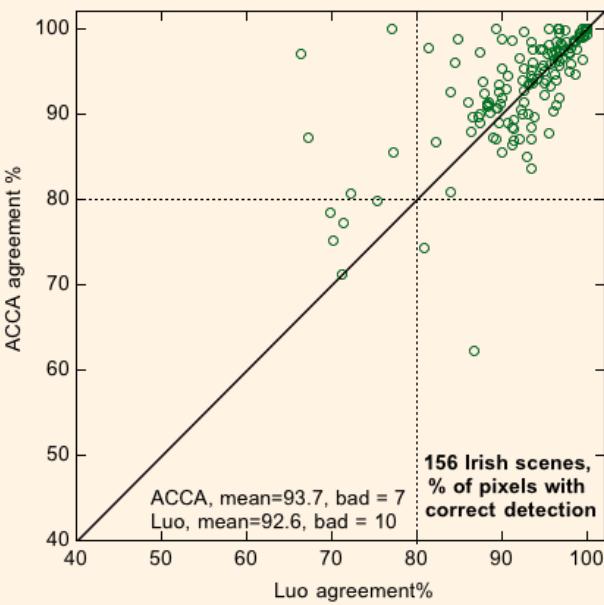


Scene pixel-level agreement

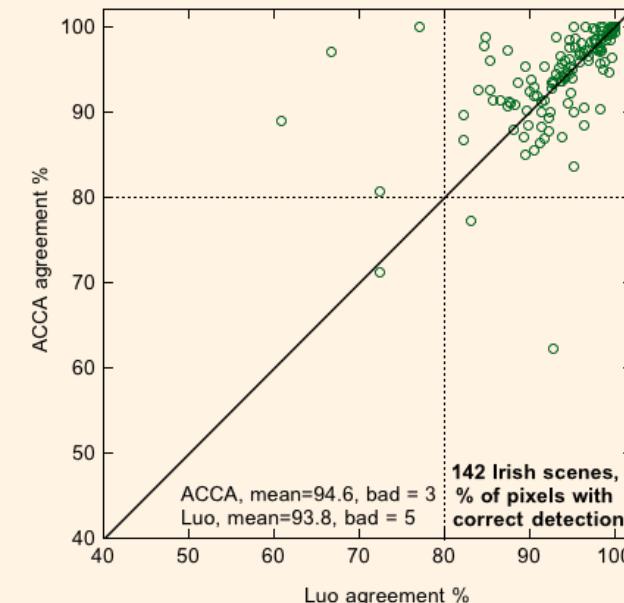
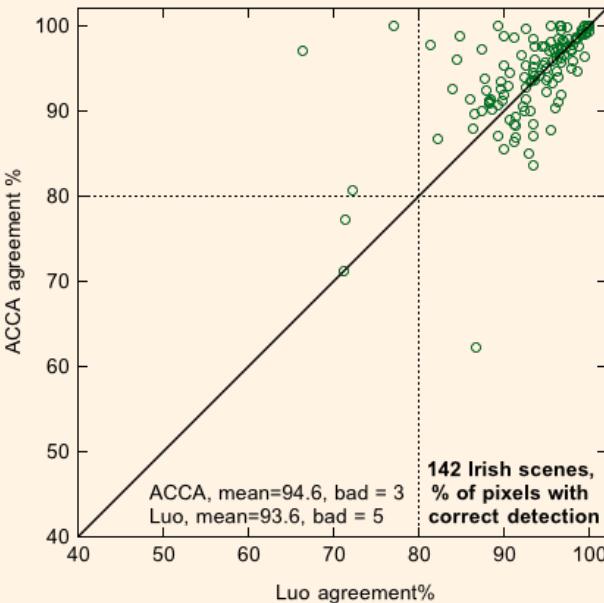
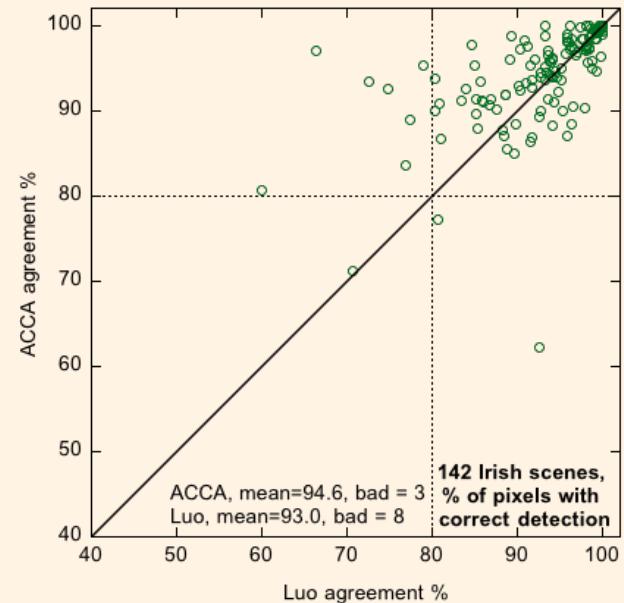
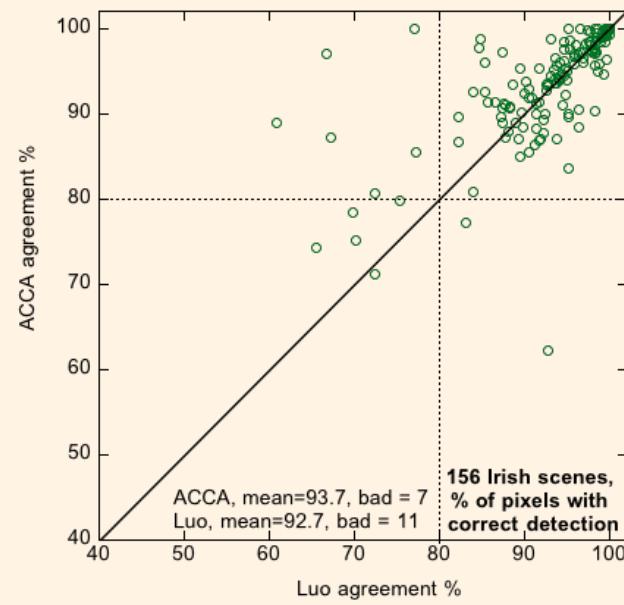
exp0



exp1



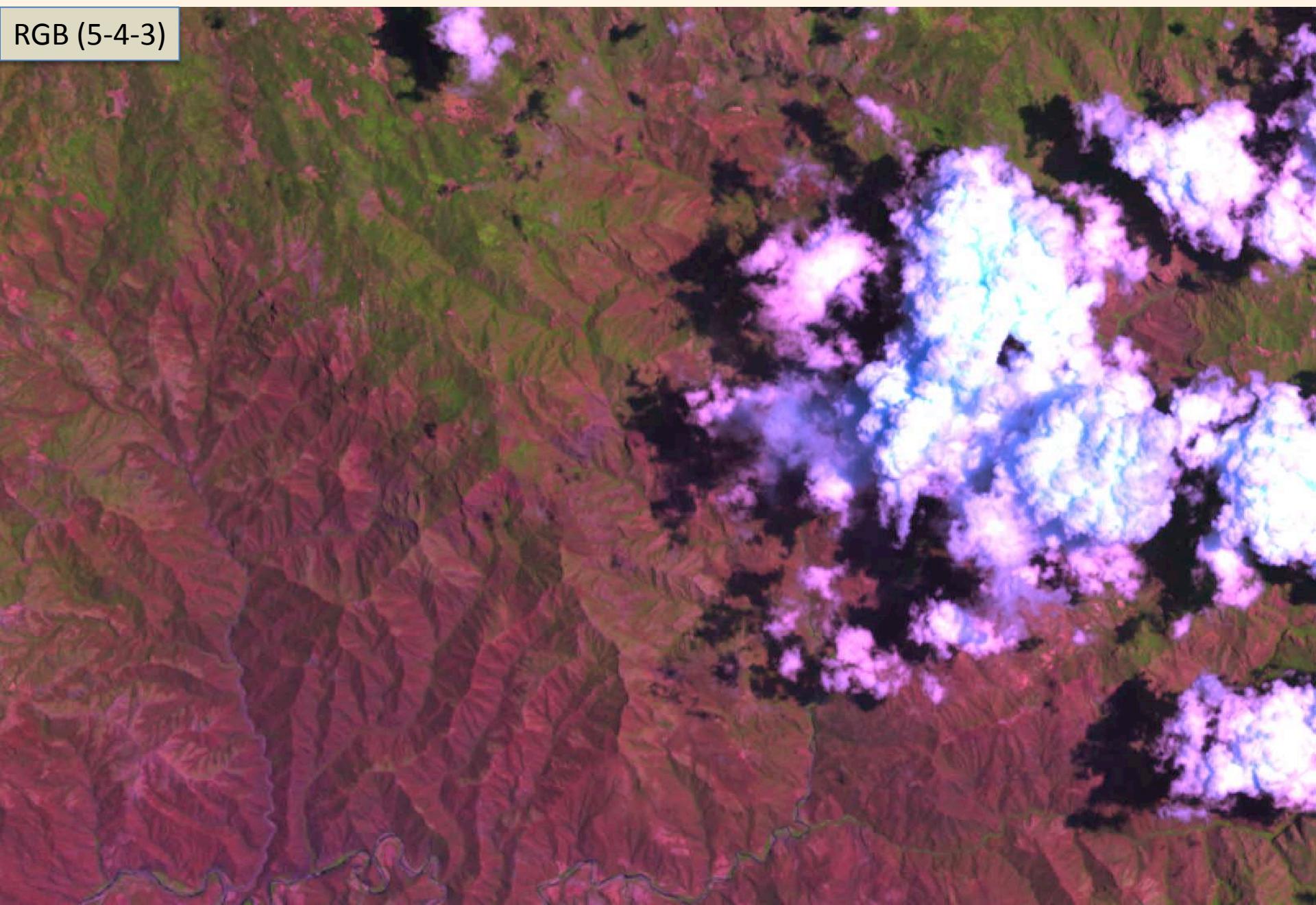
exp38



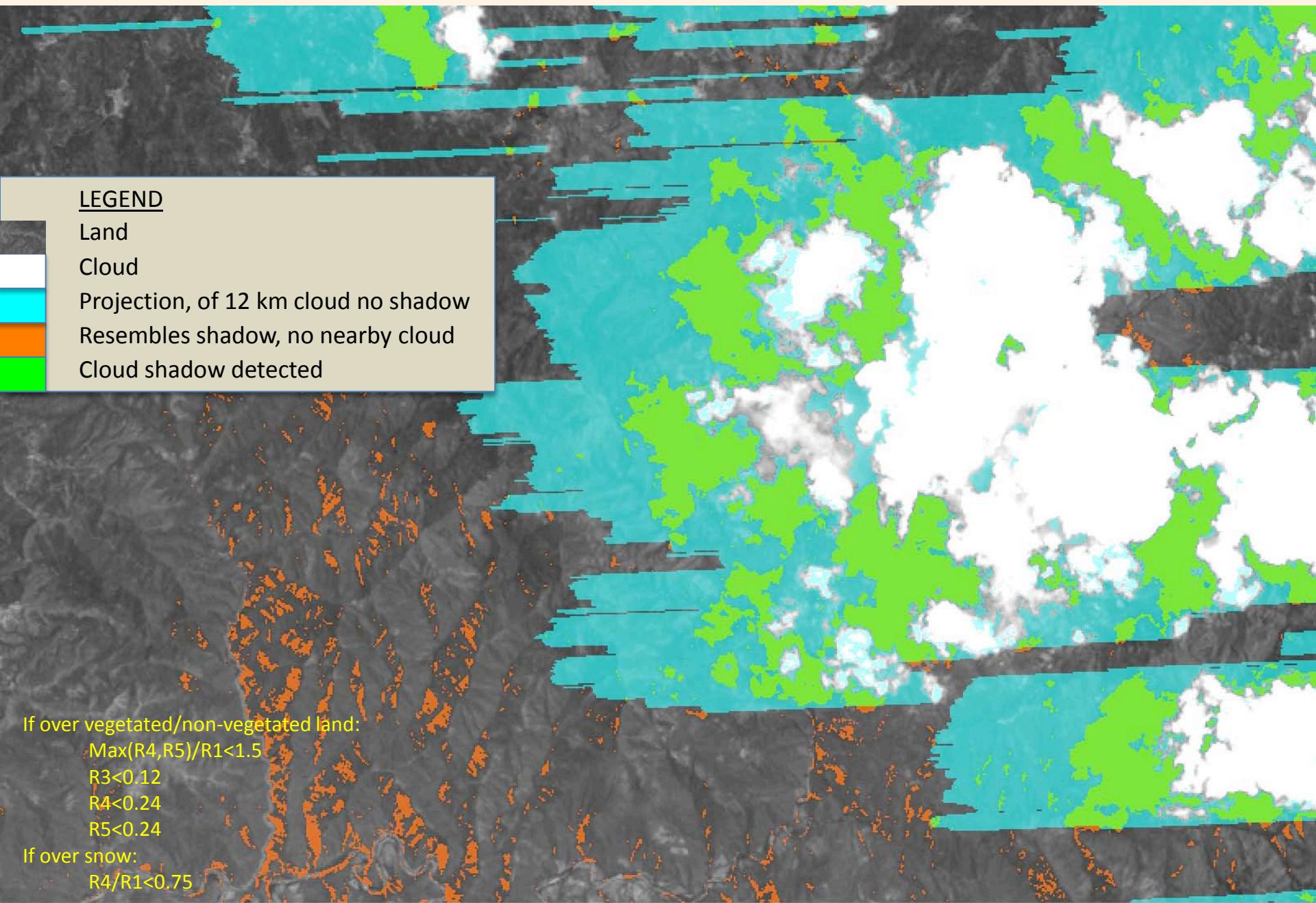


Subtropical North, Path 31, Row 43

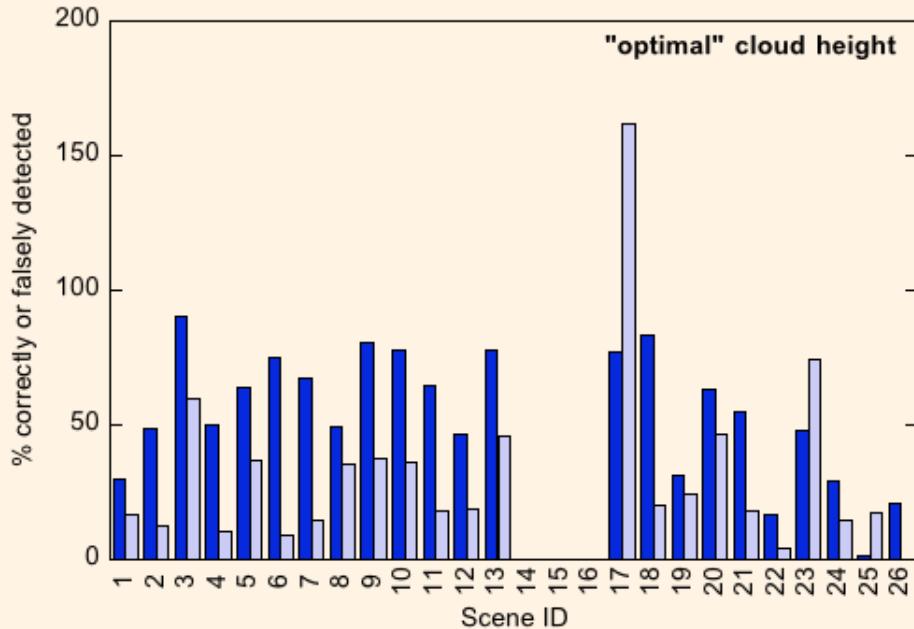
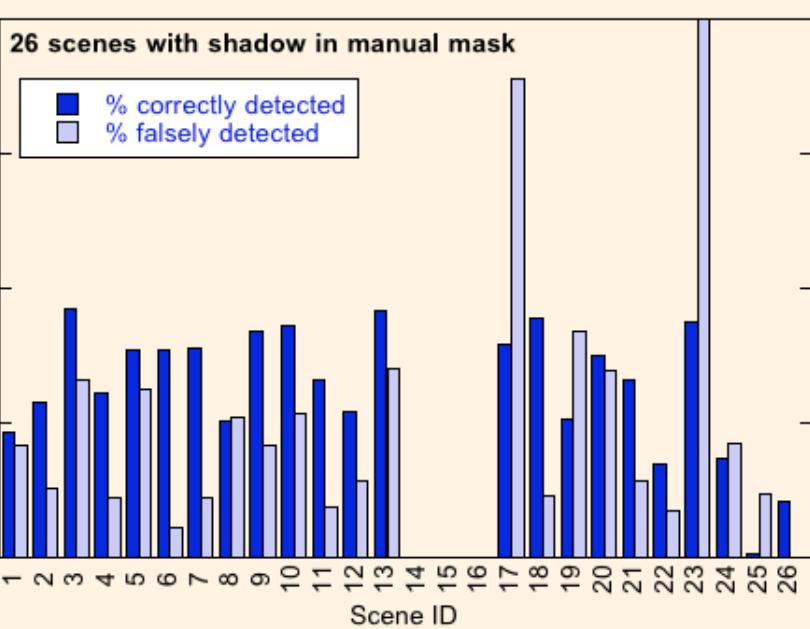
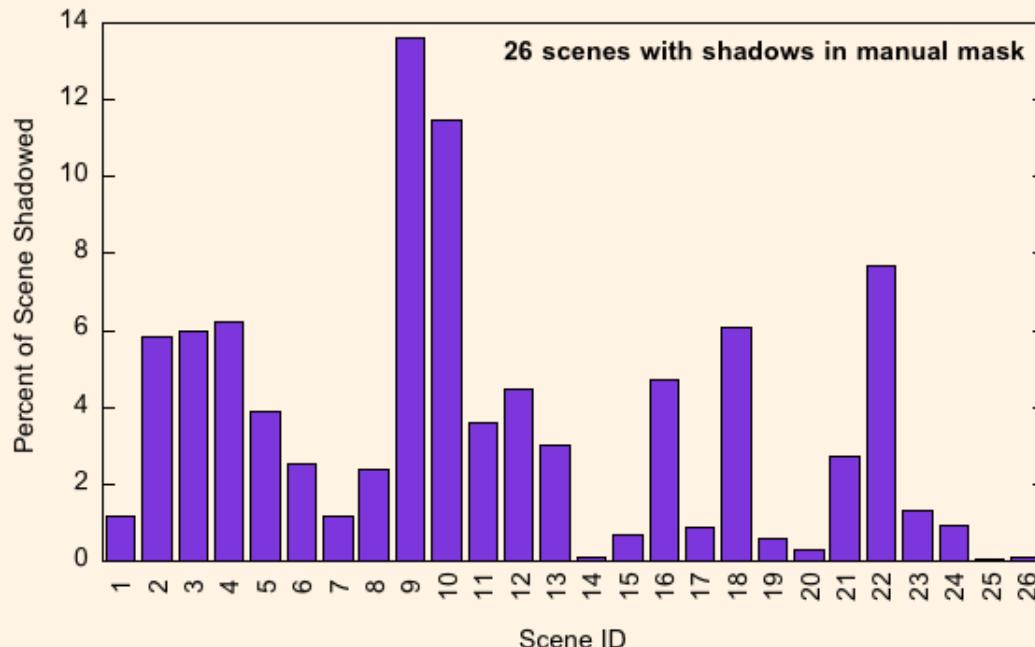
RGB (5-4-3)



Subtropical North, Path 31, Row 43

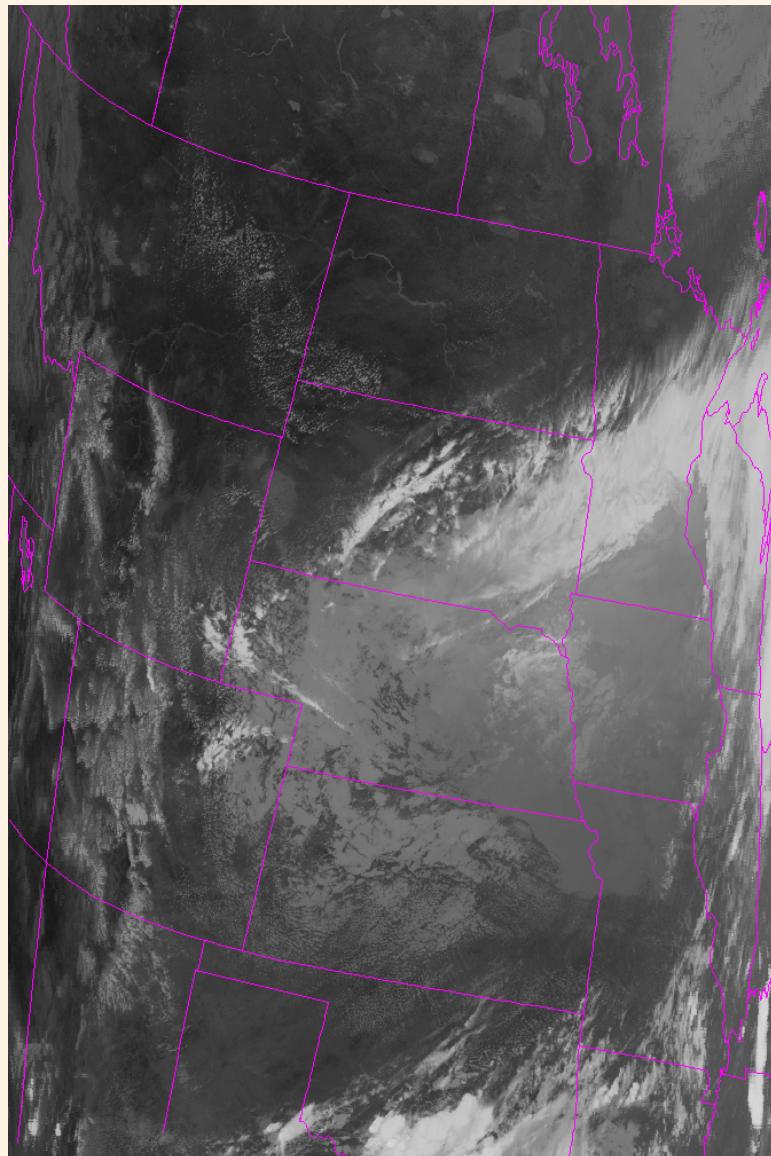


Shadow performance

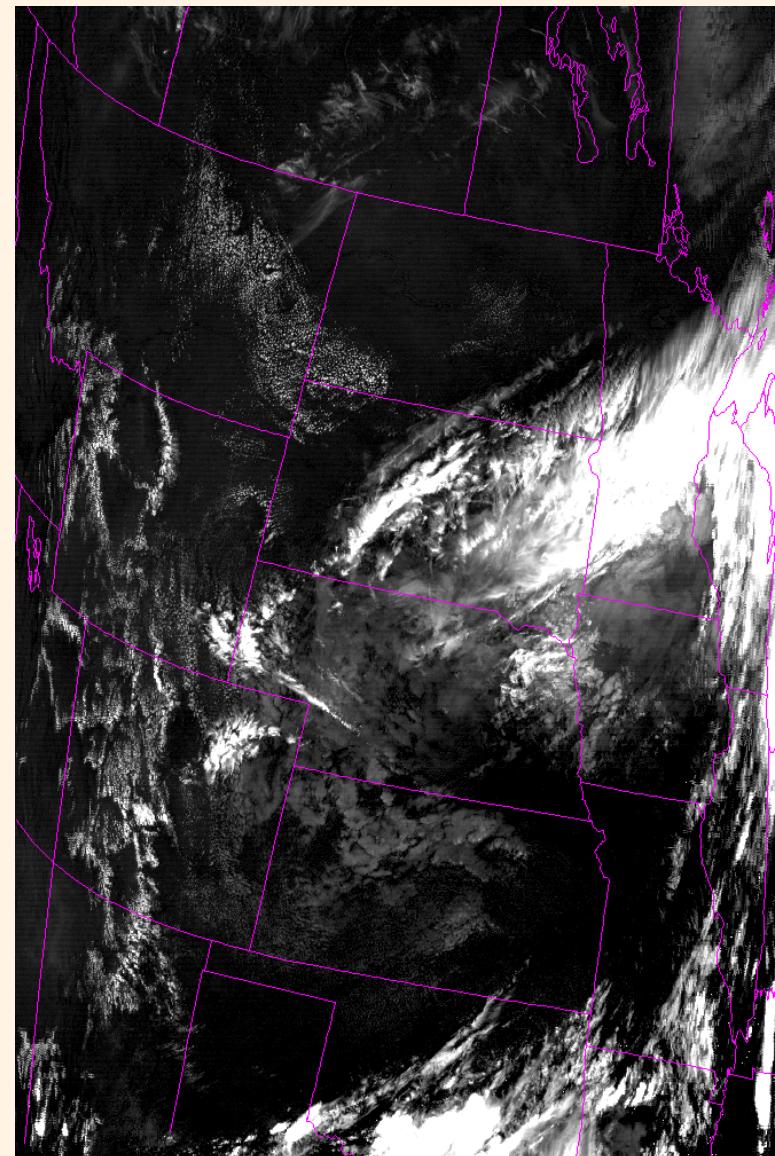


Split window cloud detection

MODIS 2006240 19:45 UTC (courtesy of R. Frey)

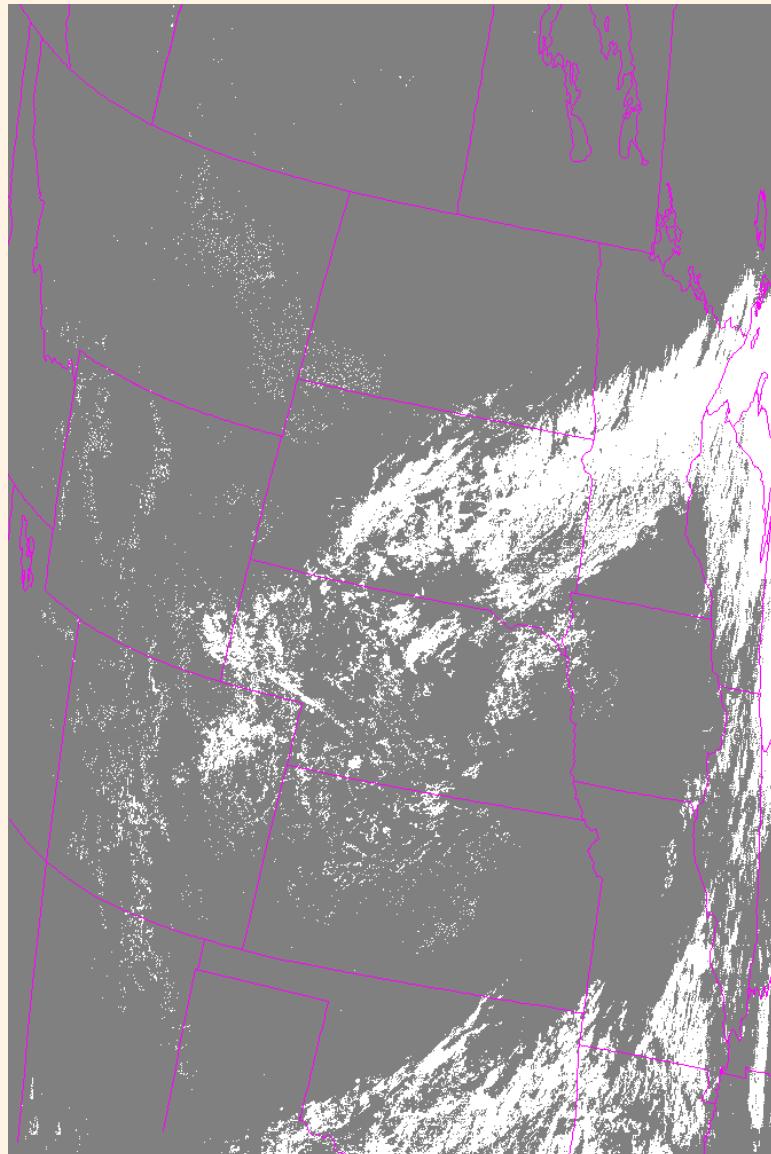


Band 31 (11.1 μ m)

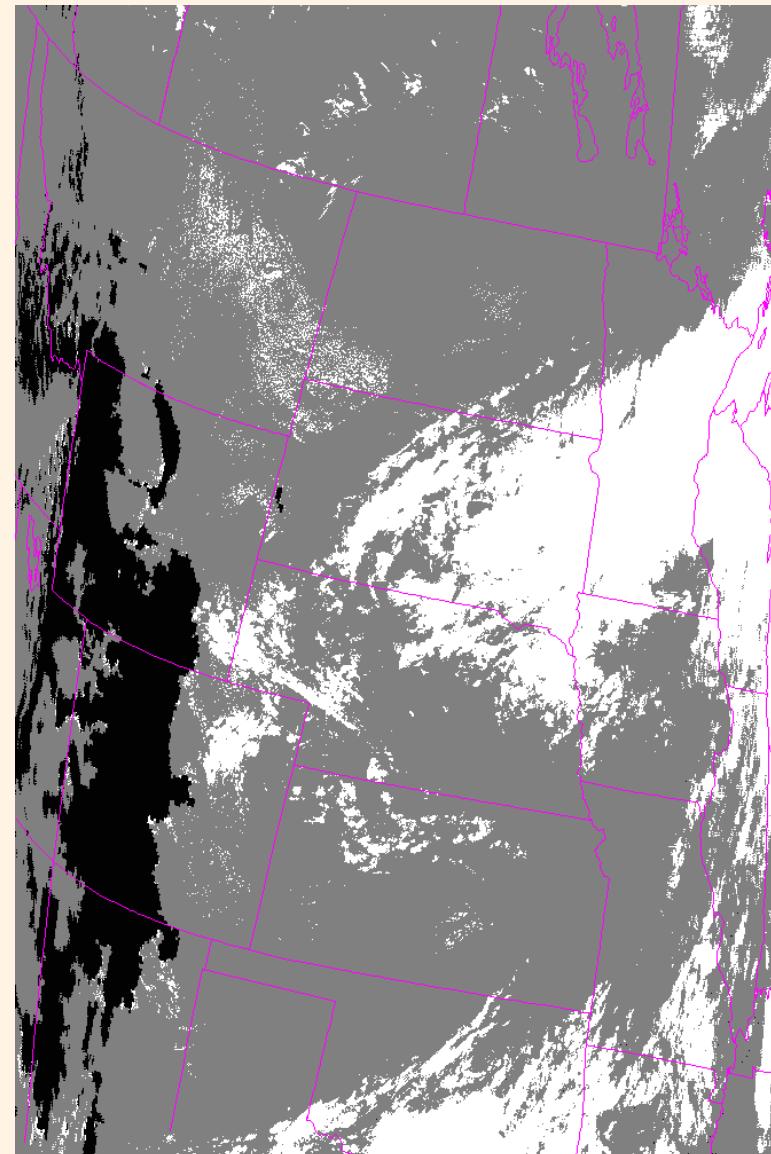


Band 26 (1.38 μ m)

MODIS 2006240 19:45 UTC (courtesy of R. Frey)



Split-window Test



1.38 μm Ref. Test
(black means test not performed)

Simulations

Clear Sky BTD45 and Thresholds

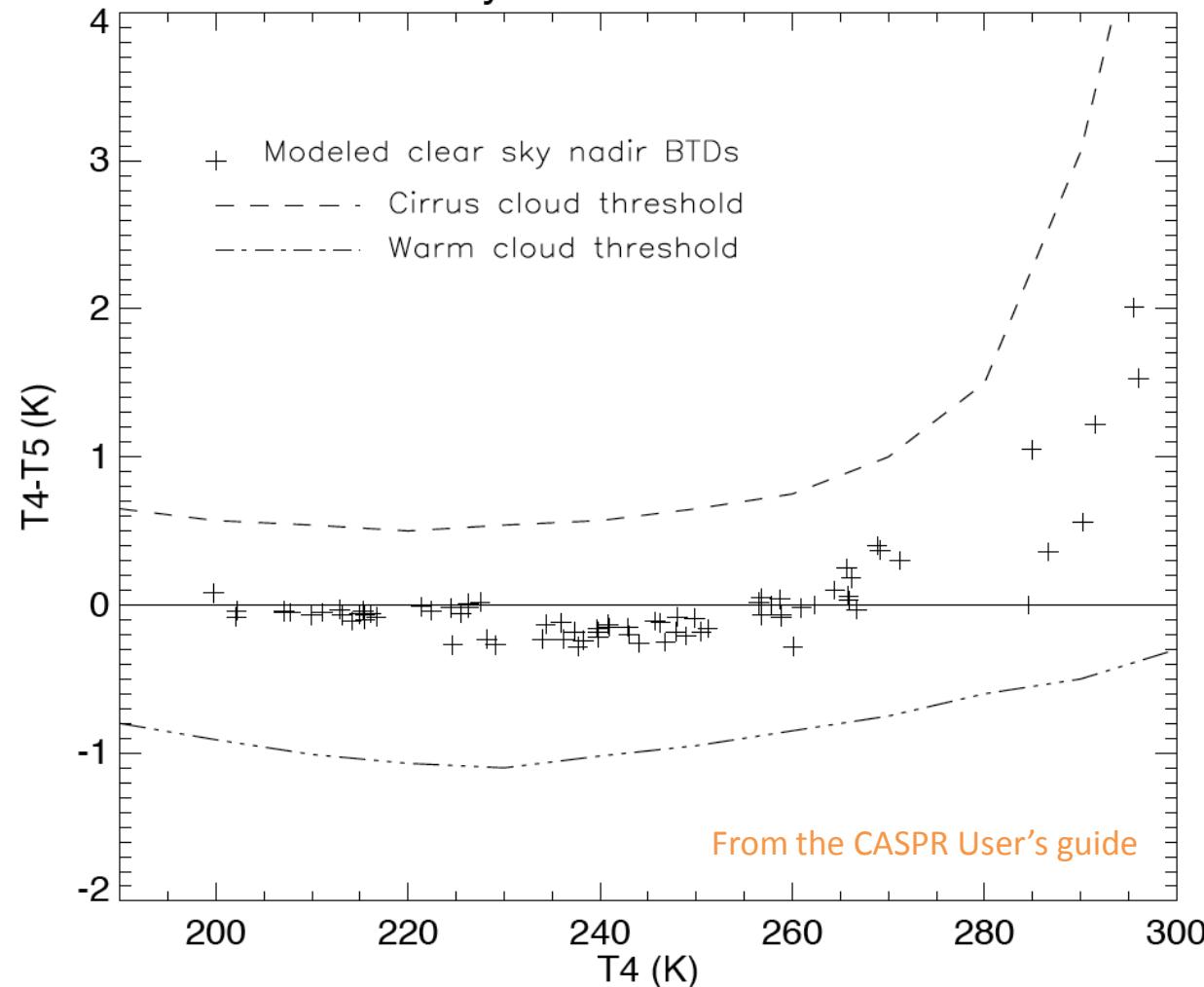


Figure 6. Modeled (*Streamer*) clear sky brightness temperature differences (plus signs) the the cirrus and warm cloud test thresholds (dashed and solid lines, respectively).