

# Geostationary Fire Radiative Power Products from Himawari8 & GOES

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GOES



MSG



Himawari-8



# Specification of Himawari8 AHI

Band	Central Wavelength [μm]	Spatial Resolution
1	0.43 - 0.48	1km
2	0.50 - 0.52	1km
3	0.63 - 0.66	0.5km
4	0.85 - 0.87	1km
5	1.60 - 1.62	2km
6	2.25 - 2.27	2km
7	3.74 - 3.96	2km
8	6.06 - 6.43	2km
9	6.89 - 7.01	2km
10	7.26 - 7.43	2km
11	8.44 - 8.76	2km
12	9.54 - 9.72	2km
13	10.3 - 10.6	2km
14	11.1- 11.3	2km
15	12.2 - 12.5	2km
16	13.2 - 13.4	2km

RGB  
Composited  
True Color Image

1.3 μm for GOES-R

Fire, saturated ~400K

Water  
Vapour

SO<sub>2</sub>

Atmospheric  
Windows

CO<sub>2</sub>

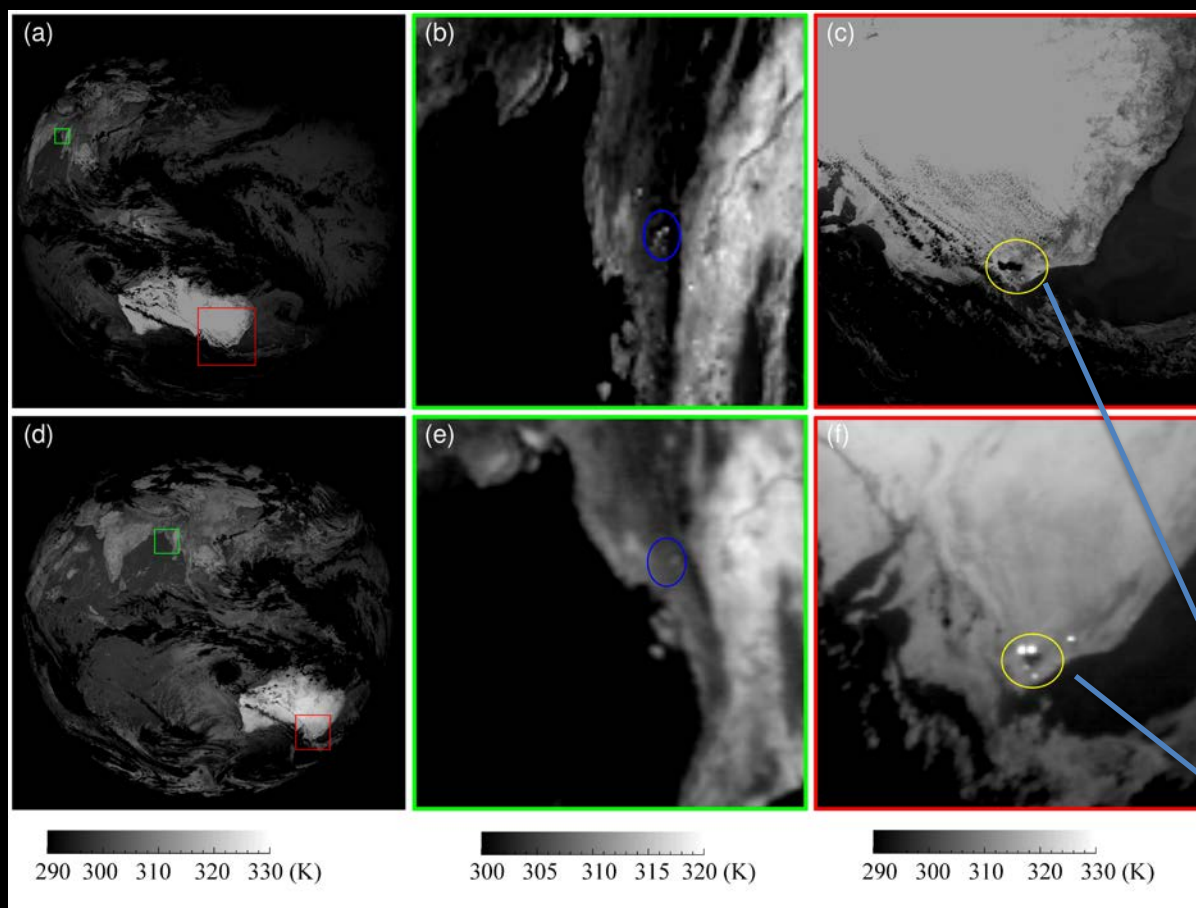


Full Disk Image  
every 10 minutes

Band	Central Wavelength [μm]	Spatial Resolution
1	0.55 – 0.90	1km
2	3.50 – 4.00	4km
3	6.50- 7.00	4km
4	10.3 – 11.3	4km
5	11.5 – 12.5	4km

X: ABI

# Limitation of MTSAT and FY2



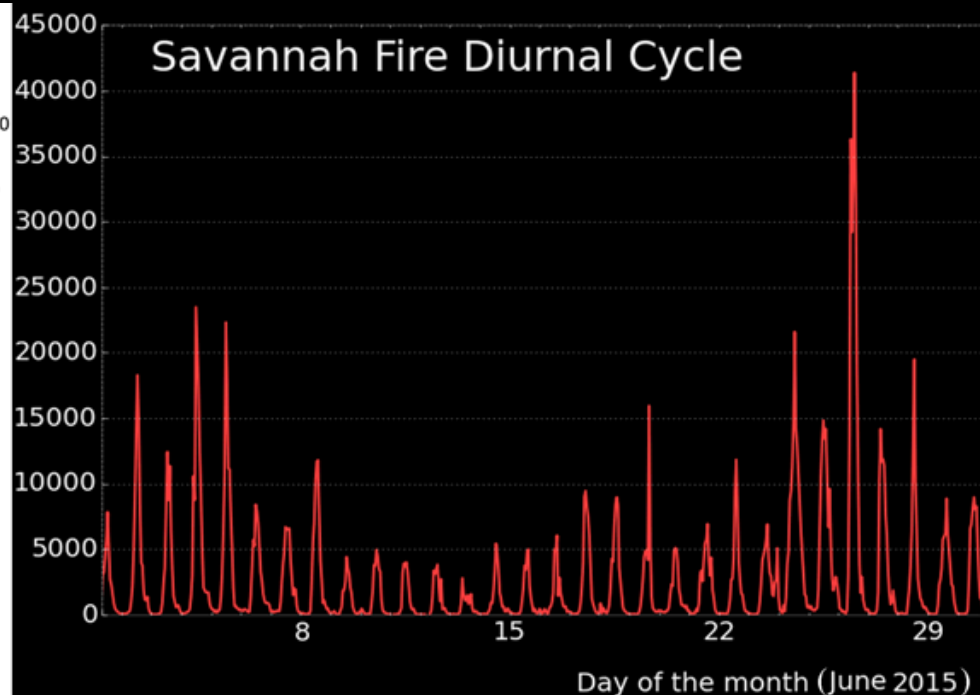
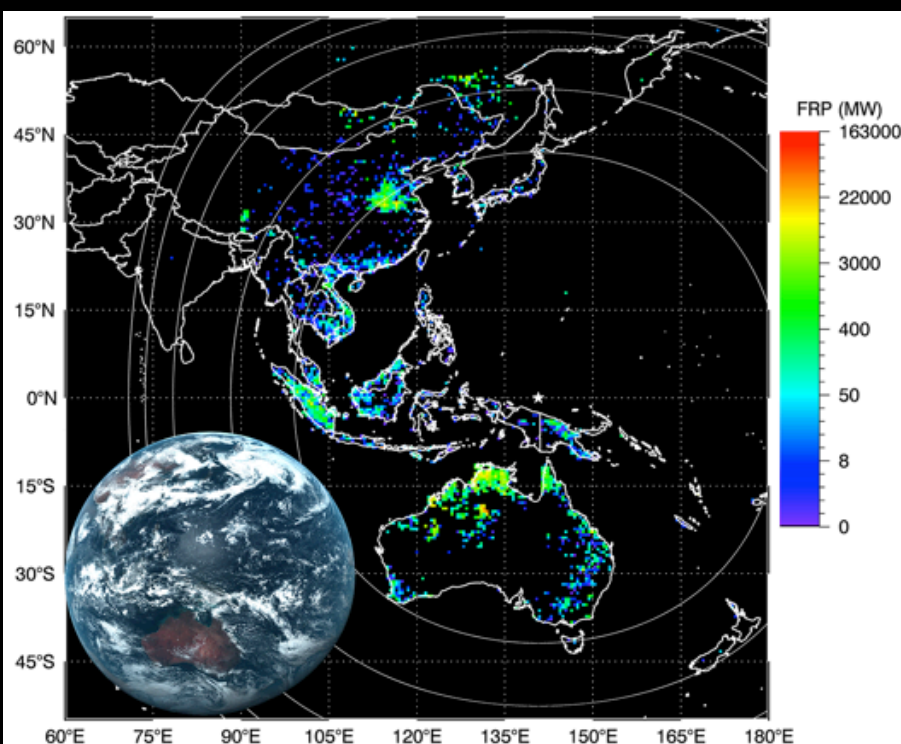
MTSAT: MWIR  
saturates at  $\sim 320\text{K}$

FY2: Poor MWIR  
image quality

Black Saturday  
bushfires

Nearly same time MWIR image from MTSAT and FY2C  $\sim 5\text{AM}$  UTC on 2<sup>nd</sup> Feb. 2009

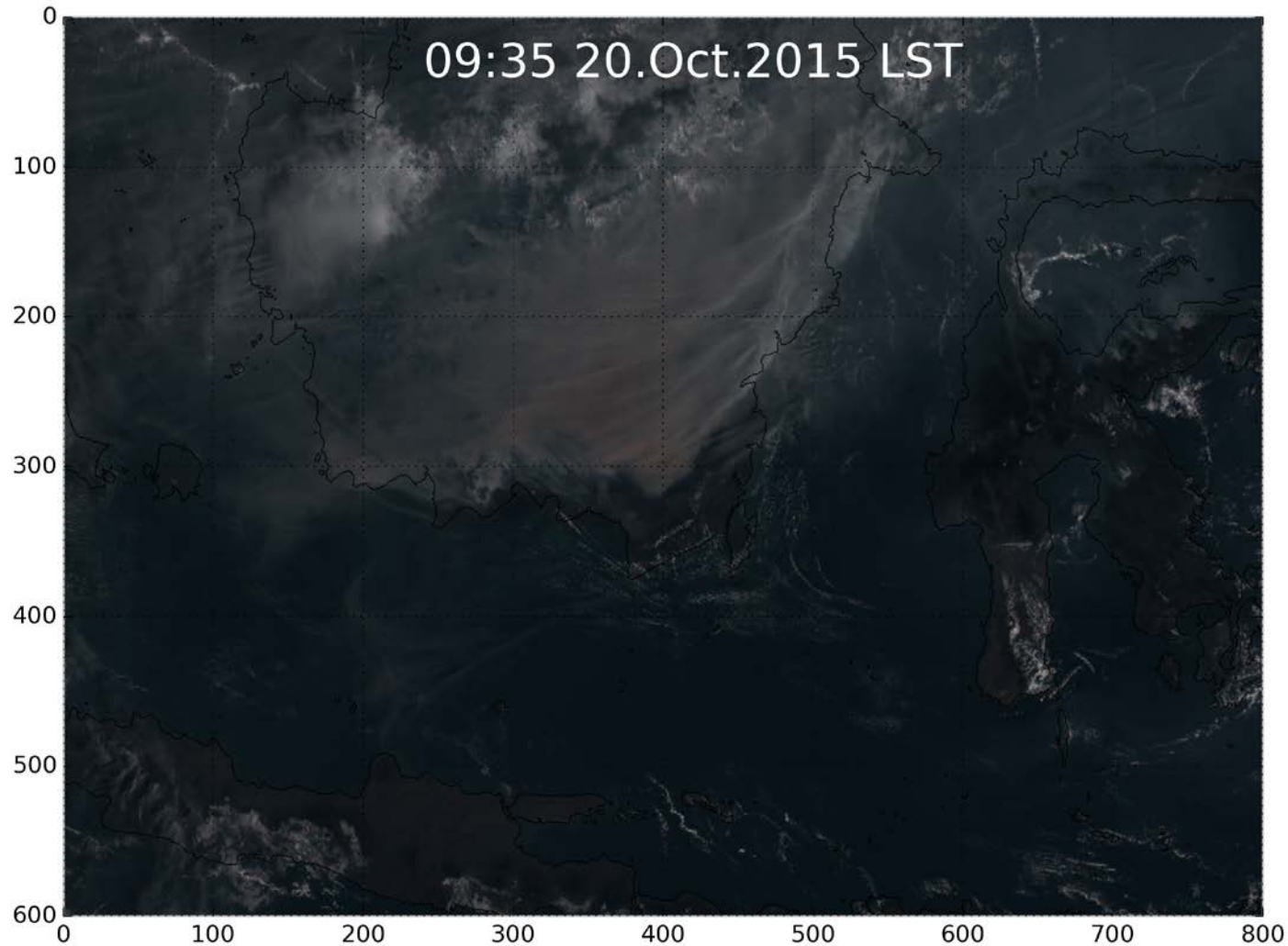
# FRP from Himawari-8



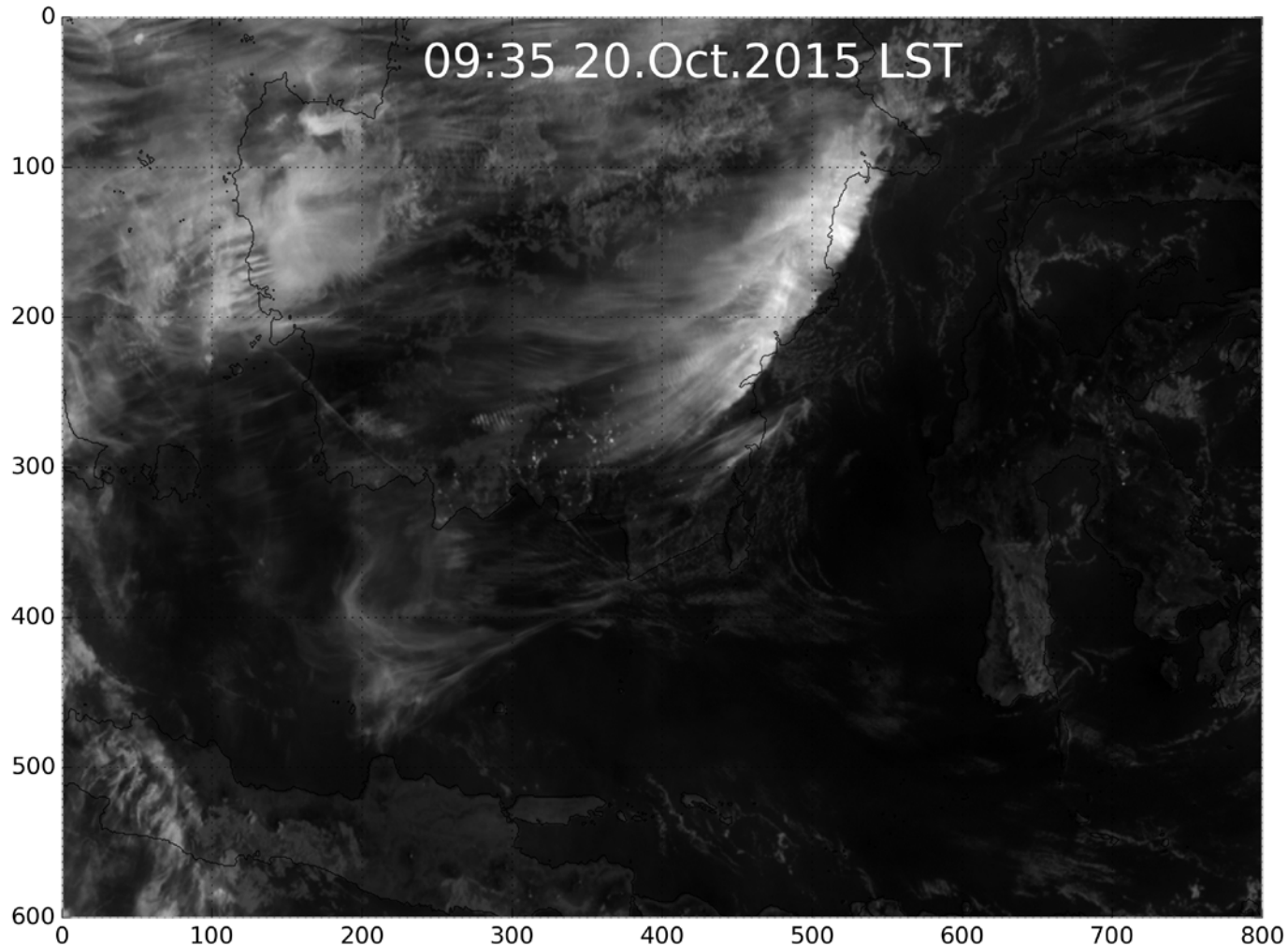
Xu, W., Wooster, M. J., Kaneko, T., He, J., Zhang, T., & Fisher, D. (2017). Major advances in geostationary fire radiative power (FRP) retrieval over Asia and Australia stemming from use of Himarawi-8 AHI. REMOTE SENSING OF ENVIRONMENT, 193, 138-149.



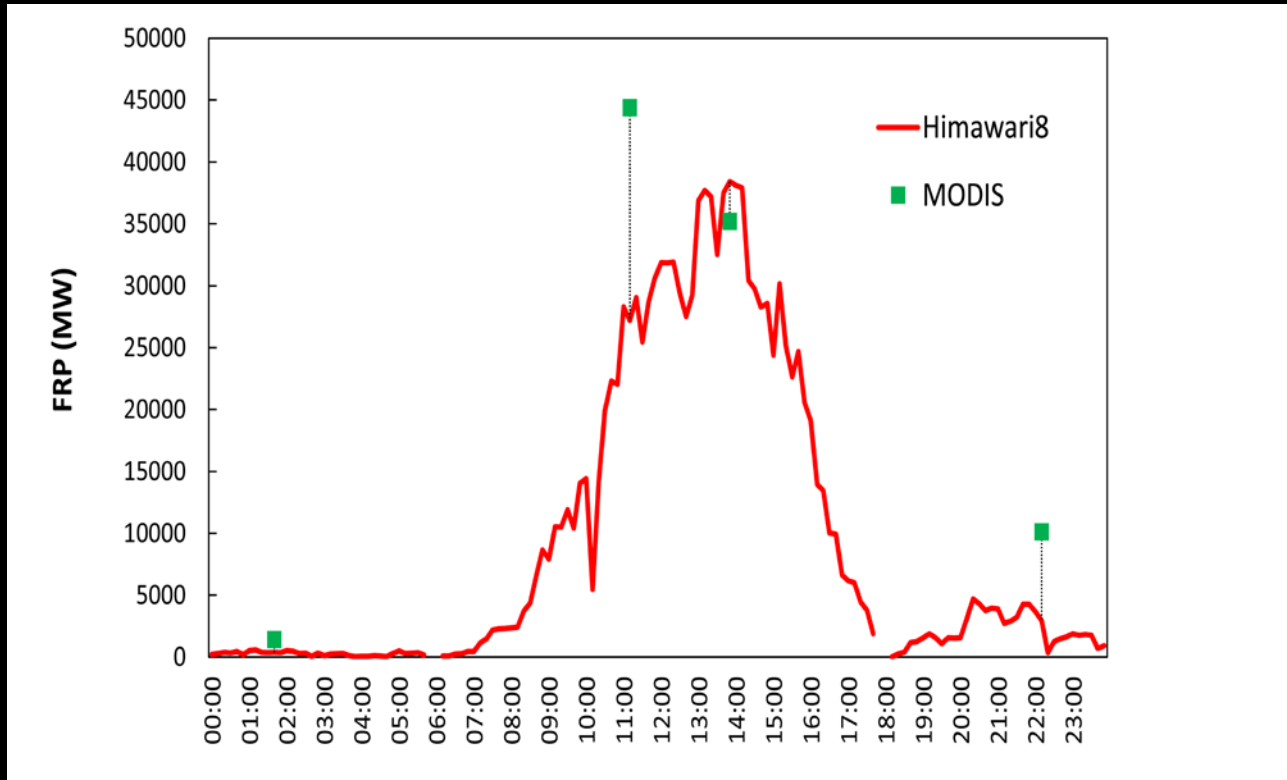
# Indonesia Fires from Himawari8 (RGB)



# Indonesia Fires from Himawari8 (Dif)

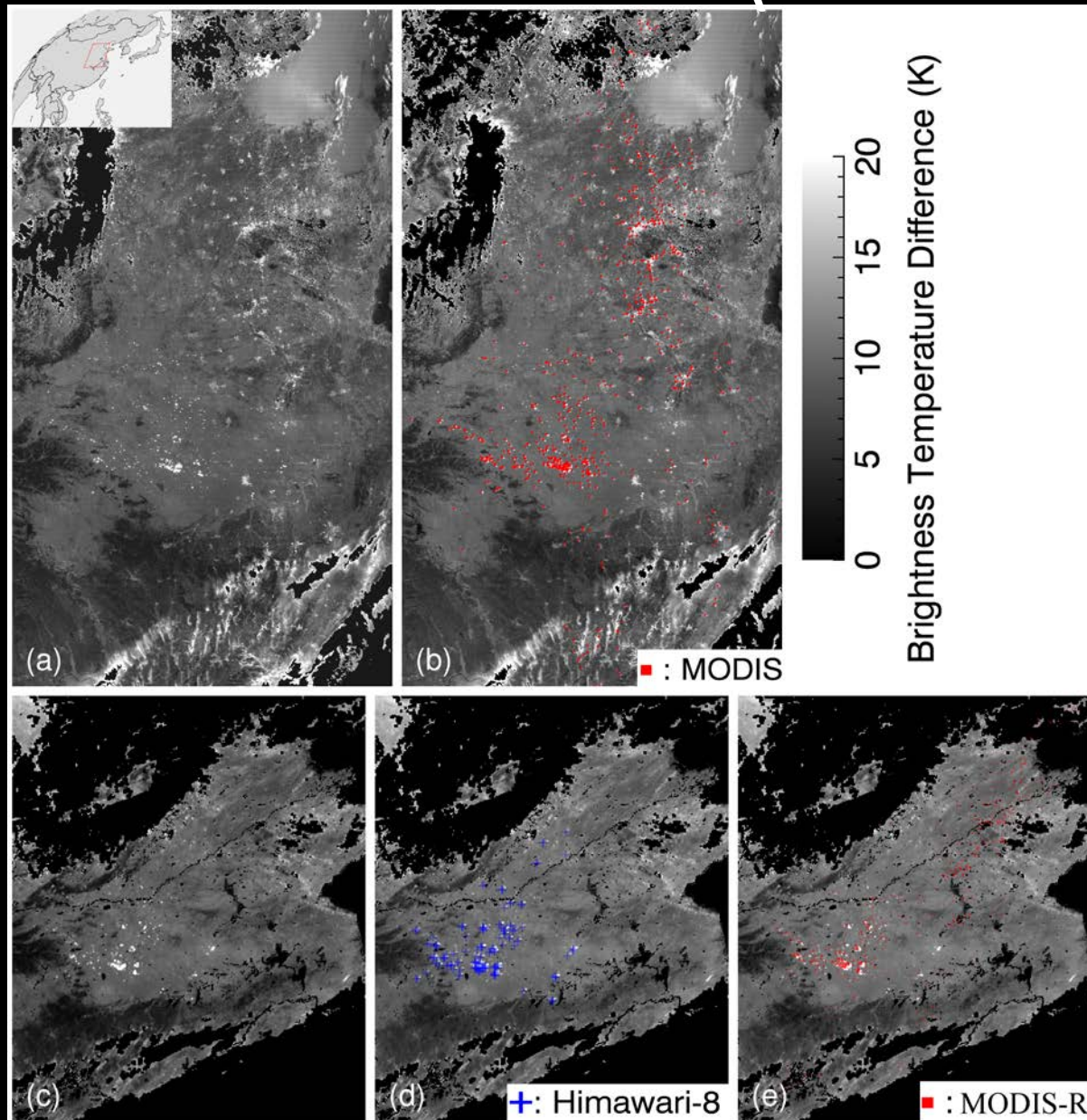


# Fire Diurnal cycle from Himawari8 over Central China



- Genuine full diurnal cycle from Himawari8;
- Only 4 over passes from MODIS.

# Comparison between MODIS and Himawari8 (Method)



For this scene:

H8 Error of Commission: 6%

H8 Error of Omission: 70%

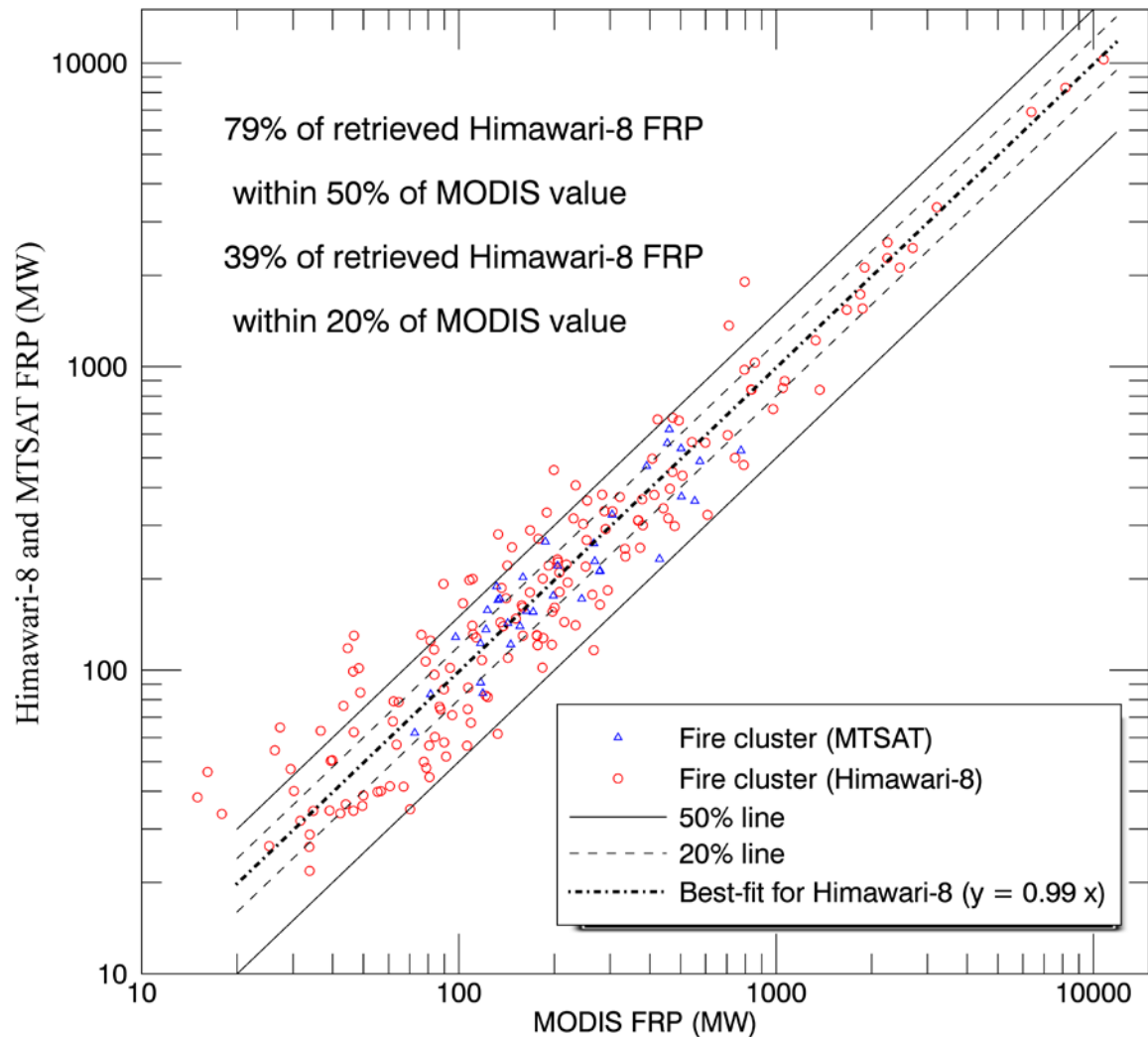
For the whole month in June  
2015:

H8 Error of Commission: ~8%

H8 Error of Omission: ~66%



# Comparison between MODIS and Himawari8 (Fire Cluster)



Slopes: 0.99

$r^2$ : 0.96

Scatter: 156 MW

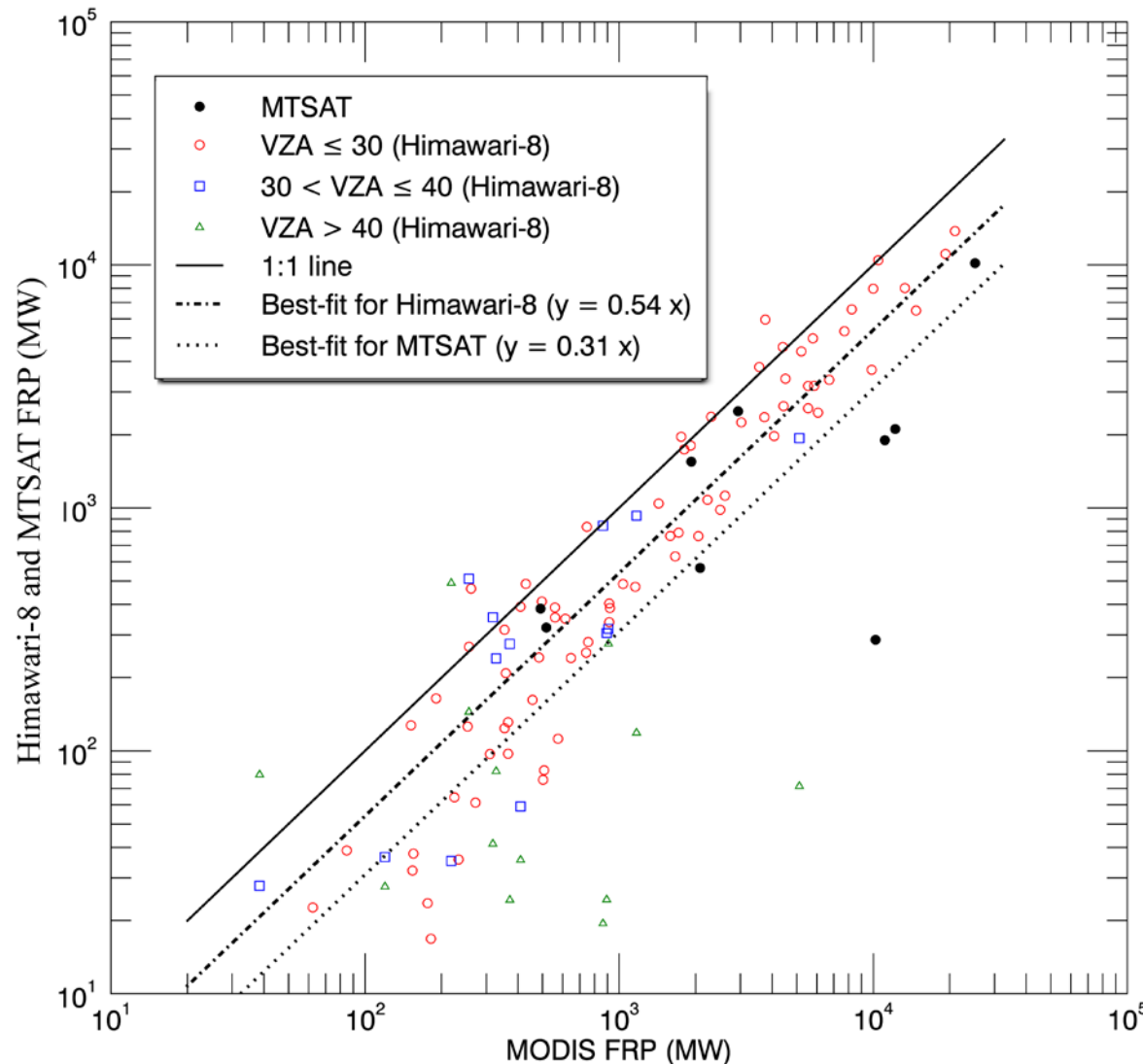
H8 sample : 168

MTSAT sample: 35

## Conclusion

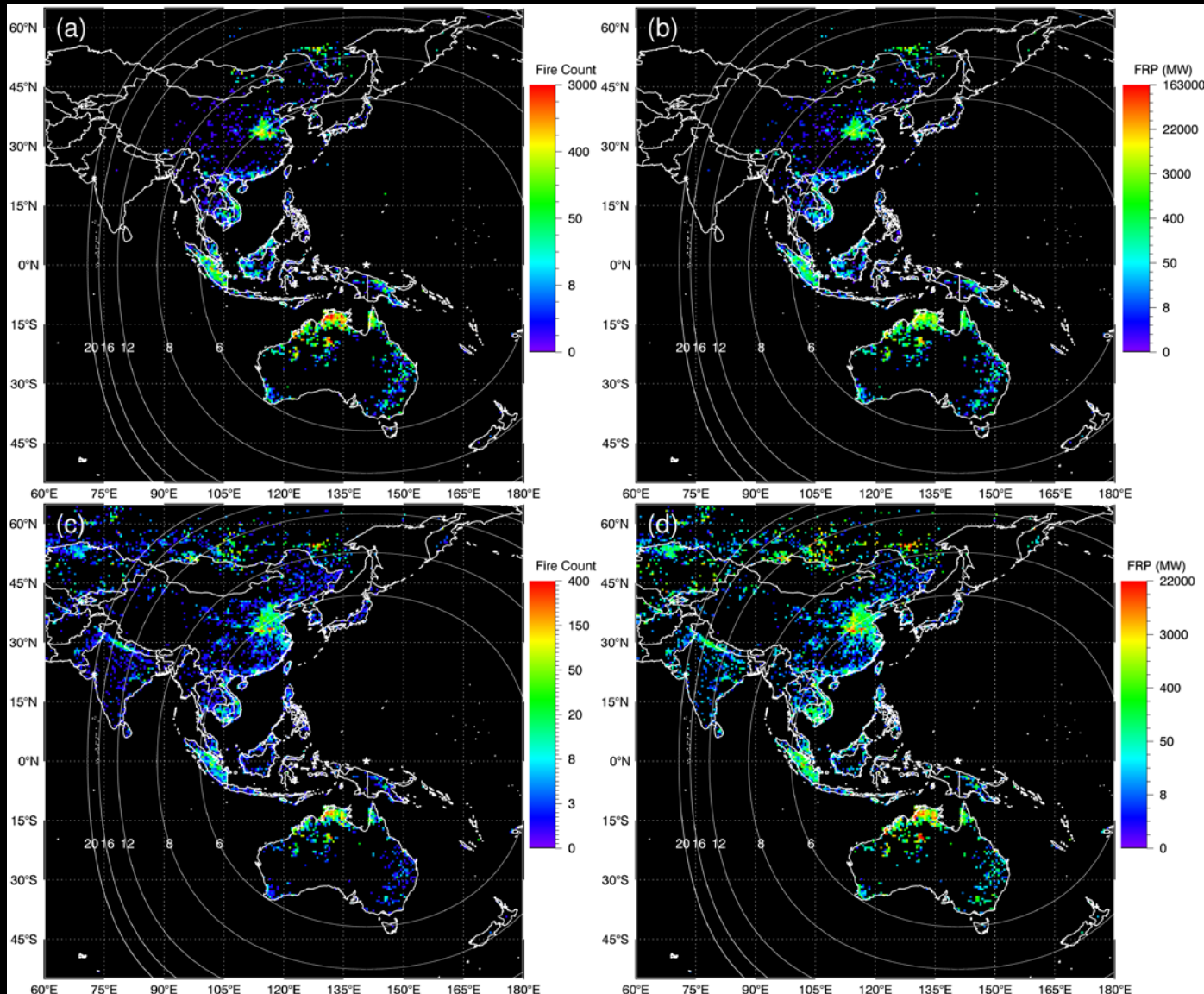
When Himawari8 and MODIS detect the same fires, the retrieved FRP shows excellent agreement. Even MTSAT show a good agreement with limited samples.

# Comparison between MODIS and Himawari8 (Area)



When Himawari8 and MODIS observe the same region, the FRP-PIXEL product tends to underestimate total regional-scale FRP, due to missing “small fire” which can be detected by MODIS.

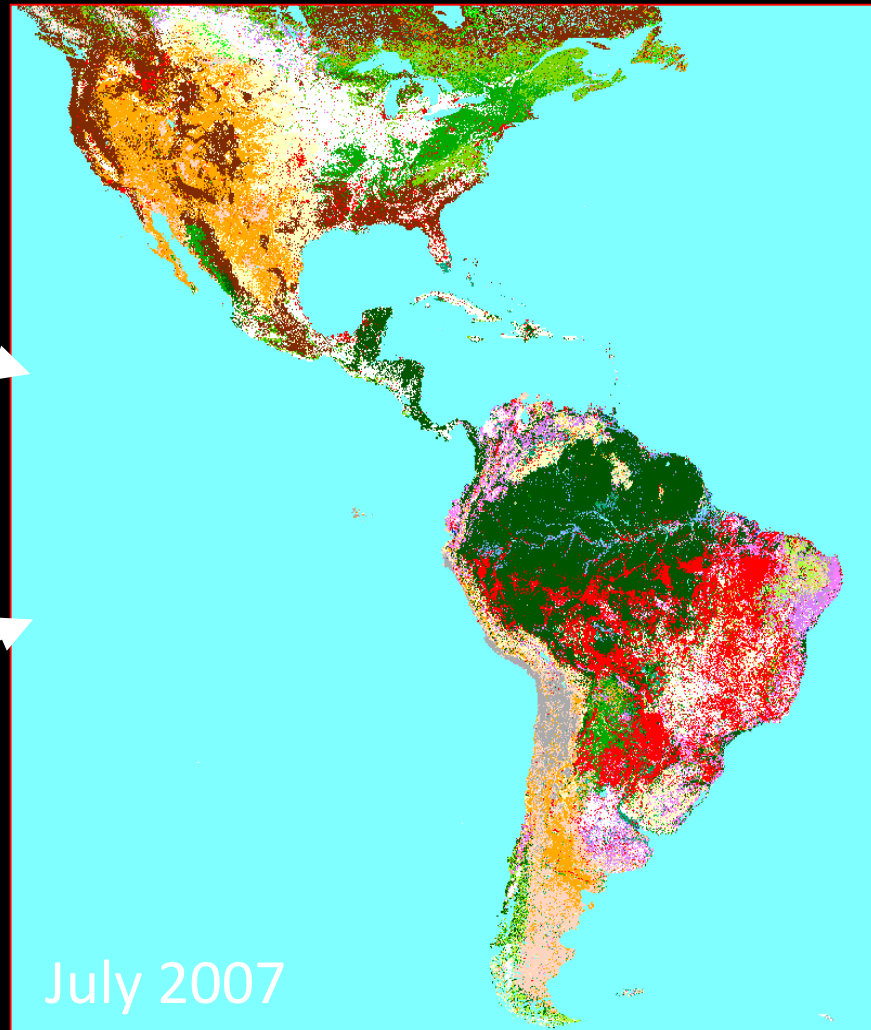
# Comparison between MODIS and Himawari8 (Grid)



Himawari8

MODIS

# GOES FRP System



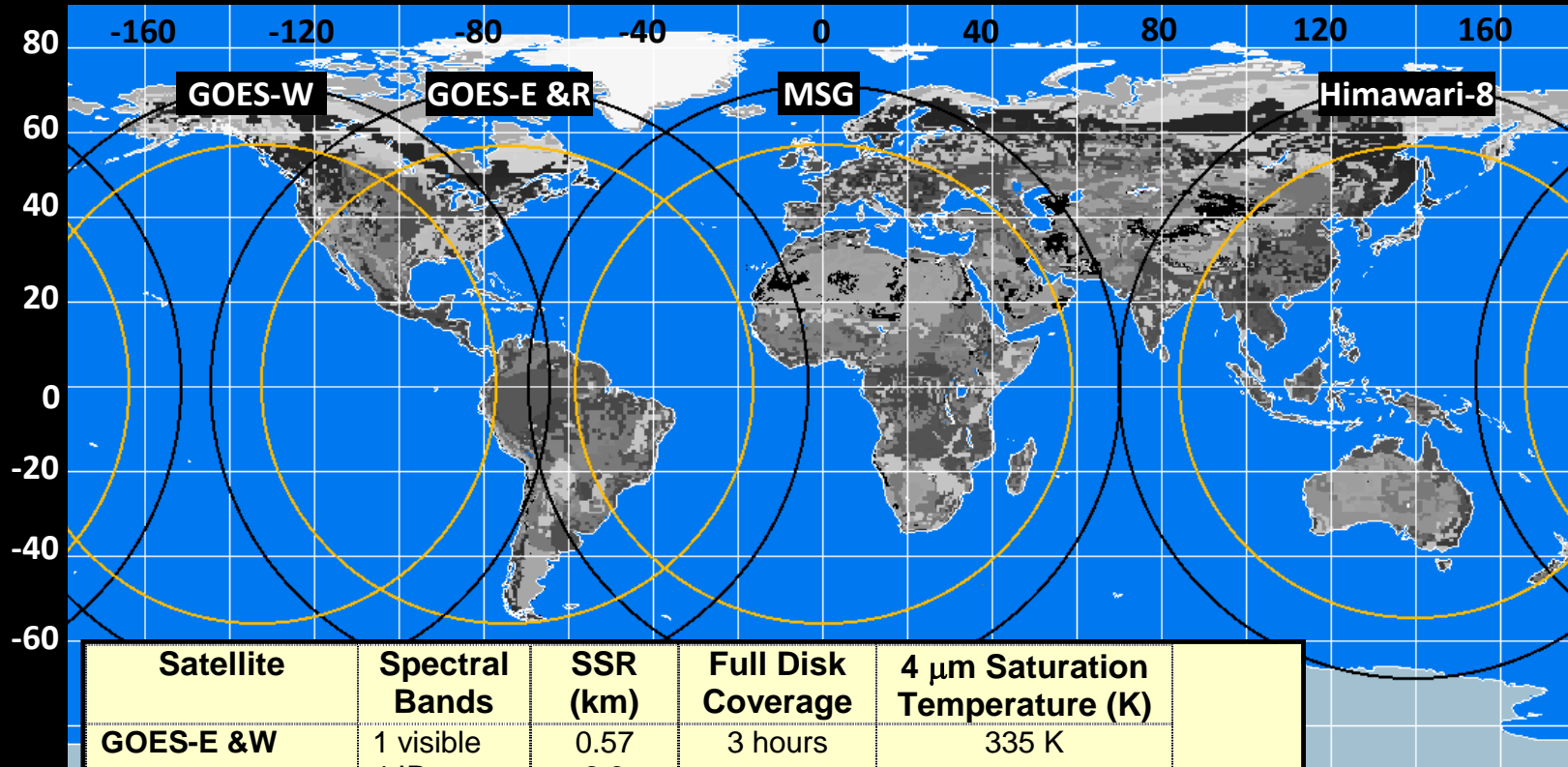
GOES-  
detected  
fires (red)  
on  
landcover  
map

W. Xu, M.J. Wooster, G. Roberts, P. Freeborn, New GOES imager algorithms for cloud and active fire detection and fire radiative power assessment across North, South and Central America, *Remote Sensing of Environment*, Volume 114, Issue 9, 15 September 2010, Pages 1876-1895





# Future work: Global Geostationary FRP System



Satellite  
View Angle

— 80°

— 65°

Satellite	Spectral Bands	SSR (km)	Full Disk Coverage	4 $\mu$ m Saturation Temperature (K)
GOES-E & W	1 visible 4 IR	0.57 2.3	3 hours	335 K
GOES-R	3 visible 3 near-IR 7 IR	0.5 2.0	10 minutes	400K
MSG SEVIRI	3 visible 1 near-IR 8 IR	1.0 (3.0) 3.0 3.0	15 minutes	> 335
Himawari-8	3 visible 3 near-IR 7 IR	0.5 2.0	10 minutes	400K