

20<sup>th</sup>-23<sup>rd</sup> November

## GWIS and GOFC Fire IT meeting

**CEOS LPV : Active Fire & FRP**



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## Land Product Validation Subgroup

- Focus on land product validation
  - Validation practice
  - Validation reference datasets
    - 3 BA reference datasets
  - Product requirements (GCOS-154)

### Active Fire Requirements :

- Frequency: 6 hours at all latitudes from Polar-Orbiting and 1 hour from Geostationary
- Resolution: 0.25-1 km (Polar); 1-3 km (Geo)
- Required Measurement uncertainty: 5 % error of commission; 10 % error of omission; Based on per-fire comparisons for fires above target threshold of 5 MW/km<sup>2</sup> equivalent integrated FRP per pixel (i.e. for a 0.5 km<sup>2</sup> pixel the target threshold would be 2.5 MW, for a 9 km<sup>2</sup> pixel it would be 45 MW).

### FRP requirements :

- Frequency: 6 hours at all latitudes from Polar-Orbiting and 1 hour from Geostationary
- Resolution: 0.25-1 km (Polar); 1-3 km (Geo)
- Required Measurement uncertainty: 10 % integrated over pixel. Based on target detection threshold of 5 MW/km<sup>2</sup> equivalent integrated FRP per pixel (i.e. for a 0.5 km<sup>2</sup> pixel the target threshold would be 2.5 MW, for a 9 km<sup>2</sup> pixel it would be 45 MW) and with the same detection accuracy as the Active Fire Maps.

### LPV Focus Areas

LAI

Fapar

Fire/Burn Area

Phenology

Vegetation Index

Land Cover

Snow Cover

BRDF/Albedo

Soil Moisture

LST and Emissivity

Biomass

# CEOS LPV : Active Fire Products

## ☐ Website Updates : Active Fire Products

Sensor	Product	Institution	Spatial Coverage	Temporal Resolution	Spatial Resolution	Temporal coverage
ATSR	World fire atlas	European Space Agency	Global	Daily	1km	2000-2012
AVHRR	GFP	JRC	Global	Daily	1km	1992-1993
TRMM	VIRS	NASA	Near global (40°N-40°S)	Monthly	0.5 x 0.5 deg	1998-2005
SEVIRI	FRP-PIXEL	LSA SAF	Euro, Africa, S. Amer	15-min	3km	2004-present
SEVIRI	FRP-GRID	LSA SAF	Euro, Africa, S. Amer	hourly	1 deg	2004-present
MODIS	Global Fire Assimilation System (GFAS)	Copernicus	Global	daily	0.1deg	
SLSTR	FRP	ESA	Global	daily	1km	2016-present
MODIS	MOD14A2	NASA/University of Maryland	Global	8-day	1km	1999-present
MODIS	MOD14A1	NASA/University of Maryland	Global	Daily	1km	2000-present
MODIS	MOD14	NASA/University of Maryland	Global	Daily	1km	2000-present
MODIS	MOD14 Rapid Response	NASA	Global	Daily	1km	2000-present
VIIRS	VIIRS Active Fire	NASA/University of Maryland	Global	Daily	750m	2012+
GOES	WF-ABBA	NOAA/University of Wisconsin	Global	> 30min	4km	2000-present
FireBird	FRP	DLR	Global	2-5 days	160m	2015
AVHRR	FIMMA	NOAA/NESDIS	North America	Daily	1.1km	rolling previous 6 months
SEVIRI	Active Fire Monitoring	EUMETSAT	Euro, Africa, S. Amer, Indian Ocean	15-min	3km	2004-present
SEVIRI	Fire Detection and Monitoring	LSA SAF	Euro, Africa, S. Amer	15-min	3 km	2004-present

☐ Links to validation publications\ATBDs where available

☐ Updated periodically but feel free to contact me with any updates to products, new products etc.

# CEOS LPV : Active Fire\FRP Validation

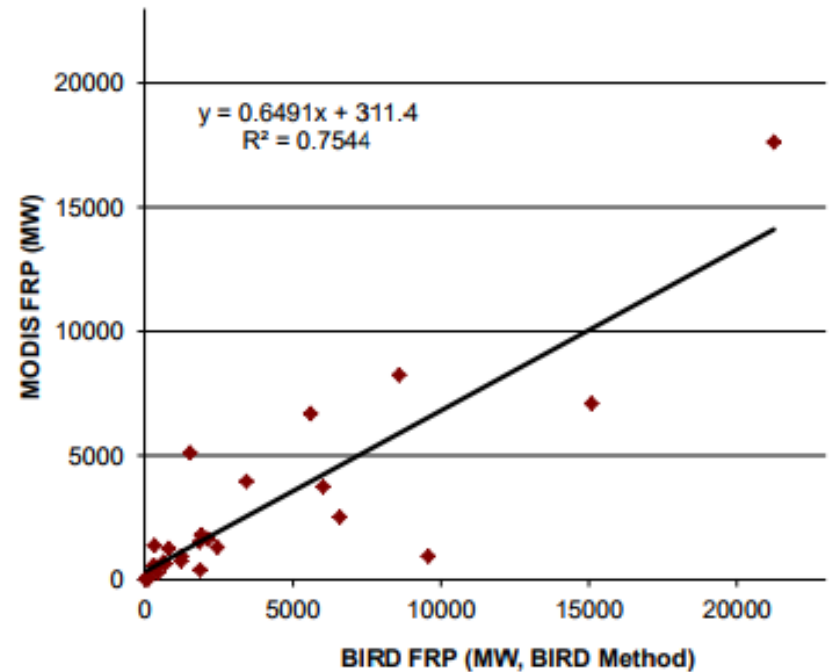
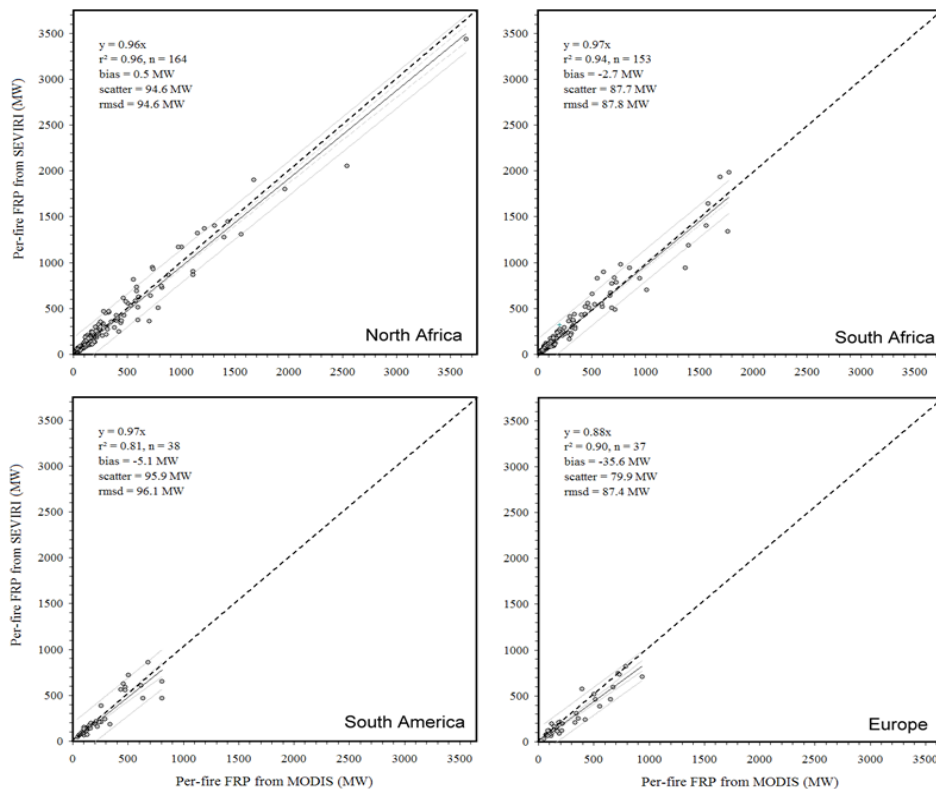
## □ Current status of active fire & FRP validation

<b>Validation Stage - Definition and Current State</b>		<b>Variable</b>
<b>1</b>	Product accuracy is assessed from a small (typically < 30) set of locations and time periods by comparison with in-situ or other suitable reference data.	<b>Fapar Snow Cover Phenology LST &amp; Emissivity Fire Radiative Power</b>
<b>2</b>	Product accuracy is estimated over a significant set of locations and time periods by comparison with reference in situ or other suitable reference data. Spatial and temporal consistency of the product and consistency with similar products has been evaluated over globally representative locations and time periods. Results are published in the peer-reviewed literature.	<b>Leaf Area Index Burned Area</b>
<b>3</b>	Uncertainties in the product and its associated structure are well quantified from comparison with reference in situ or other suitable reference data. Uncertainties are characterized in a statistically rigorous way over multiple locations and time periods representing global conditions. Spatial and temporal consistency of the product and with similar products has been evaluated over globally representative locations and periods. Results are published in the peer-reviewed literature.	<b>Land Cover Albedo Soil Moisture</b>
<b>4</b>	Validation results for stage 3 are systematically updated when new product versions are released and as the time-series expands.	

# CEOS LPV : Active Fire\FRP product inter-comparison

□ FRP products assessed via product inter-comparison (eg)

- SEVIRI against MODIS
- MODIS against BIRD

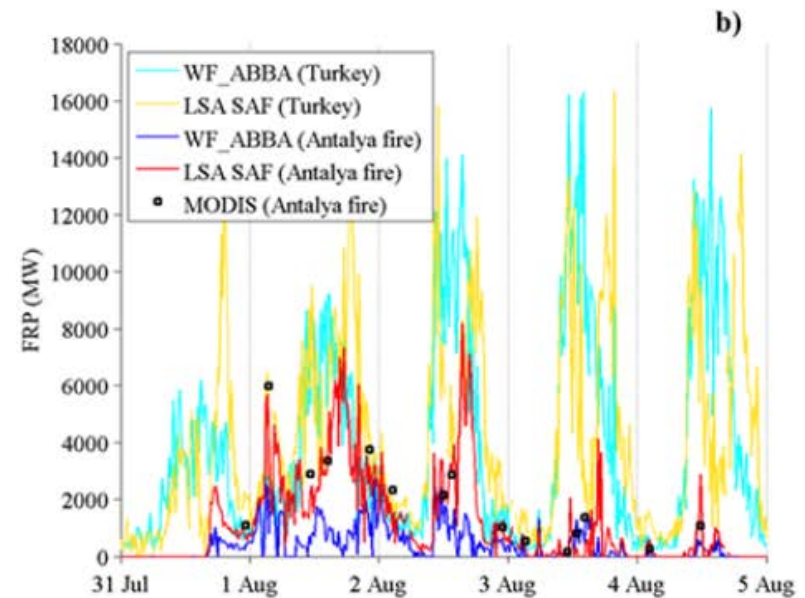
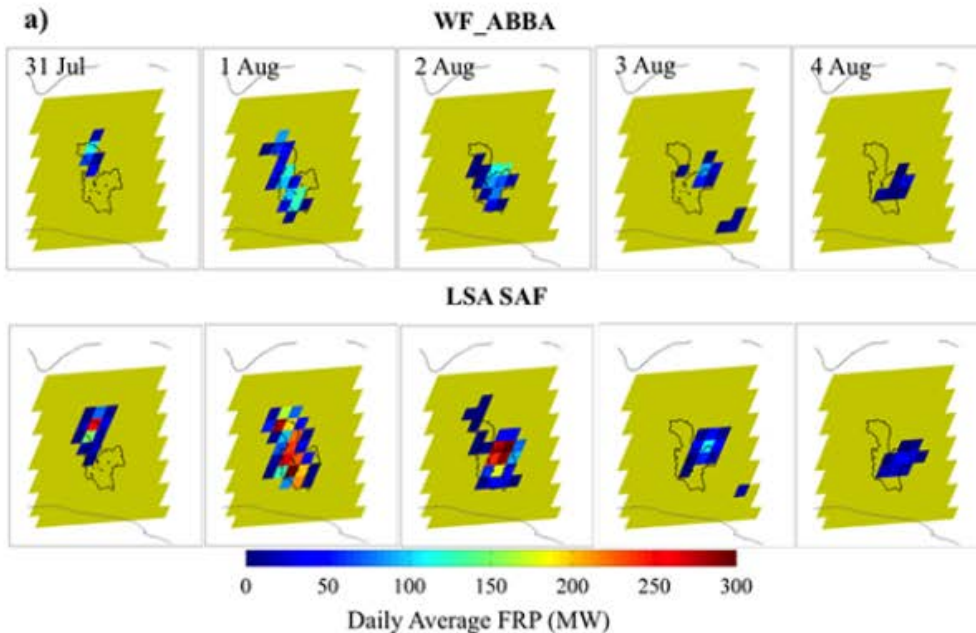


Per-fire FRP comparison between SEVIRI  
FRP-PIXEL and MODIS (Roberts et al., 2015)

*Rucker et al., (2013)*

# CEOS LPV : FRP product inter-comparison

- Active fire products inter-comparison
  - Spatial & temporal comparison of fire pixel detections



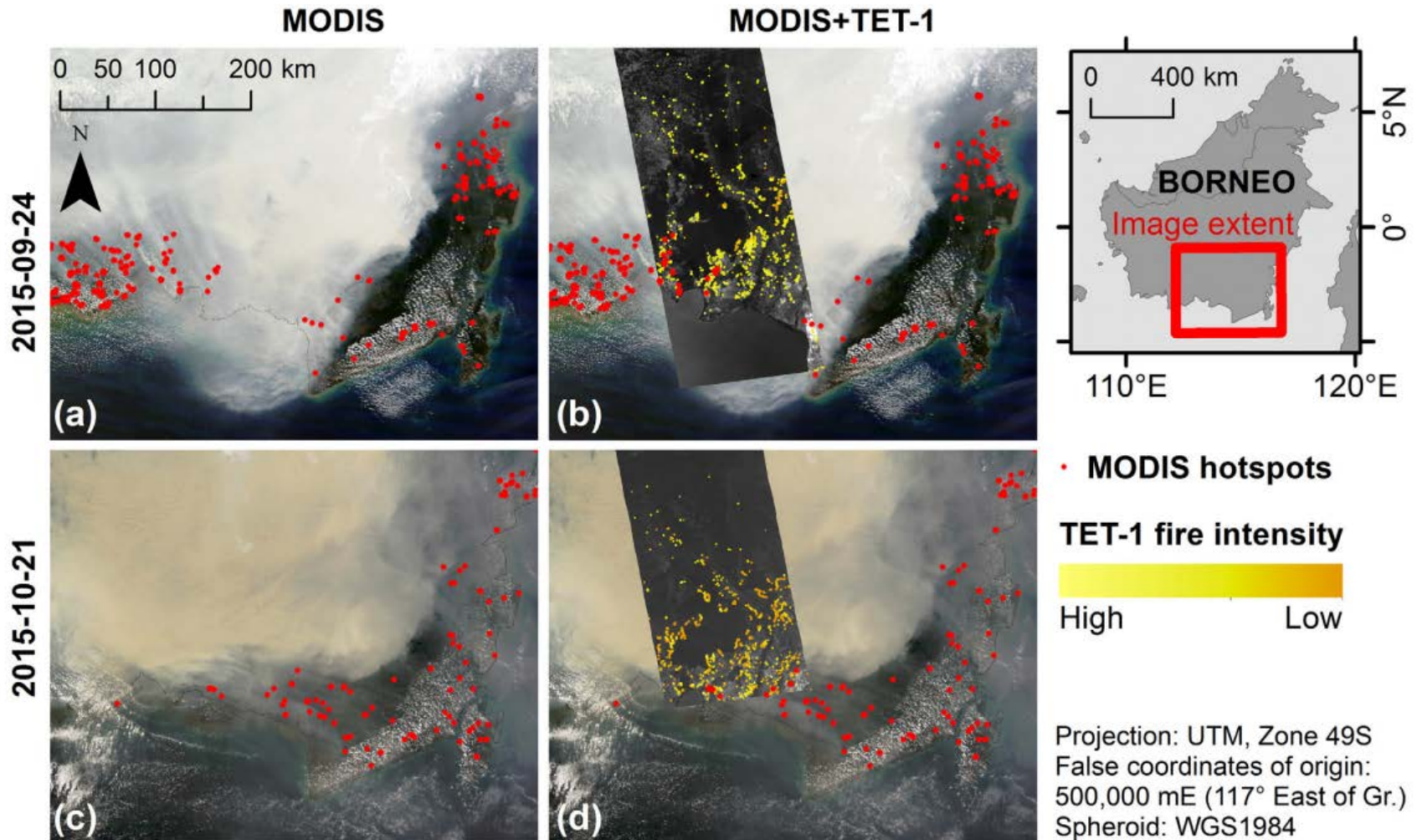
Baldassarre et al., 2015; Atm. Chem. Phys

	Turkey	Antalya fire
WF_ABBA	29 411.9 <i>158 894.5</i>	3967.1 <i>10 559.1</i>
LSA SAF	48 090.6 <i>199 287.6</i>	18 992.3 <i>50 551.8</i>

Total particulate matter estimates [tons] est. from WF\_ABBA and FRP-PIXEL

# CEOS LPV : Active Fire product inter-comparison

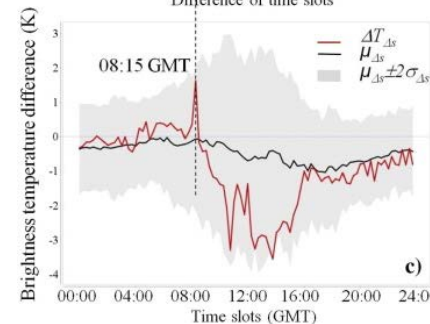
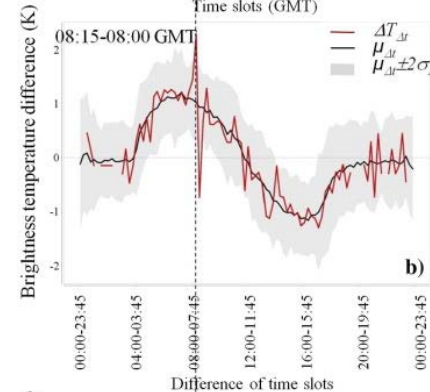
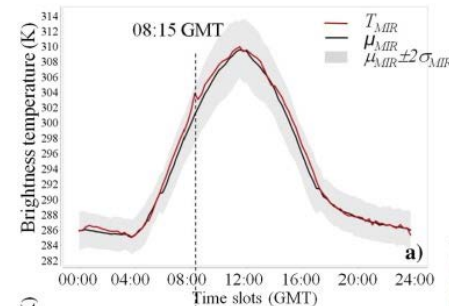
☐ MODIS (1km) against TET-1 (160m)



# CEOS LPV : Active Fire product inter-comparison

- Active products compared against ground obs.
  - Comparison of SEVIRI active fire detects against fire reports
    - Fire agency \ local gov.

Validation campaign	Number of days	Total documented events	Observable and verifiable events	Identified events		Not identified events					
						Absent signal variations		Low signal variations		Other	
						n.	%	n.	%	n.	%
PP 2009	39	482	349	248	71.1%	78	22.3%	23	6.6%	0	0.0%
Bas 2010	38	610	323	133	41.2%	141	43.6%	49	15.2%	0	0.0%
PP 2010	42	187	149	144	96.6%	3	2.0%	2	1.3%	0	0.0%
PP 2011	86	223	188	159	84.6%	12	6.4%	17	9.0%	0	0.0%
Bas 2012	51	883	557	190	34.1%	102	18.3%	222	39.9%	43	7.7%
<b>Total</b>	<b>256</b>	<b>2385</b>	<b>1566</b>	<b>874</b>	<b>55.8%</b>	<b>336</b>	<b>21.5%</b>	<b>313</b>	<b>20.0%</b>	<b>43</b>	<b>2.7%</b>



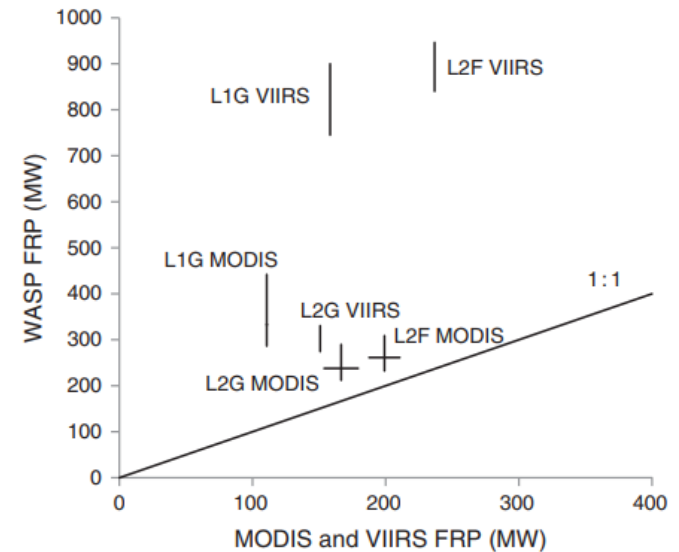


# CEOS LPV : FRP validation

- ❑ More limited near surface validation opportunities
  - Ideally need airborne FRP meas.
    - challenging logistically
  
- ❑ RxCADRE project
  - Compared ground, airborne and satellite FRP
  
- ❑ Fire And Smoke Model Evaluation Experiment (FASMEE) (Ottmar et al., 2017)
  - Measurement campaigns (2019-)
    - Ground, airborne and satellite
    - Fire energy, fuel consumption just one component



Napi replicate plots in KNP



Dickinson et al., (2016)

# CEOS LPV : Active fire & FRP validation

- Active fire/FRP currently at stage 1 validation

<b>Validation Stage - Definition and Current State</b>		<b>Variable</b>
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- How to push forward validation status of AF/FRP?
  - reference datasets for validation AF & FRP
    - what do we need?
      - high res. FRP (e.g. FireBIRD, VIIRS)
      - temporal requirements
  - coordinated campaigns



## lpve – land product validation and evolution

27 Feb – 1 Mar 2018 | ESA-ESRIN | Frascati (Rome), Italy

European Space Agency

### □ Workshop on the following :

- Overview on current land product Cal/Val approaches
- Revisit existing Cal/Val standards
  - in light of new sensors e.g. S-2 and S-3
- Land product inter-comparison methodologies & Data\sensor harmonisation
- Identify recommendations for ESA land algorithm development
- Formulate recommendations for future products & Cal/Val activities
- Encourage close collaboration between Cal/Val and research groups

- **abstract submission deadline is 30<sup>th</sup> November**

