Lessons Learned about Satellite and Airborne Radar for Biomass Monitoring and Land Cover Change

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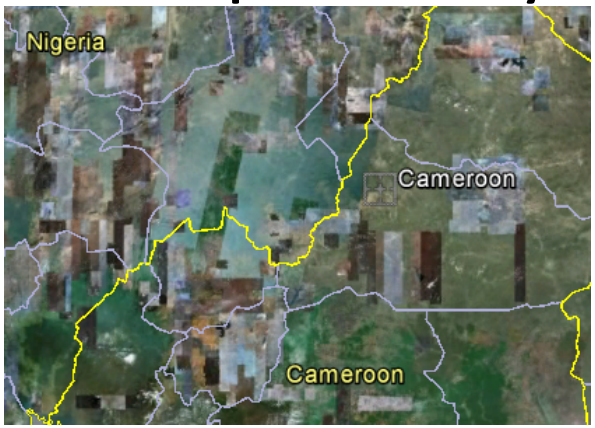
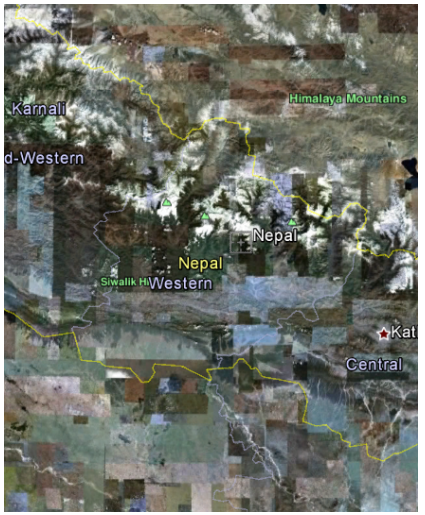
CRC AUSTRALIA

International Forest Carbon Initiative (IFCI)

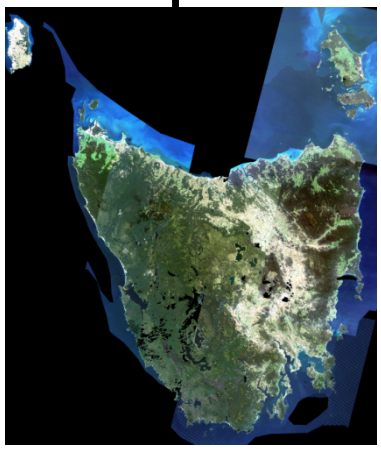
- GEO FCT – Group on Earth Observations Forest Carbon Tracking task
- Series of themed 'National Demonstrators' to
- Tasmania theme – sensor interoperability



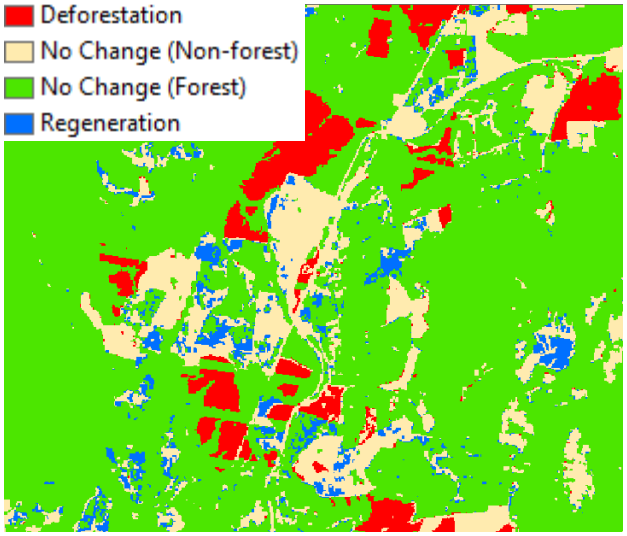


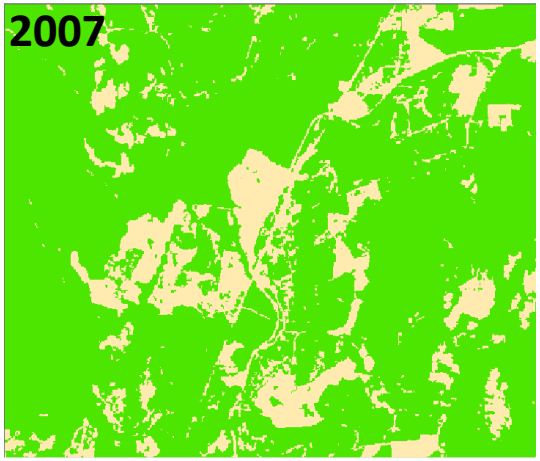
National Carbon Accounting System (NCAS) -- Australia

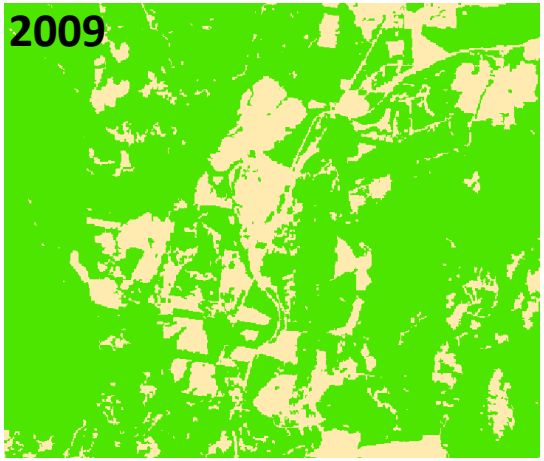
- Optical (Landsat) Time Series 1972-2010



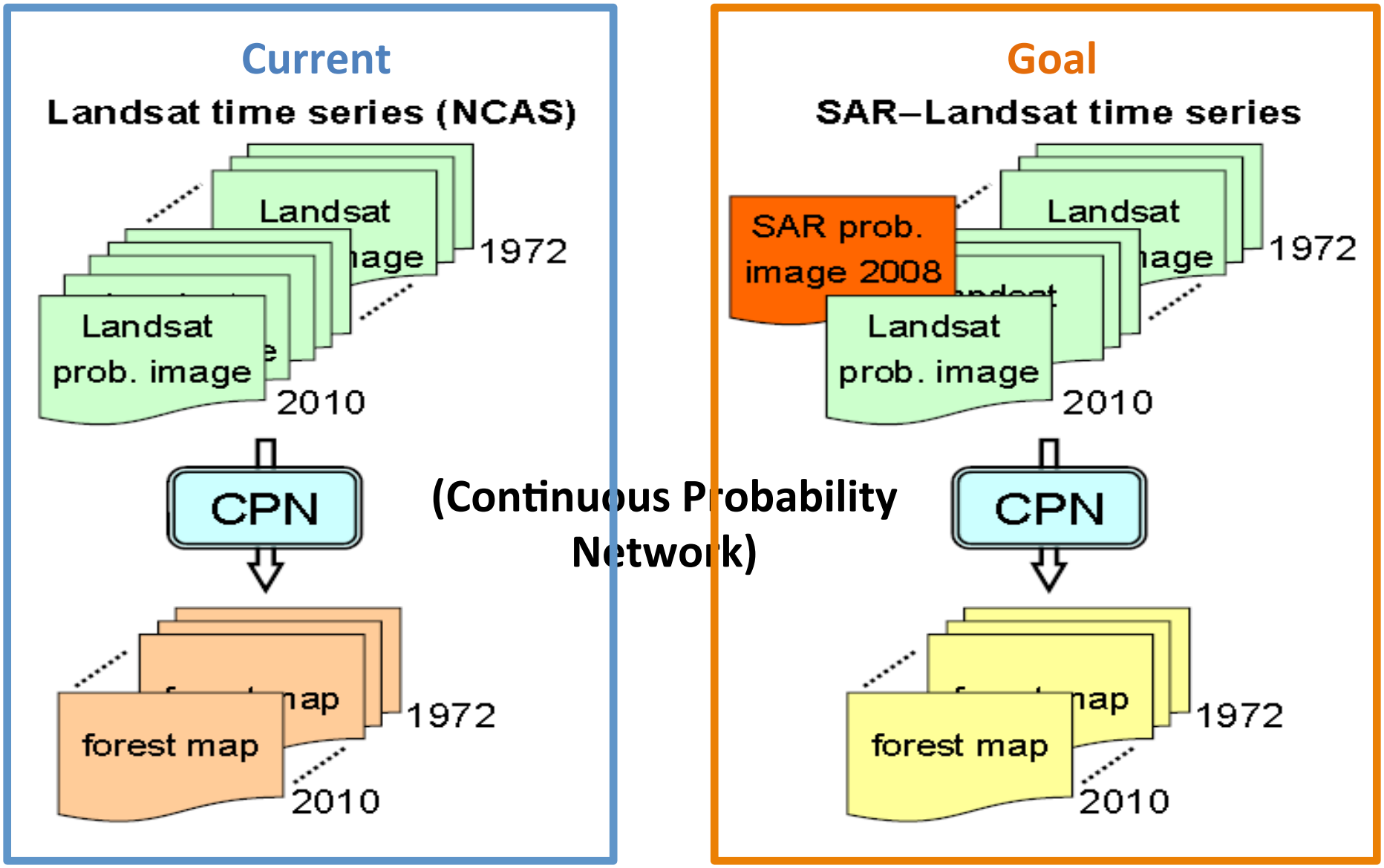
Forest/Non-forest



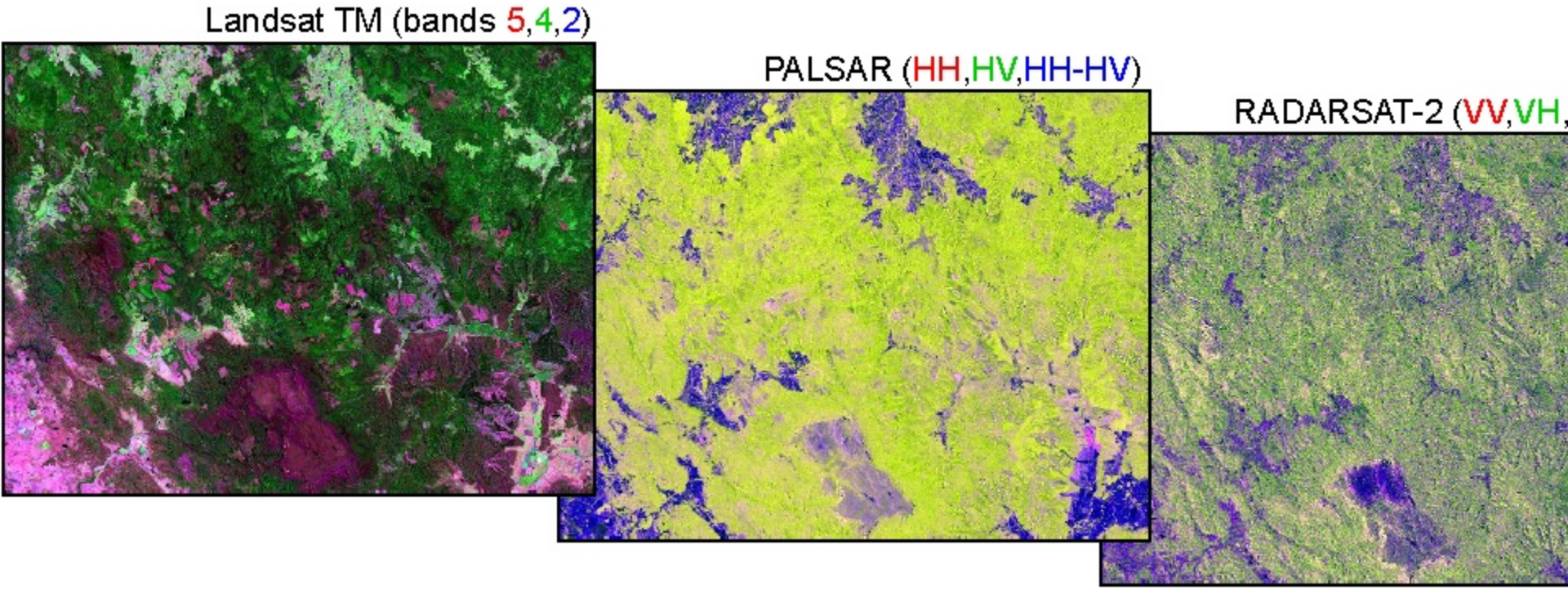




Interoperability

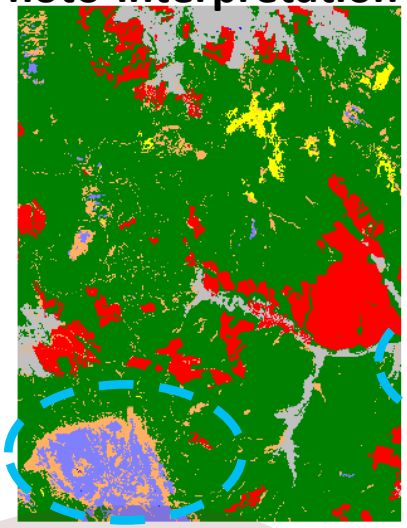


Sensors “see” the landscape differently and processing is different…

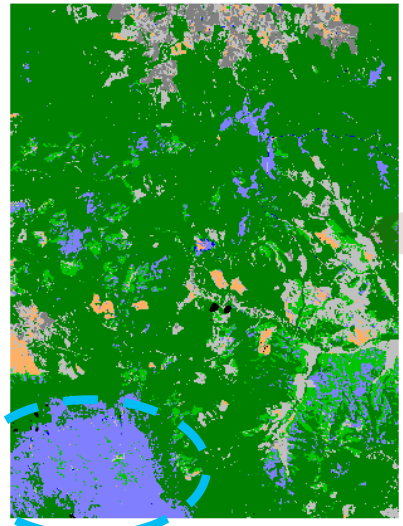


... so classifications are different

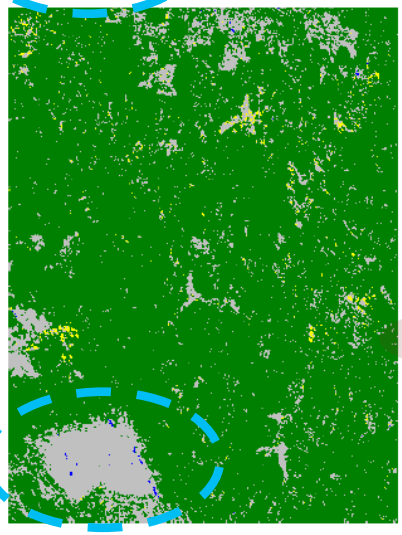
Photo-interpretation



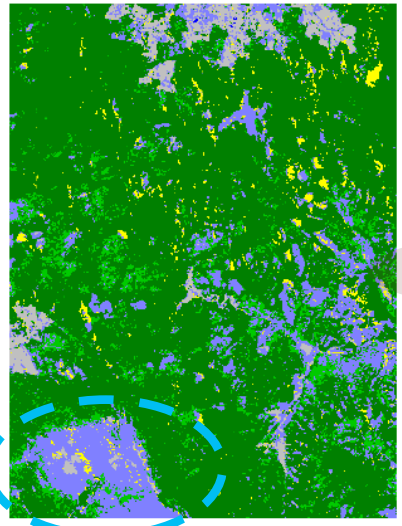
TASVEG
- forest
- plantation
- agriculture
- Buttongrass
- water
- alpine veg.
- other NF



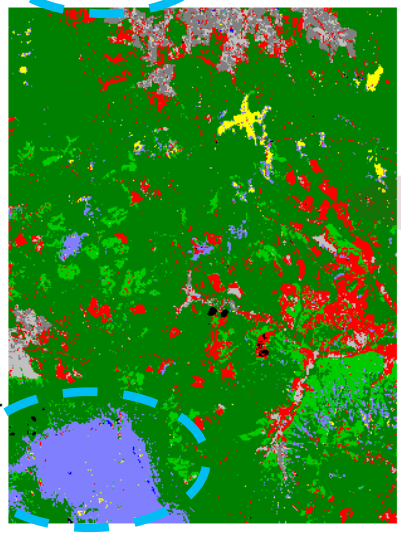
Landsat TM
- dense forest
- sparse forest
- water
- agric. crops
- agric. + plant.
- alpine + B.grass
- bare



RADARSAT C-band
- forest + imm. plant.
- water
- Buttongrass
- non-forest



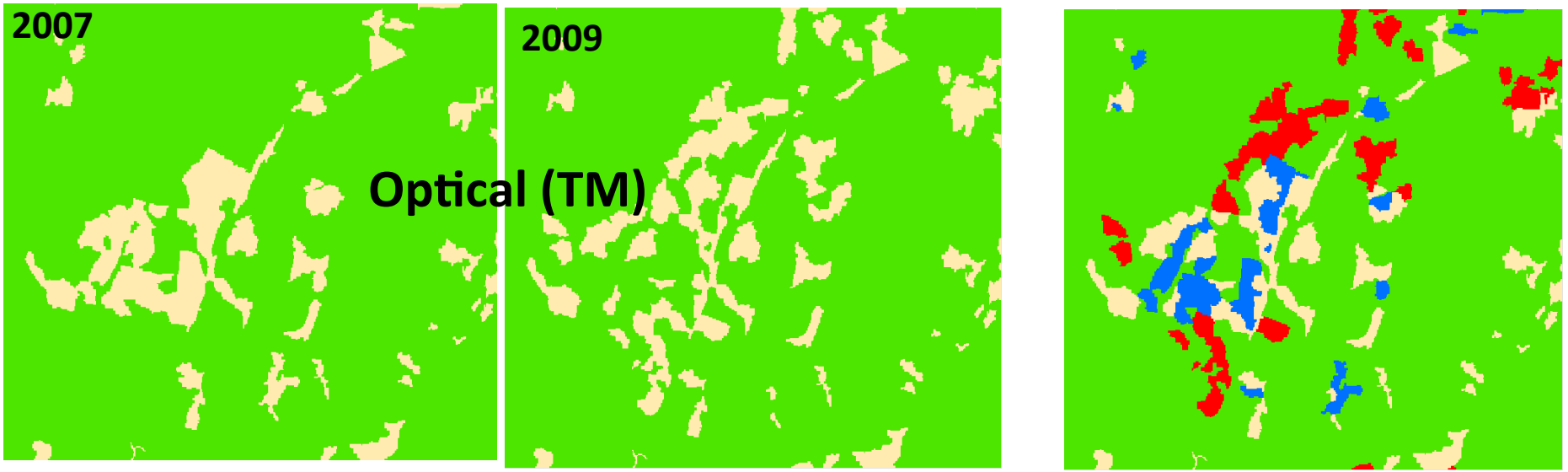
PALSAR L-band
- dense forest
- dense + sparse F
- water
- agriculture
- Buttongrass
- alpine + imm. plant.

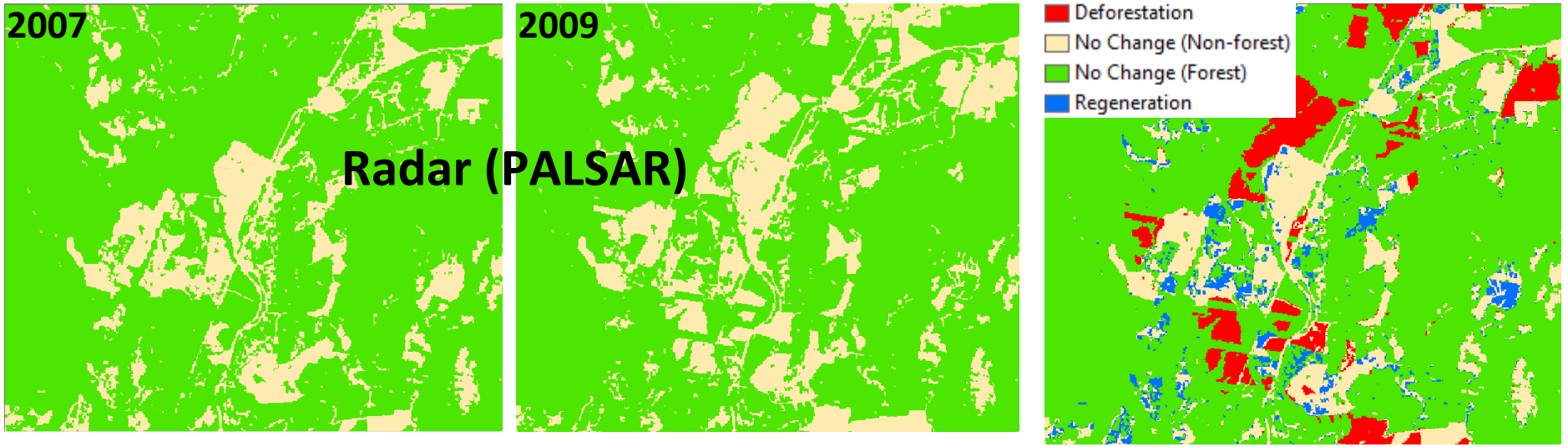


Combination

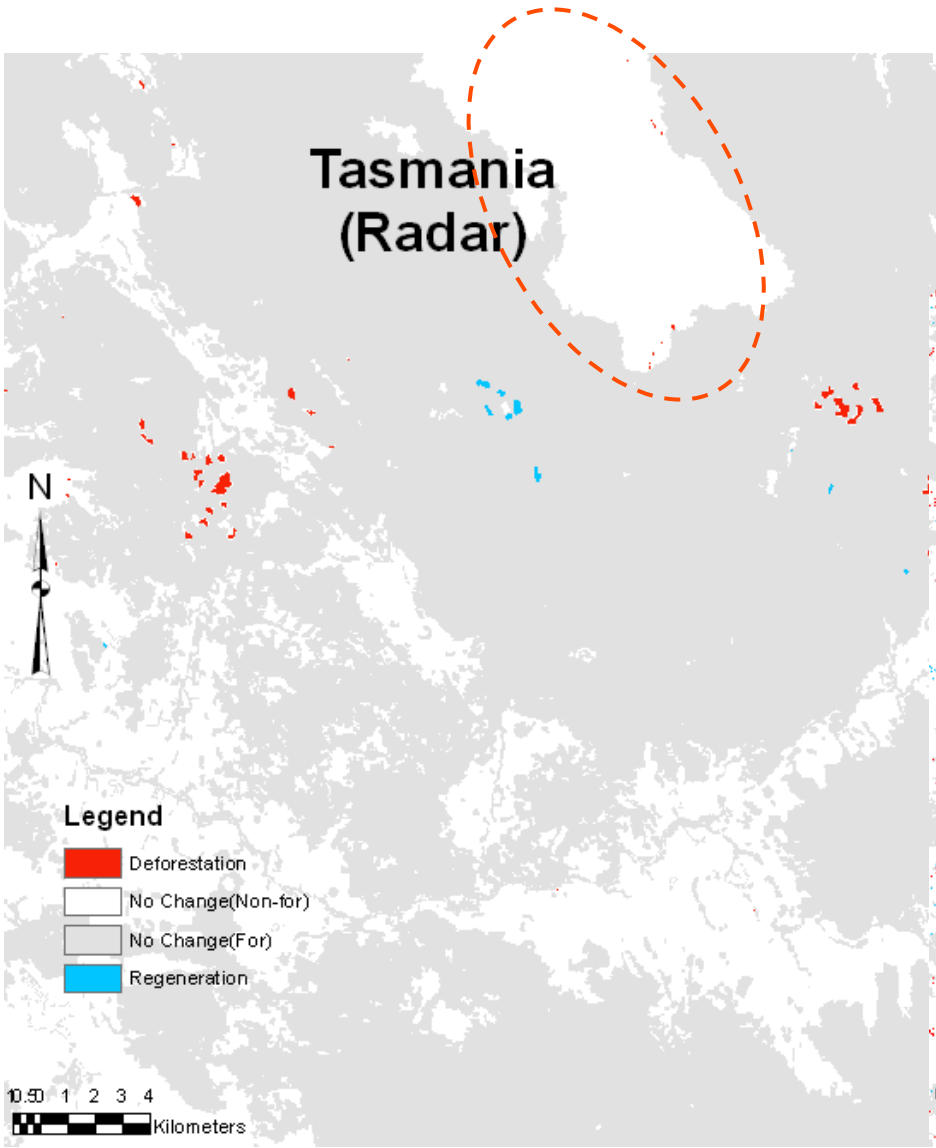
SAR-optical data
- dense forest
- sparse forest
- water
- agric. crops
- imm. plant.
- Buttongrass
- alpine veg.
- bare

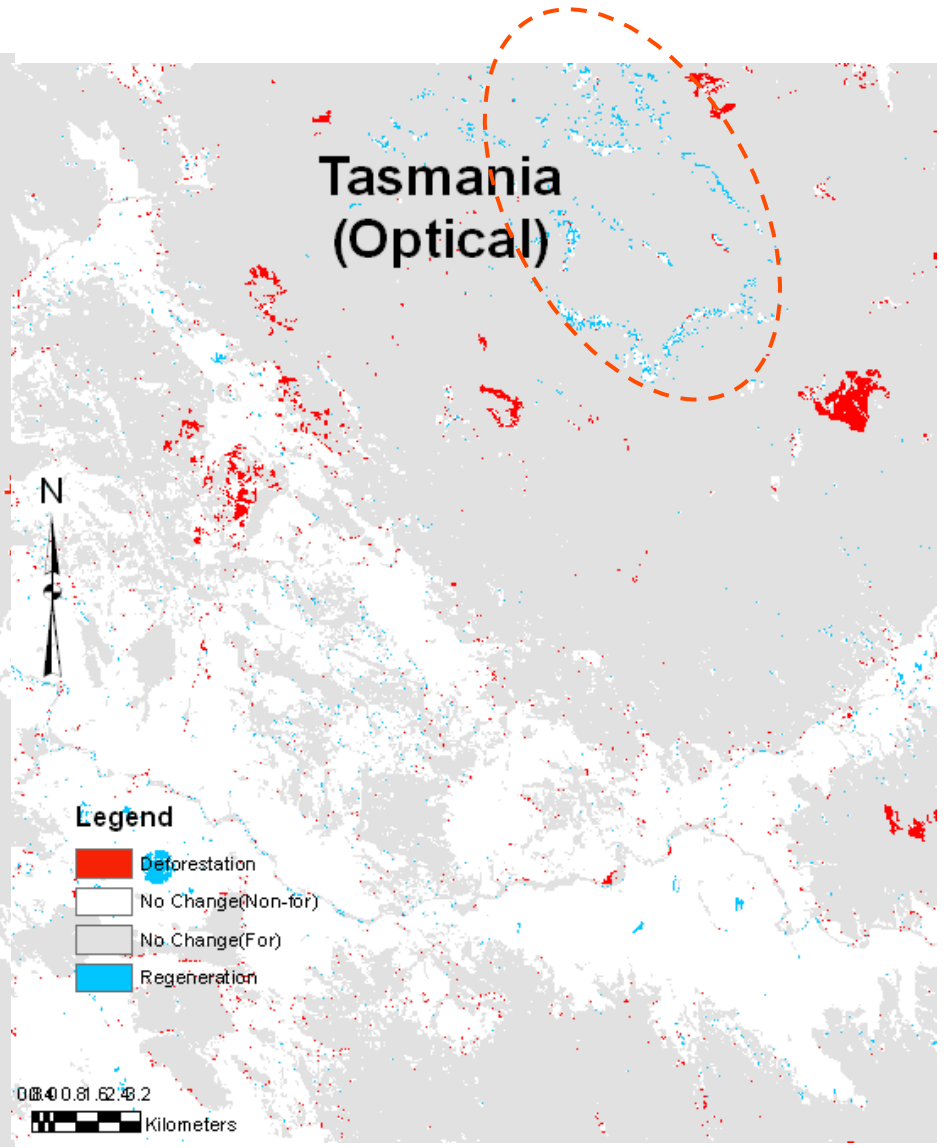
Change maps are different



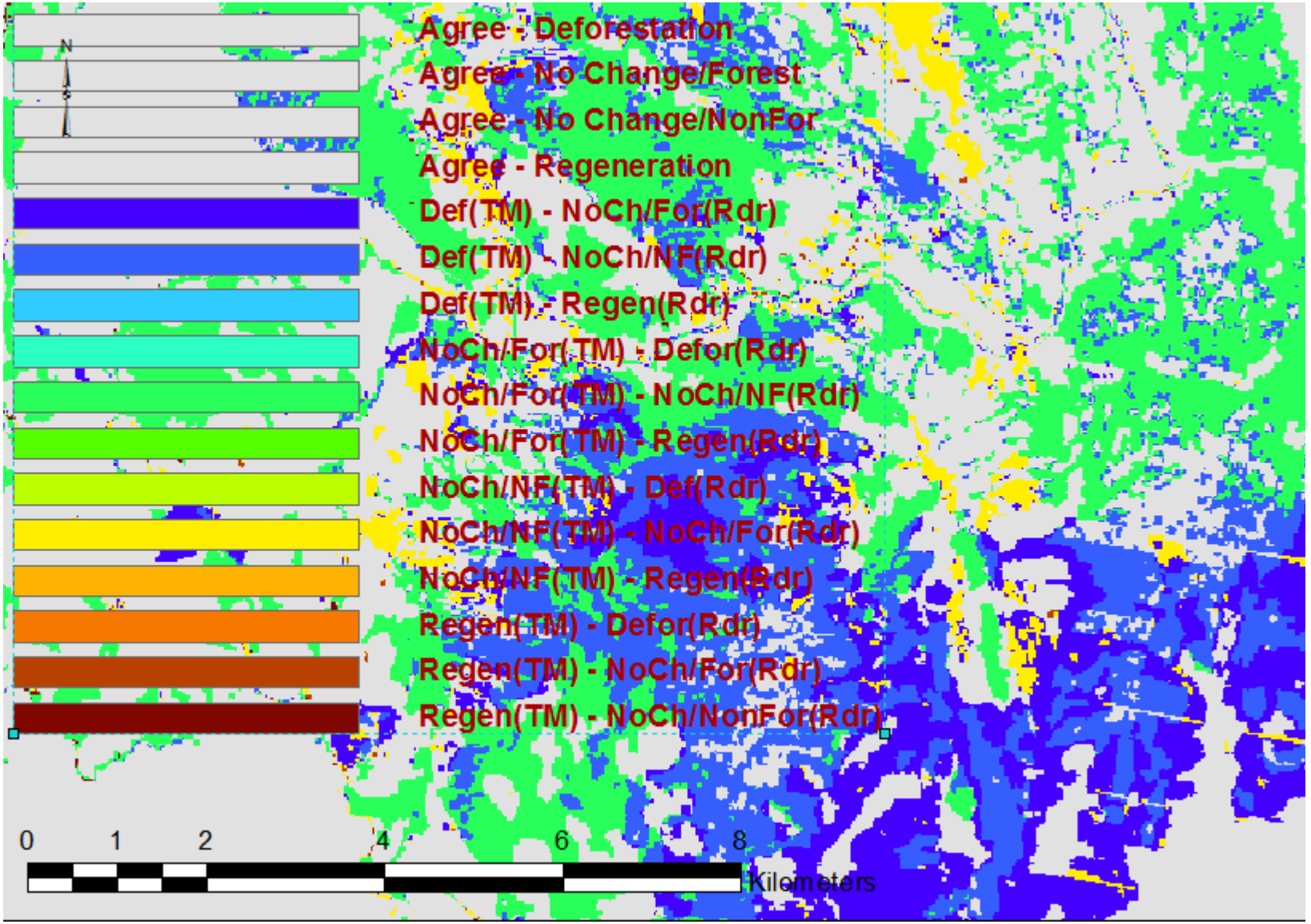


Or are they…?

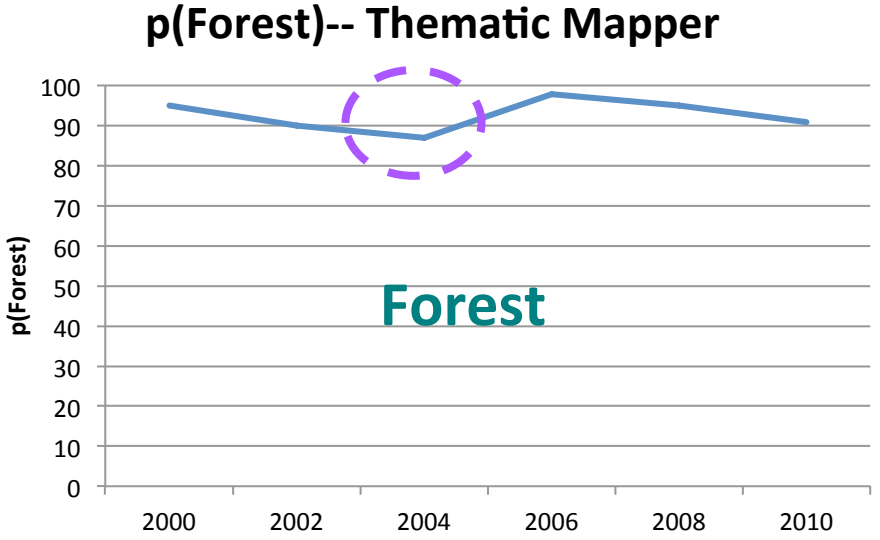

Tasmania
(Radar)
N
Legend
Deforestation
No Change(Non-for)
No Change(For)
Regeneration
Kilometers

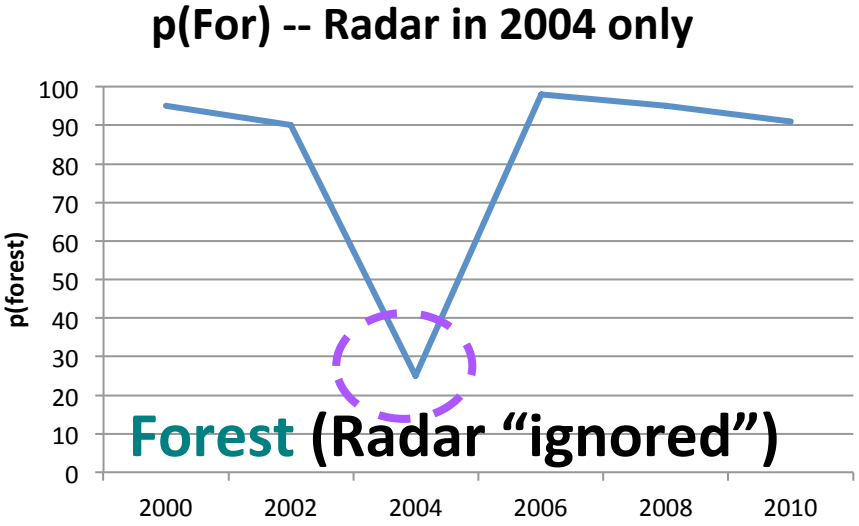

Tasmania
(Optical)
N
Legend
Deforestation
No Change(Non-for)
No Change(For)
Regeneration
Kilometers

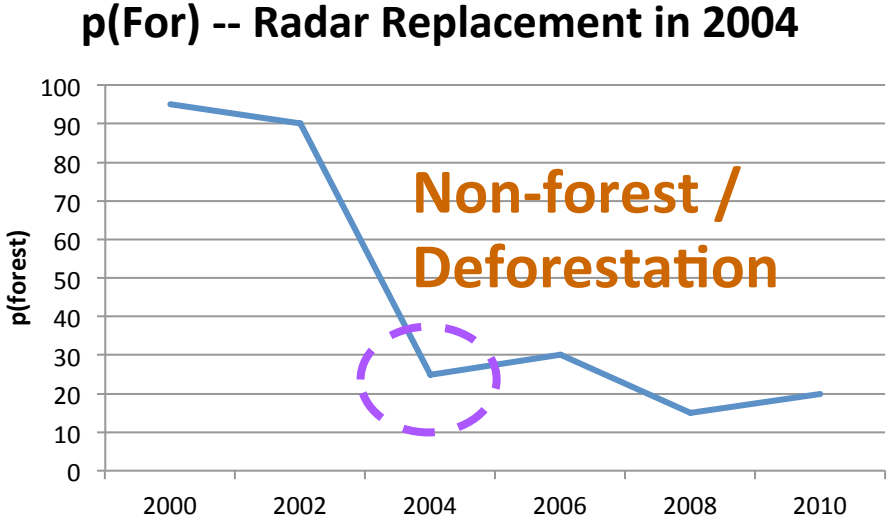
Example: Gray ***not*** different

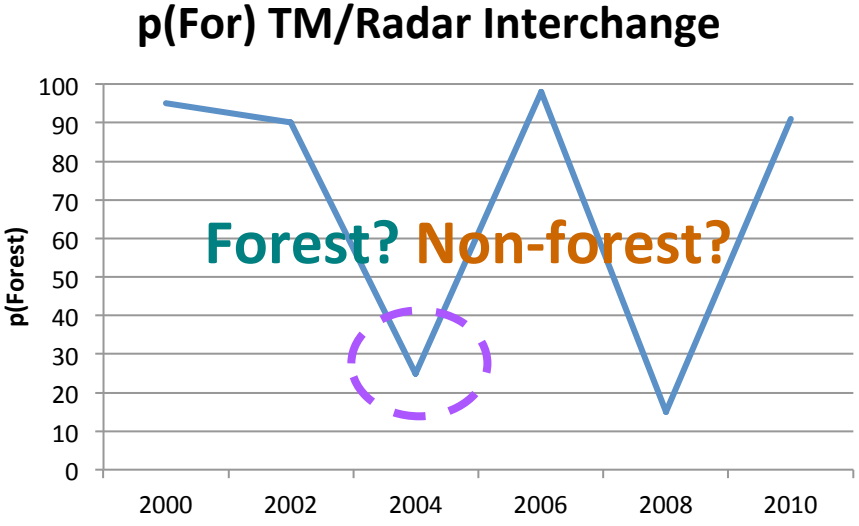


CPN Interoperability Classification Scenarios – 2004 conclusion









Complication: There is no absolute truth for calibration → Forest (20% cover)?

Worse for change maps + multi-temporal data

Interoperability + Combining

	TM only	PALSAR only	TM+PALSAR
OUTPUTS Year	Forest (%)	Forest (%)	Forest (%)
2007	68.01	62.55 !!!!	62.52
2008	66.94	62.19	63.52
2009	66.49	61.96	63.27
2010	66.3	61.76	63.41
Change estimates (%)		ates (%)	ates (%)
2007 to 2008	-1.08	-0.36 3X!!!	1.0
2008 to 2009	-0.45	-0.23 2X!!!	-0.25
2009 to 2010	-0.2	-0.2	0.14

Forest Increase!!!

Conclusions

- Optical and radar are not (cannot be made?) interchangeable
- For carbon accounting, one might be able to replace the other
- May require non-image solution
  - Example, radar replaces TM in 2010
  - Radar and TM processed in 2010
  - Relative difference used to “back-correct” prior to 2010
  - Radar continues to be used