Sentinel-3 SLSTR Active Fire Detection & FRP

Martin J. Wooster[1,2], Weidong Xu[1]
Phillipe Goryl[3]

[1] Department of Geography, King's College London.
[2] National Centre for Earth Observation, [3] ESA ESRIN

Australian Fires (photographed at night from the ISS)

Sentinel-3 & SLSTR

National Centre for Earth Observation

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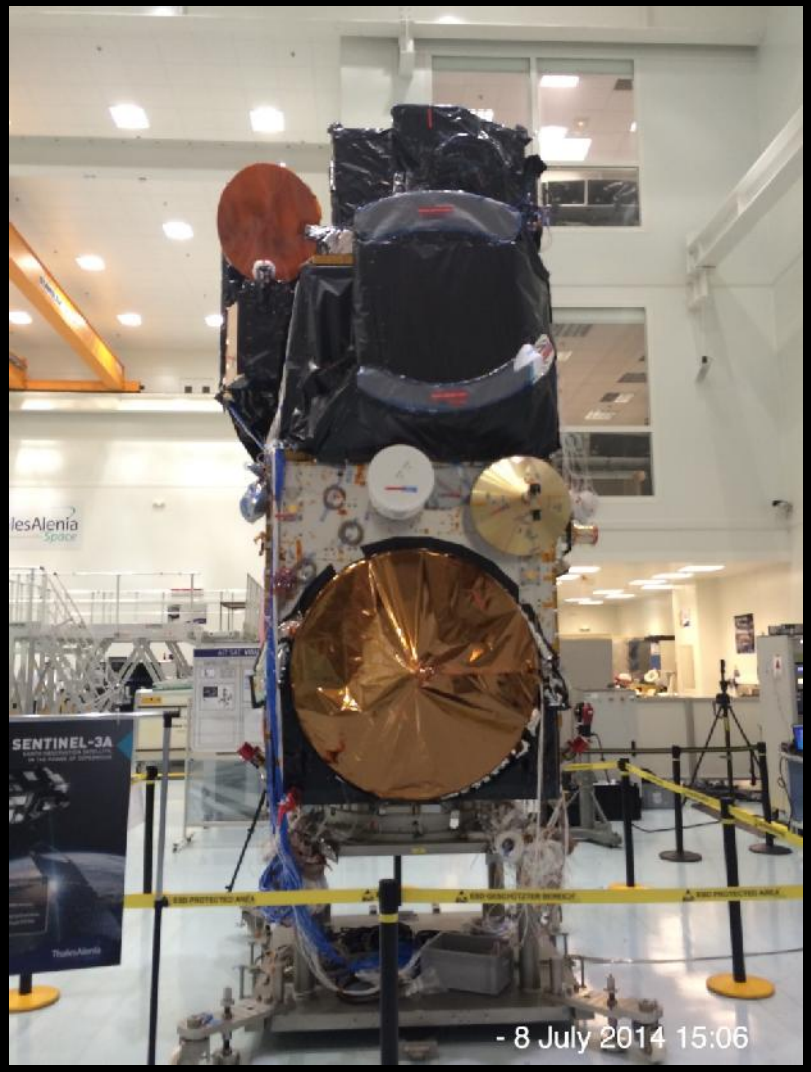

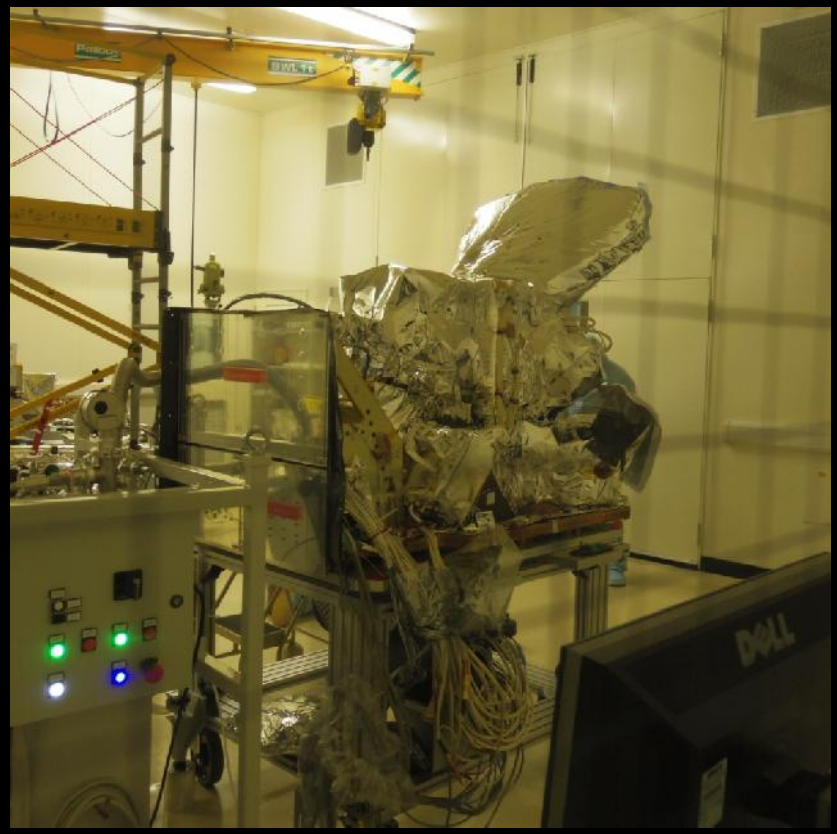


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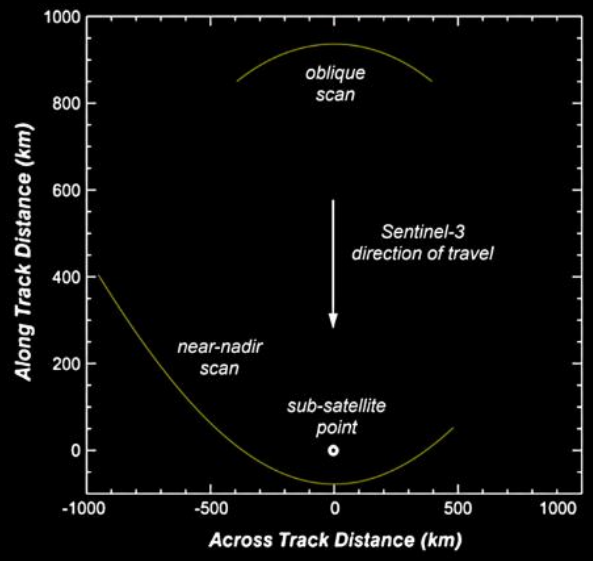
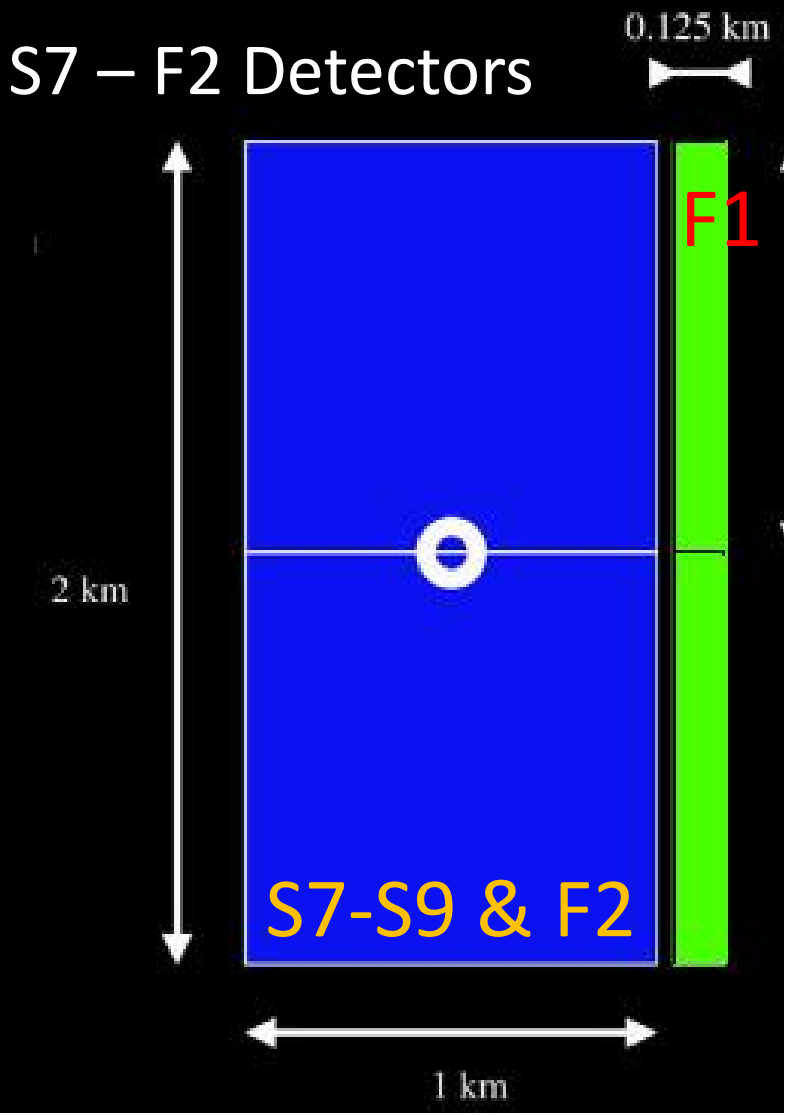
SLSTR Thermal Bands

Band	Bandwidth (µm)	Dynamic Range (K)	NeDT (mK)
S7	3.55 - 3.93	200 -323	56
S8	10.4 - 11.3	200 - 321	29
S9	11.5 - 12.5	200 - 318	21
F1	3.55 - 3.93	285 – 500	680-16
F2	10.4 - 11.3	230 - 400	79-35

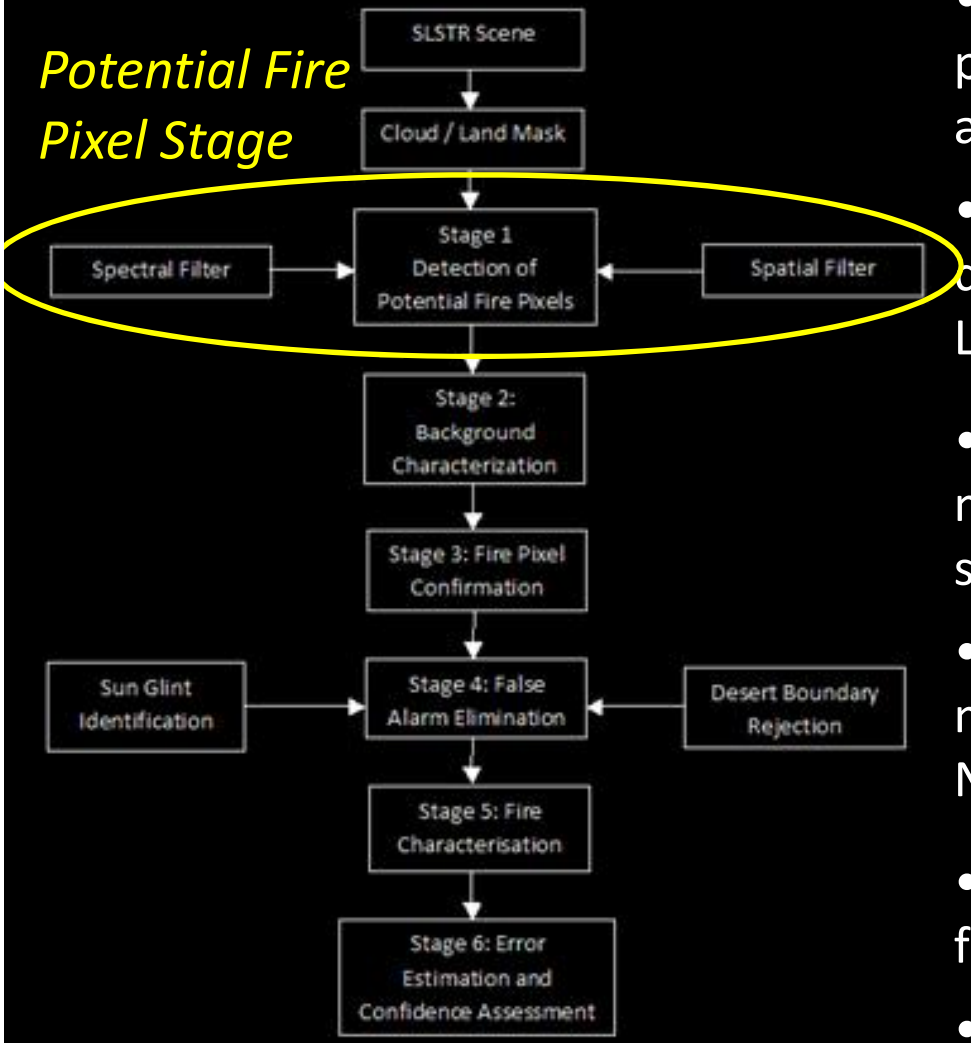


Fire product is derived from 1000 km nadir view scan

S7 – F2 Detectors

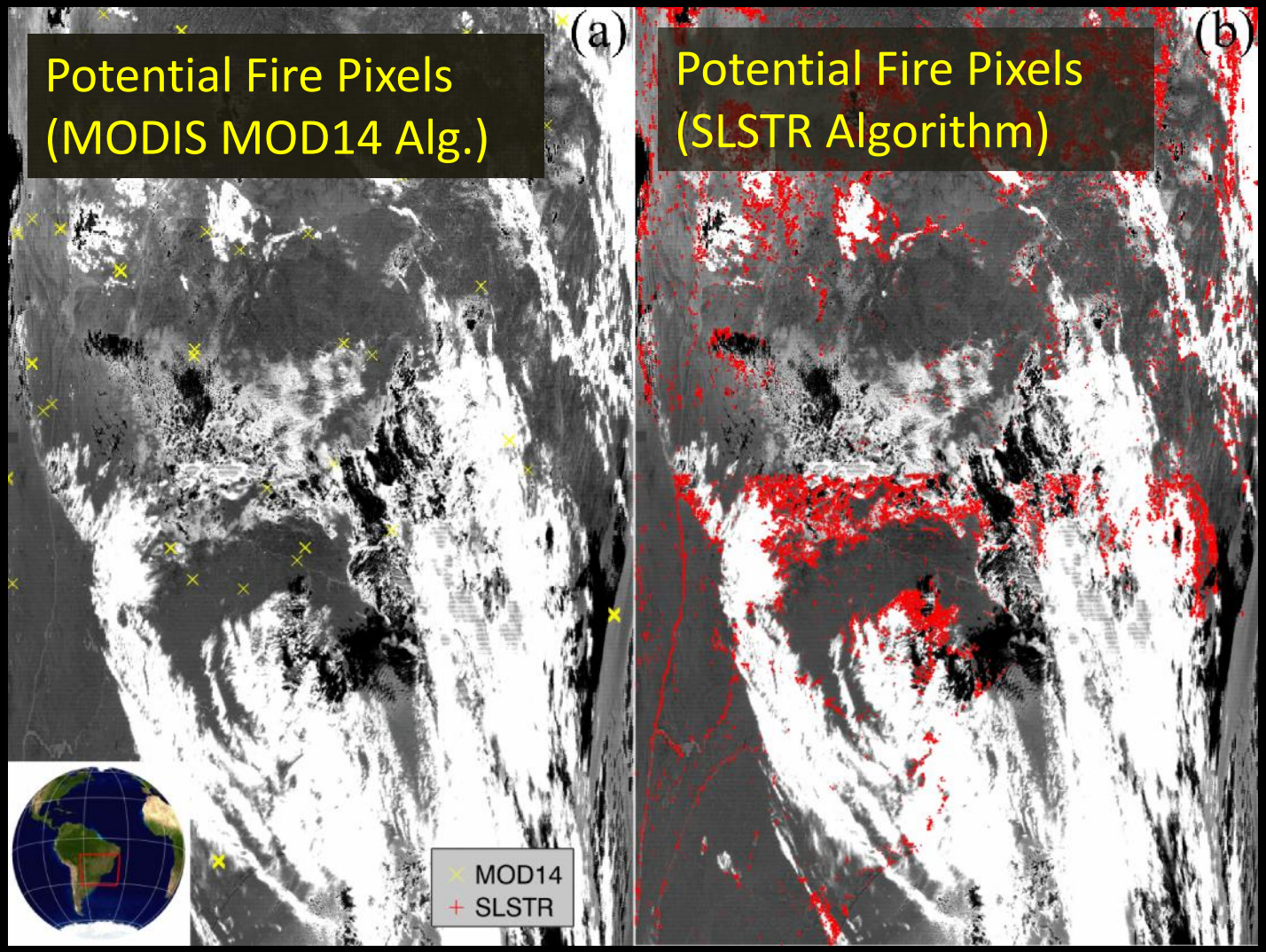


SLSTR Active Fire & FRP Alg.



- Six stages – detecting and confirming fire pixels (based on contrast with surroundings) and characterising their FRP.
- Multi-channel thresholding approach to detection – using combination of MWIR, LWIR and VIS-SWIR spectral channels.
- MWIR and LWIR signals of high BT pixels measured in F1 and F2 channels, avoiding saturation over higher FRP fires.
- MWIR and LWIR signals of low BT pixels measured in S7 and S8 channels, to get low NeDT and better sensetivity to low FRP fires.
- Dynamic thesholding, utilising high pass filter & moving window approaches.
- Relies on availability of adequate cloud mask (not smoke mask!) and water mask.

MODIS Collection Alg. 5 *vs.* SLSTR Alg.



Wooster *et al.* (2012)

MODIS Collection Alg. 5 *vs.* SLSTR Alg.

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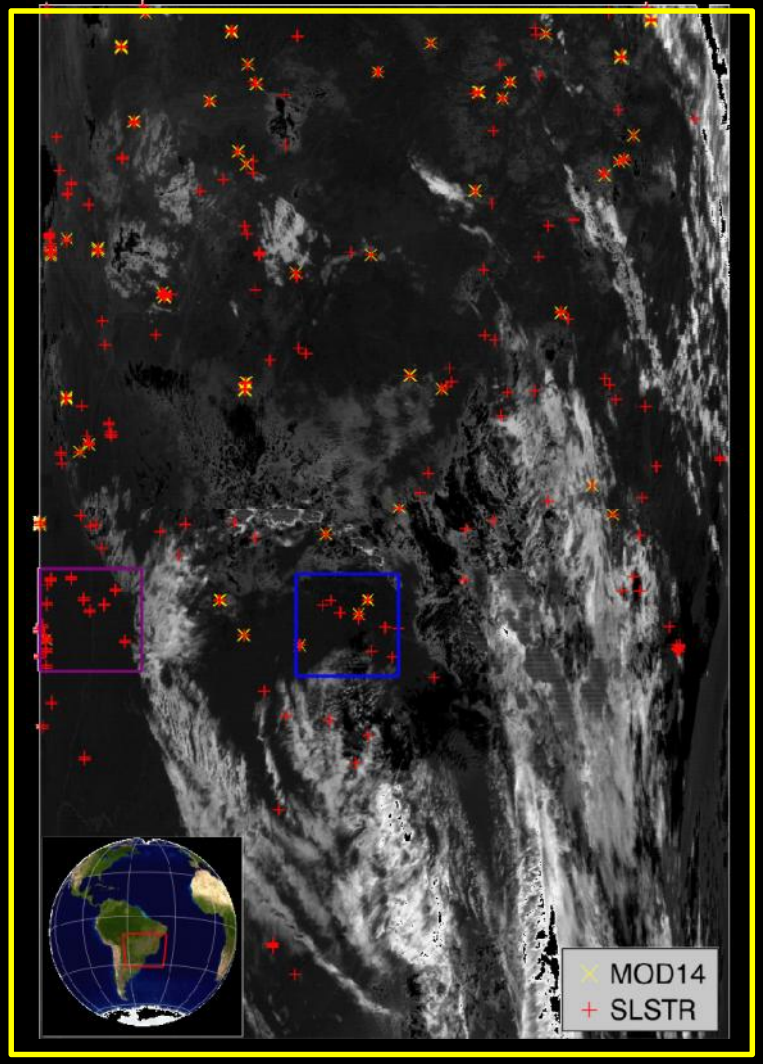
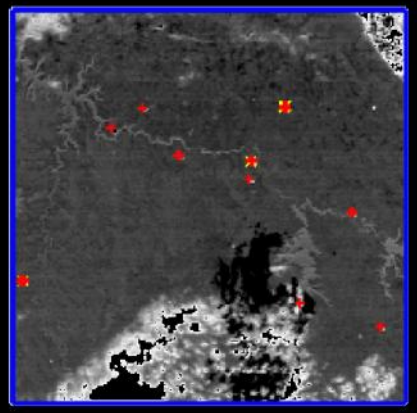
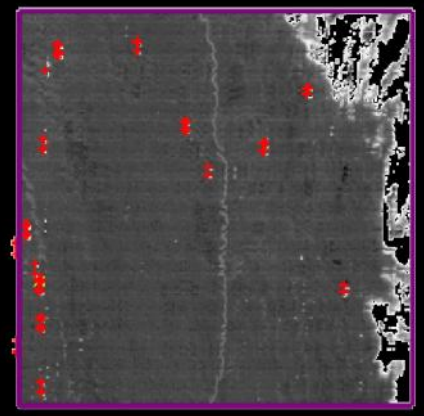


SLSTR Alg. : 432 Fire Pixels
MODIS Alg. : 100 Fire Pixels

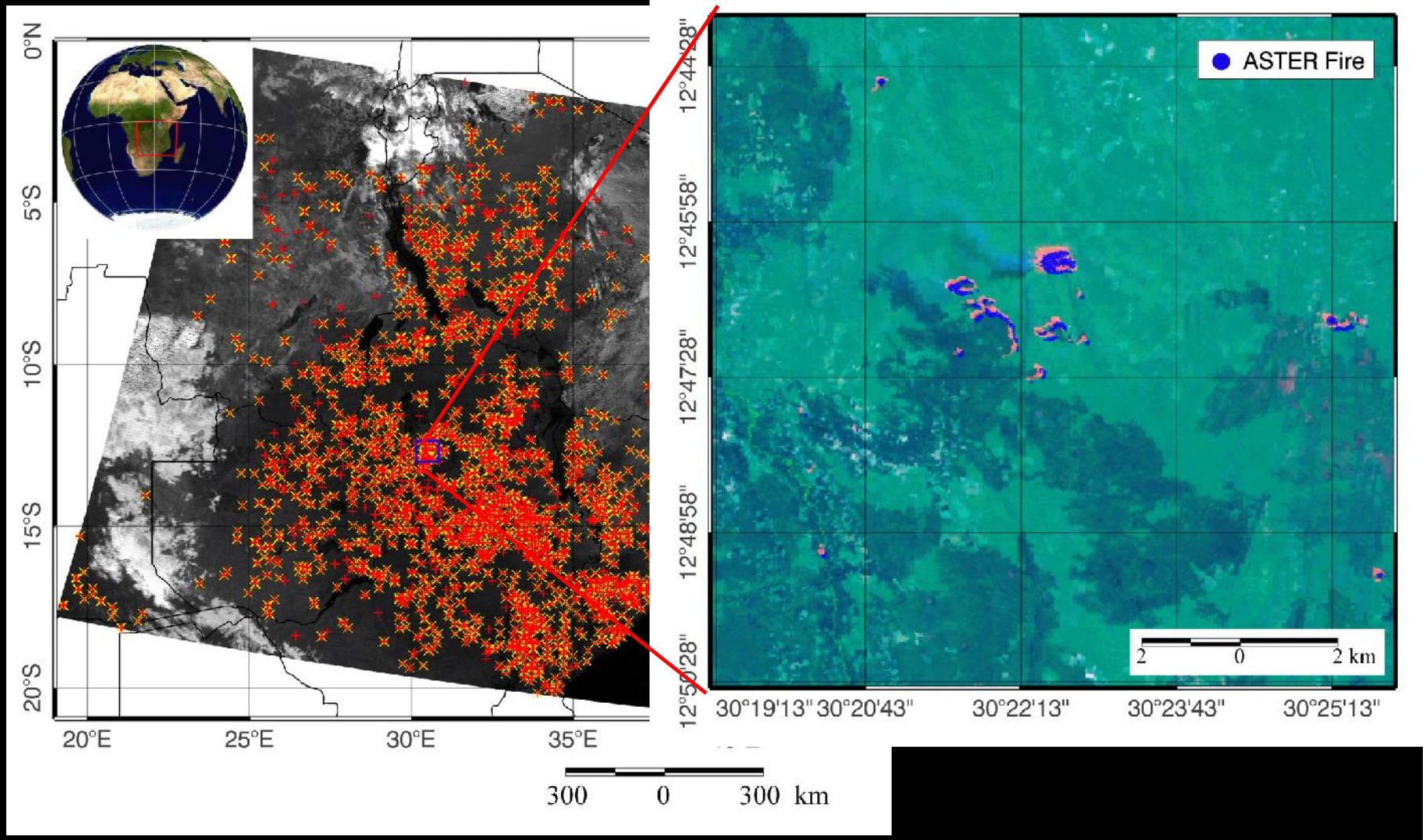


SLSTR : 10 Fire Pixels
MODIS Alg. : 3 Fire Pixels



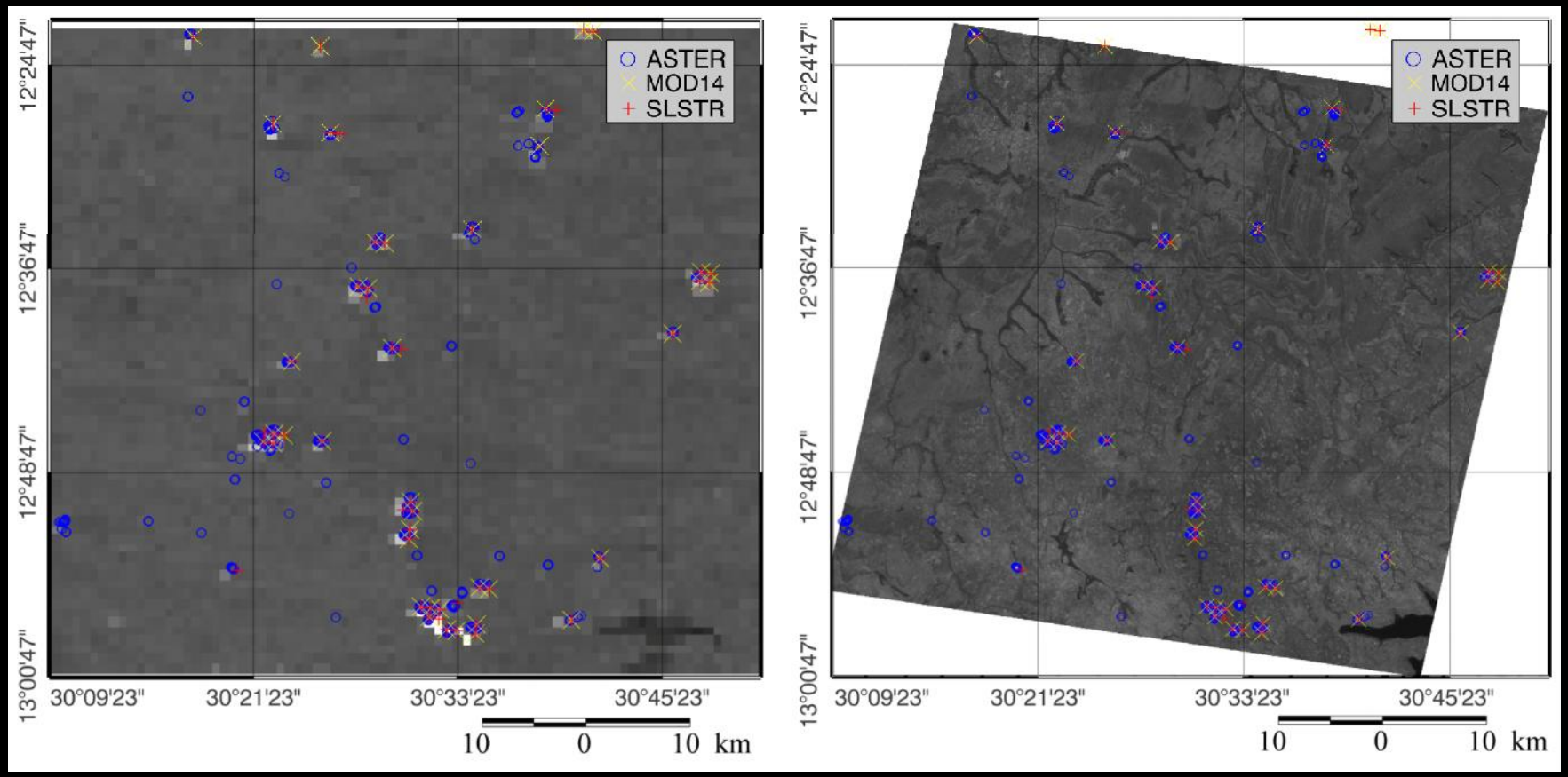
SLSTR : 31 Fire Pixels
MODIS Alg. : 1 Fire Pixels

Evaluation against ASTER (30 m)



Evaluation against ASTER (30 m)

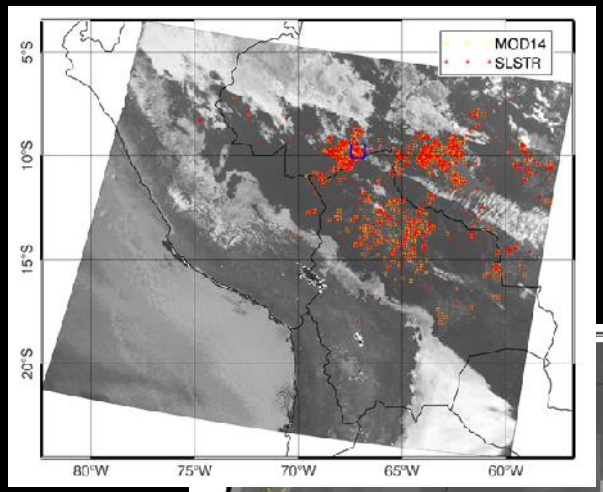
South Africa: Larger savannah fires – SLSTR active fire detection algorithm appears similarly performing to MODIS algorithm.



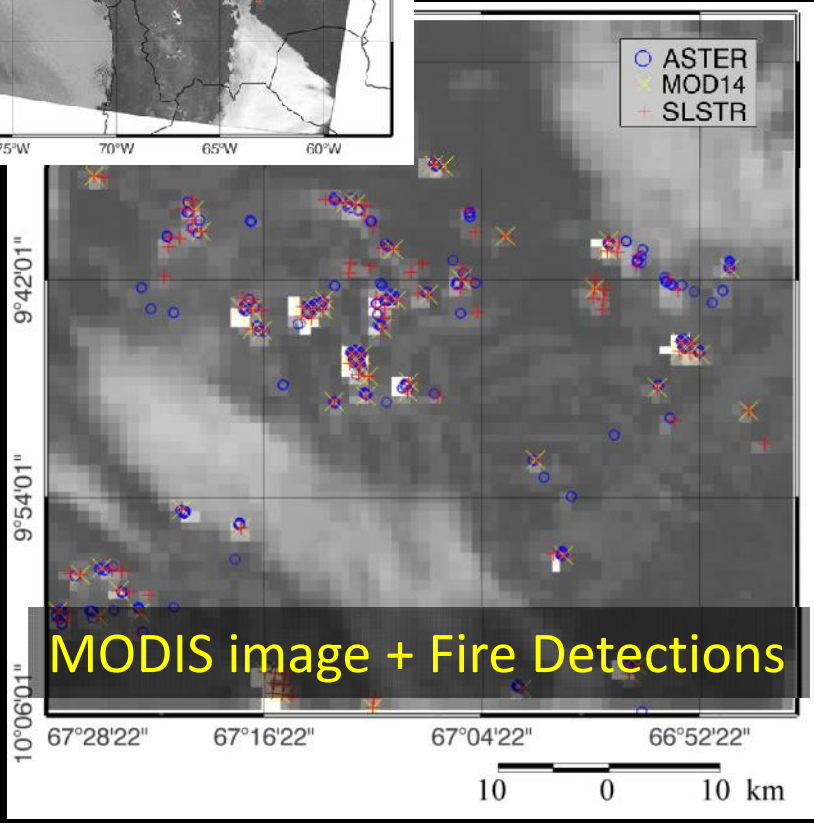
MODIS image + Fire Detections

ASTER image + Fire Detections

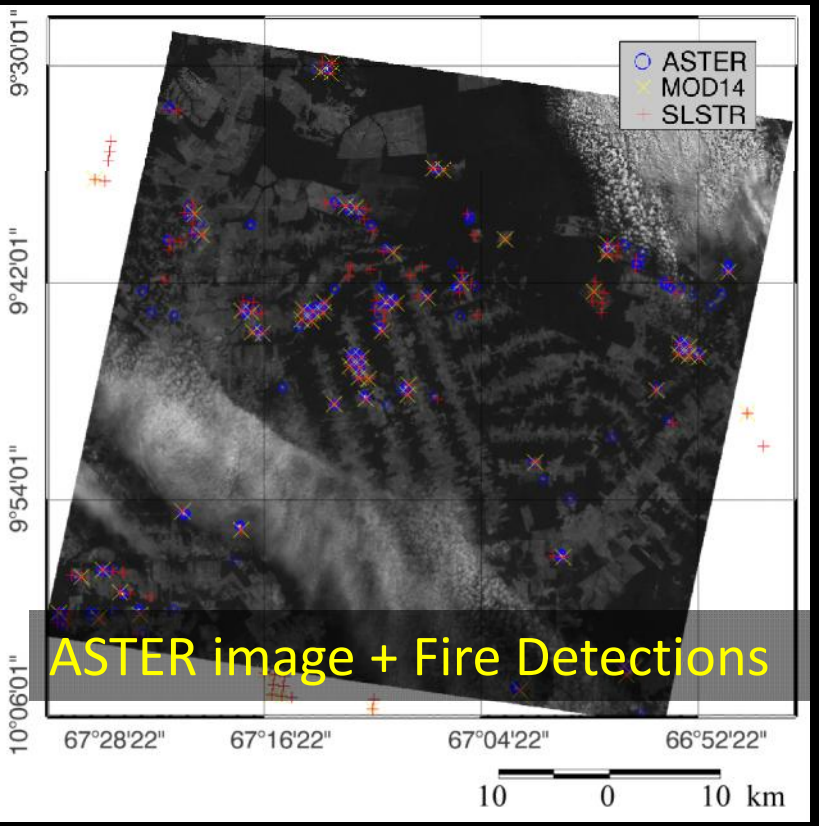
Evaluation against ASTER (30 m)



South America: More smaller “deforestation” fires – SLSTR algorithm appears a bit better performing than MODIS algorithm.

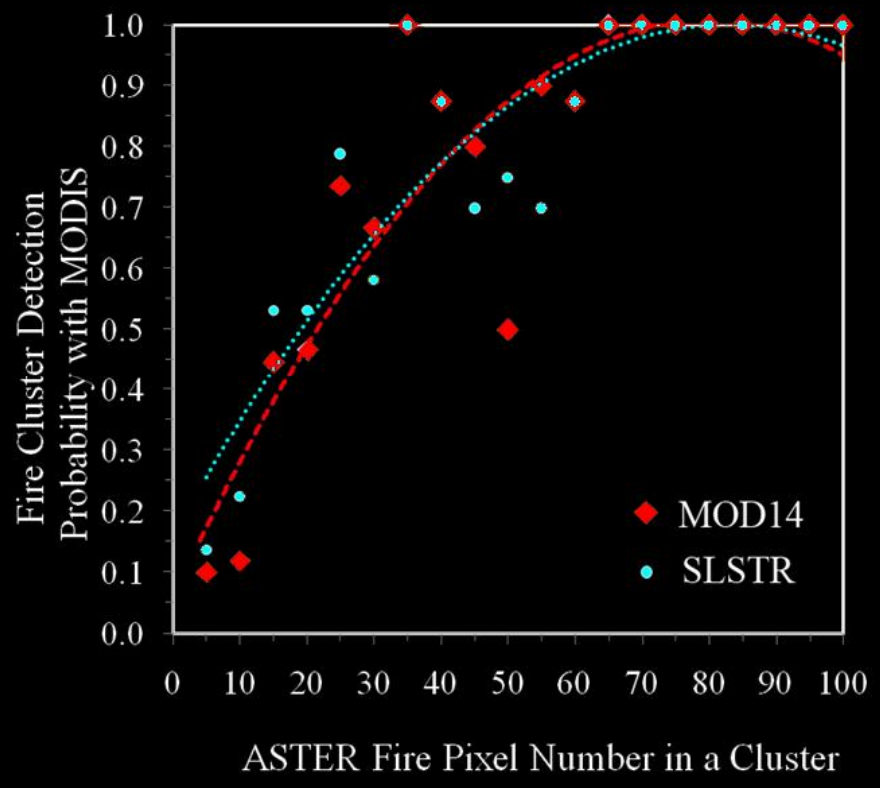


MODIS image + Fire Detections



ASTER image + Fire Detections

MODIS *vs.* SLSTR Alg. Performance



- SLSTR algorithm applied to MODIS detects ~36% more true fire pixels than does the MOD14 algorithm.
- Small (2%) increase in false alarm.
- Results only valid in the central part of the MODIS swath – and when applied to MODIS data.

Sentinel-3 SLSTR active fire detection and FRP product: Pre-launch algorithm development and performance evaluation using MODIS and ASTER datasets

M.J. Wooster [a,*], W. Xu [a], T. Nightingale [b]

(RSE, 2012)