

Processing of Suomi-NPP VIIRS Data for near real time applications – Observations on VFIRE375 active fire products

Fires Team

National Remote Sensing Center/ISRO

NASA Direct Readout Conference webinar-2

15th May 2019

Presentation Outline

- NRSC/ISRO Activities.
 - Suomi-NPP data processing setup.
 - Fire products generation and dissemination.
- Part-1
- Anomalies observed with VFIRE375_2.5.1.
 - Improvements/Observations on VFIRE375_V3.0.
 - Fire products generated with VIIRS_L1_V3.0a and VFIRE375_V3.0.
- Part-2
- Conclusion.

NRSC/ISRO Activities



**Main campus
at Hyderabad**

New Shadnagar Facility

**Multi-mission Data
Reception, Archival,
Processing and
Dissemination**



Regional Remote Sensing Centres

South



Bangalore

West



Jodhpur

East



Kharagpur

center



Nagpur

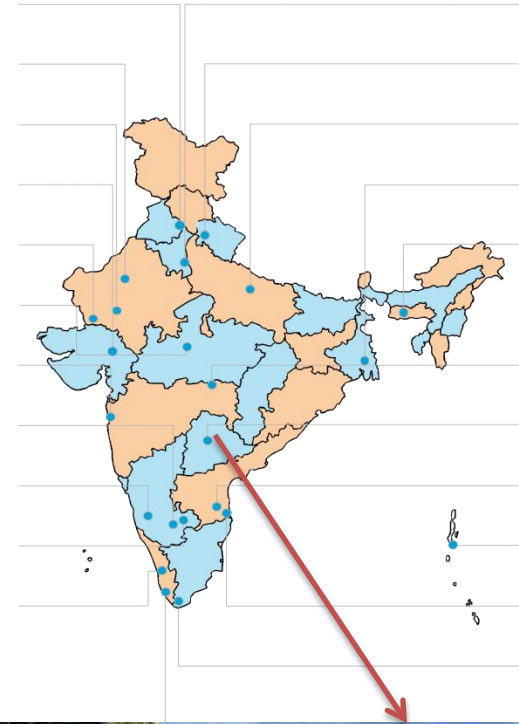


Delhi

NRSC (National Remote Sensing Center) is one of the centers of the **ISRO** (Indian Space Research Organization) located at Hyderabad, India.

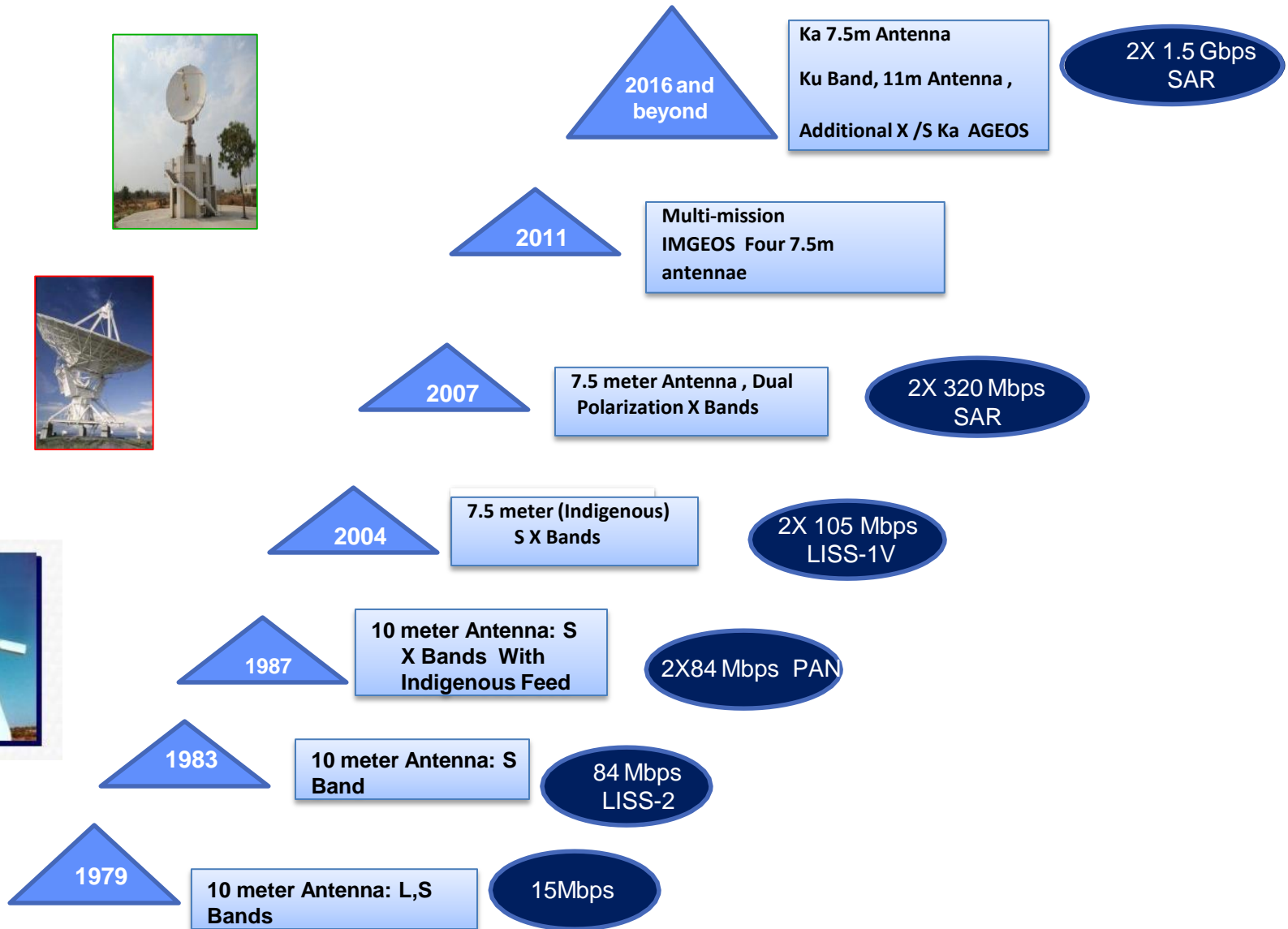
It is responsible for

- Remote sensing satellites data acquisition.
- Data processing and products generation.
- Remote sensing applications development using satellite data.
- Aerial services.
- Decision support for disaster management.



The state of art ground station facility **IMGEOS** (Integrated multi-mission ground segment for earth observation satellites) facilitates data acquisition, processing and products dissemination for

- A suite of **IRS** (Indian remote sensing satellites) satellites.
- Some foreign satellites like **NOAA, AQUA, TERRA, SNPP, JPSS-1, Metop** and **Landsat** series.



| Local Time(IST) | Mission |
|-----------------|---|
| 0600 Hrs | SARAL |
| 0920 Hrs | Scatsat1, Cartosat-2/2B, Cartosat series, Metop |
| 1000 Hrs | Landsat7/ 8 |
| 1030 Hrs | Cartosat-1, Resourcesat-1/2/2A, TERRA |
| 1200 Hrs | Oceansat-2 |
| 1240 Hrs | JPSS-1 |
| 1330 Hrs | AQUA, SUOMI NPP |
| 1500 Hrs | NOAA-19 |

NRSC provides decision support for disaster management services for disasters like


- Floods
- Cyclones
- Landslides
- Earthquakes
- Forest Fires
- Drought etc.

More information <http://bhuvan.nrsc.gov.in>



Home x DIKSTR x NRSC x Welcom x Disast x NRSC x W Satellit x Search x Comm x Policy x New Tab x +

Not secure | bhuvan-noeda.nrsc.gov.in/governance/bhuvandisaster/

Apps dns.nrsc.gov.in:9090 http://uops.nrsc.gov.in Welcome to OceanSat Directory of ancillary/L Google WELCOME to New Vers NRSC employee direct New Tab


 **bhuvan**
Gateway to Indian Earth Observation


Disaster Management Support Services


National Remote Sensing Centre  

FLOOD CYCLONE LANDSLIDE EARTHQUAKE FOREST FIRE DROUGHT


FLOOD

 Near Real Time Flood Monitoring



 Flood Early Warning

 Flood Vulnerability Index









CYCLONE

 Near Real Time Cyclone Monitoring

LANDSLIDE

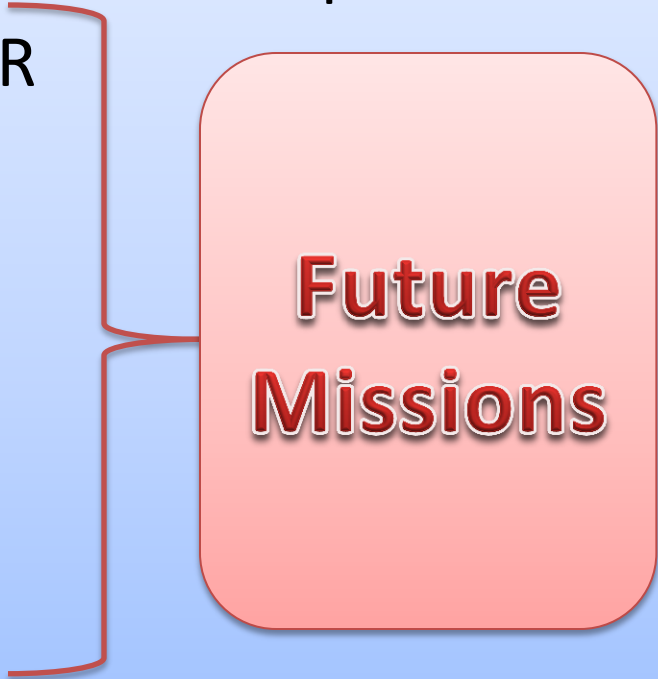
 

© Disaster Management Support Division, RSAA/NRSC/ISRO, 2017

Start         6:55 PM 11/26/2018

Ongoing & Future Activities

ISRO's Recent and Future Satellites

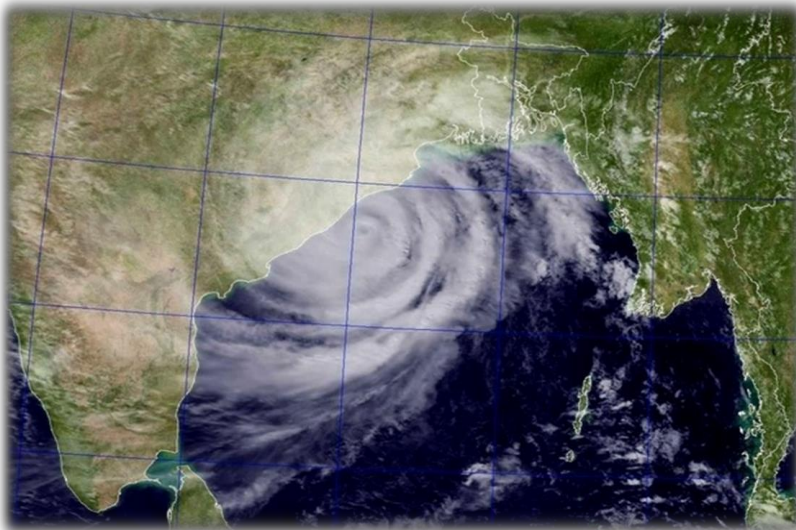
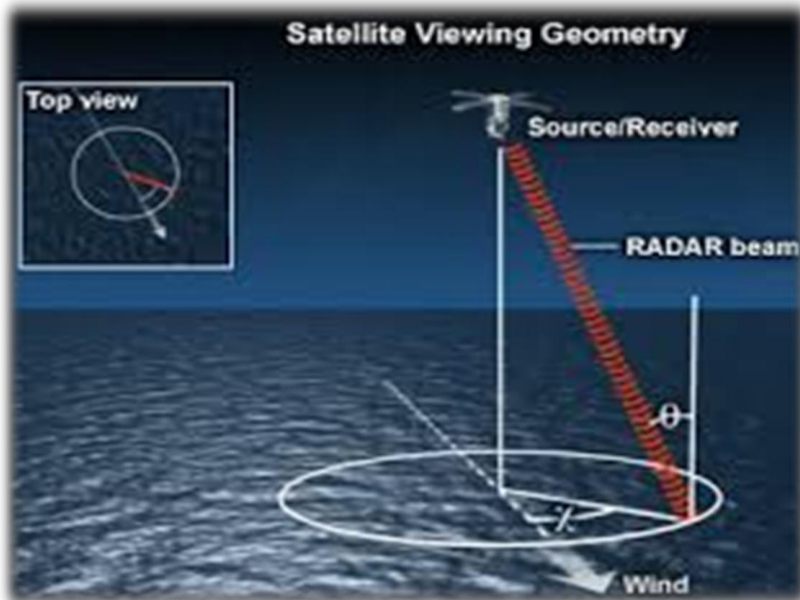
- SCATSAT-1 successfully launched in 2016 –operational
 - CARTOSAT-2S successfully launched in 2017–operational
 - Cartosat-3 - Sub meter PAN, Mx & IR
 - OCEANSAT-3
 - RISAT-1A
 - GISAT: HR Missions from Geo orbit
 - HRSAT Constellation of 3 satellites
 - Resourcesat-3A
 - Resourcesat-3S
- 
- A red bracket on the right side of the list groups the last six items (RISAT-1A, GISAT, HRSAT, Resourcesat-3A, and Resourcesat-3S) and points to a red rounded rectangle containing the text 'Future Missions'.
- Future Missions**

For more information and data products please contact
ndc@nrsc.gov.in

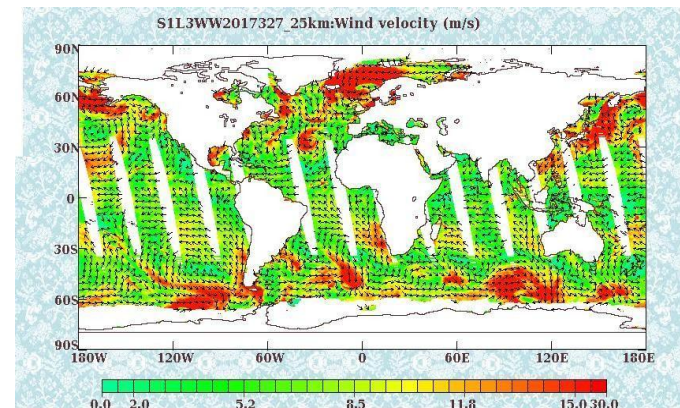
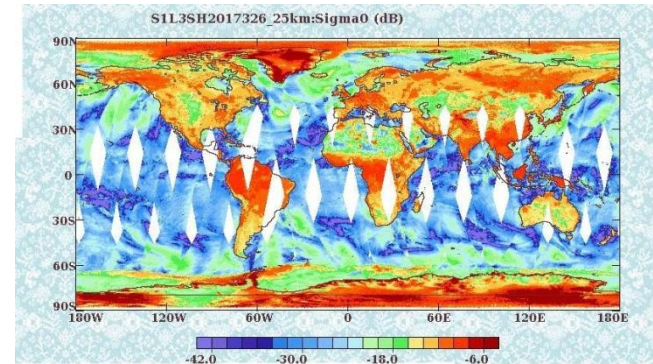
Ongoing & Future Activities...

SCATSAT-1

Operational



OSCAT continuity mission



8 lakhs scenes downloaded

Payloads:

- Ku-Band Pencil Beam Scatterometer with 25km x 25km

Launch date

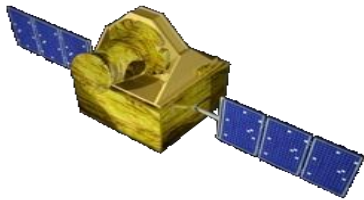
26th Sept. 2016

Data made available within 90 minutes of the pass

Ongoing & Future Activities...

OCM-3

F
U
T
U
R
E



Ocean Color Monitor-3 Payload

- Payload for Ocean & Land Applications
- Thirteen(13) Spectral Bands in the Visible & Near Infra red region (407 to 1020 nm)
- Narrow band width spectral bands
- Large Coverage with good Spatial Res.

Swath : 1440 km.

Repeativity : 2 days

IGFOV : 360 m (B1 to B10);
1080 m (B11 to B13)

- High radiometric performance at low radiance
 - SNR > 1000 at Sea Ref Radiance
- Provision for along track tilt ($\pm 20^\circ$) to avoid Sun glint

Payloads

- OCM(Ocean Color Monitor) -3
- Scatterometer-3
- SSTM-1 (Sea Surface Temperature Measurement with 2 TIR Bands)

Launch planned by Oct 2019

Suomi-NPP data processing @ IMGEOs

- NRSC has started Suomi-NPP satellite data acquisition and processing since September 2014.
- Daily 4 passes (2-day, 2-Night) data is being acquired and processed.
- Currently VIIRS, ATMS and CrIS sensors data is being processed.
- Data acquisition and processing happens in a complete automated manner.
 - Two workstations for data acquisition and data processing for prime chain and two work stations for redundant chain.
 - Data acquisition system is responsible for acquisition and RDR/PDS products generation.
 - Data processing system is responsible for data products (SDR/EDR and customised products) generation, dissemination and archiving.
- Till Dec 2018 68TB data archived

Acquisition system

Processor:16 core CPU

RAM: 8 GB

Hard disk: 2TB

OS: Centos 6.5, 64 bit

One Gigabit Ethernet card

Data processing system

Processor:32 core CPU

RAM: 16 GB

Hard disk: 2TB

OS: Centos 6.5, 64 bit

One Gigabit Ethernet card

- Suomi-NPP automatic data processing software is developed by using different SPA's from DRL/NASA.

Recent upgradation

Migrated data processing to new system with upgraded configuration (48 core CPU, 128GB RAM) and CentOS 7.0

Future Plans

- Planning to use IPOPP interface in the near future

Active fire products generation and dissemination

Fire products generation and dissemination

NRSC is generating and disseminating fire products from

- MODIS on-board AQUA and TERRA satellites
- VIIRS on-board SNPP, **JPSS-1***

Using SPA's provided by DRL/NASA

Fire alerts are disseminated to

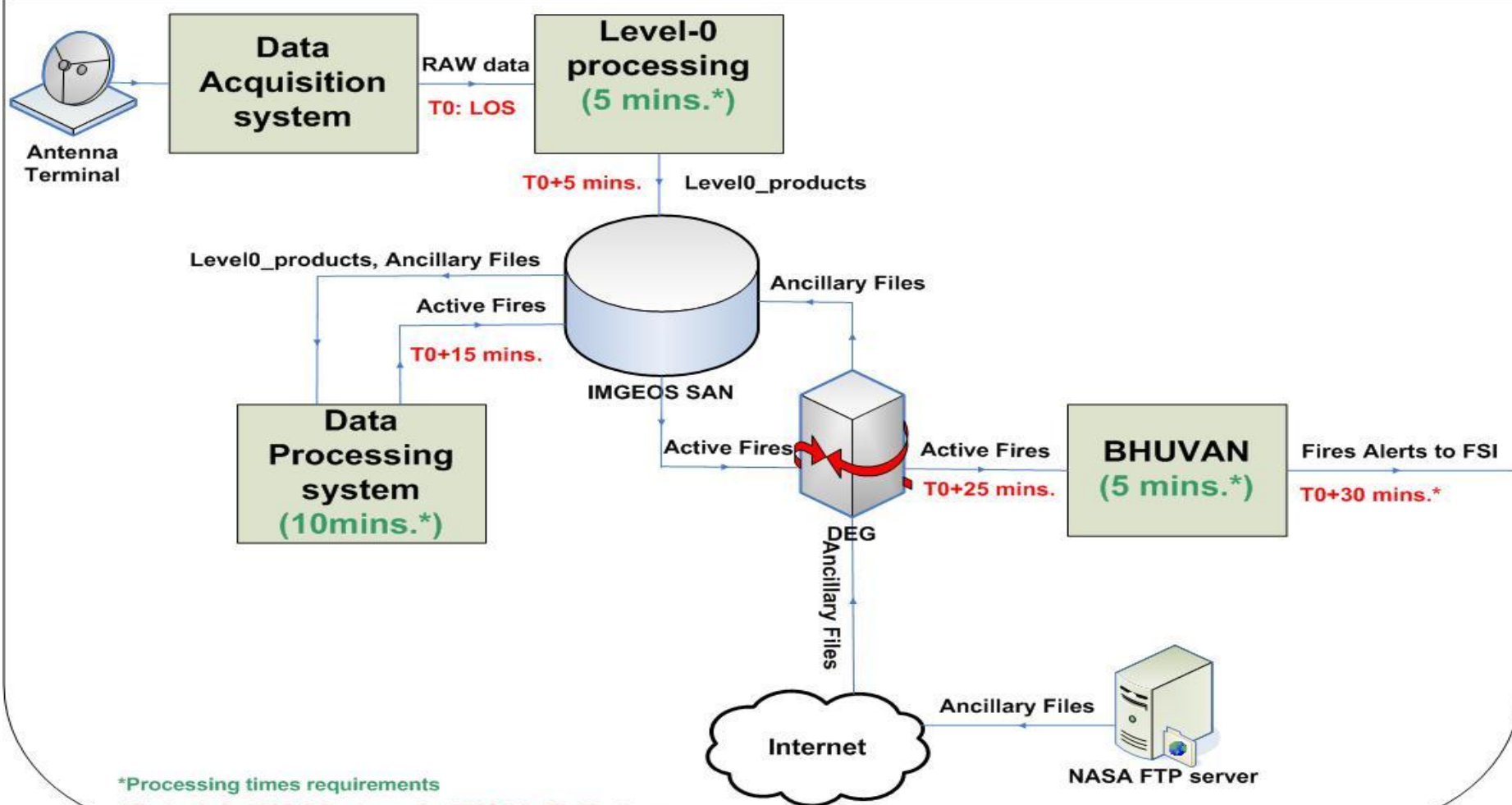
- FSI (Forest survey of India)
- Different state government departments

Fire products are also web published on BHUVAN portal

*** Recently started**

Fire products generation and dissemination setup

MODIS/VIIRS Active Fires data products generation and dissemination block diagram

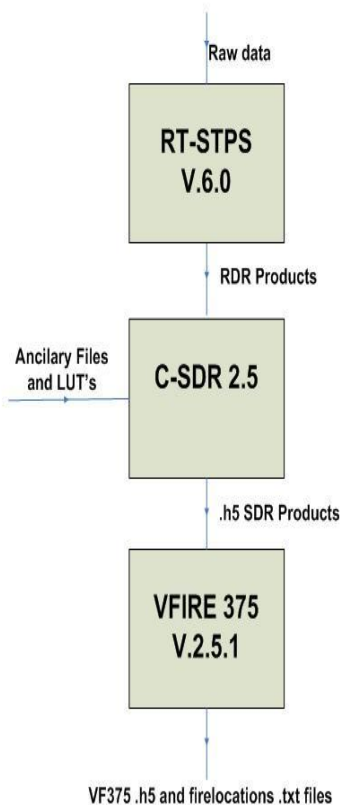


*Processing times requirements

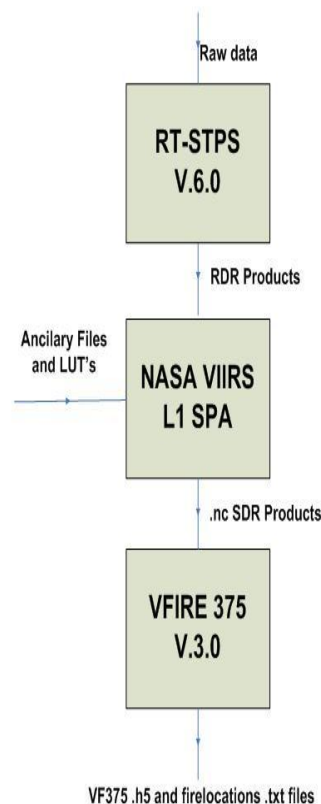
* Timing is for MODIS Products , for VIIRS it is T0+90 minutes

SNPP Fire products generation- data processing chain

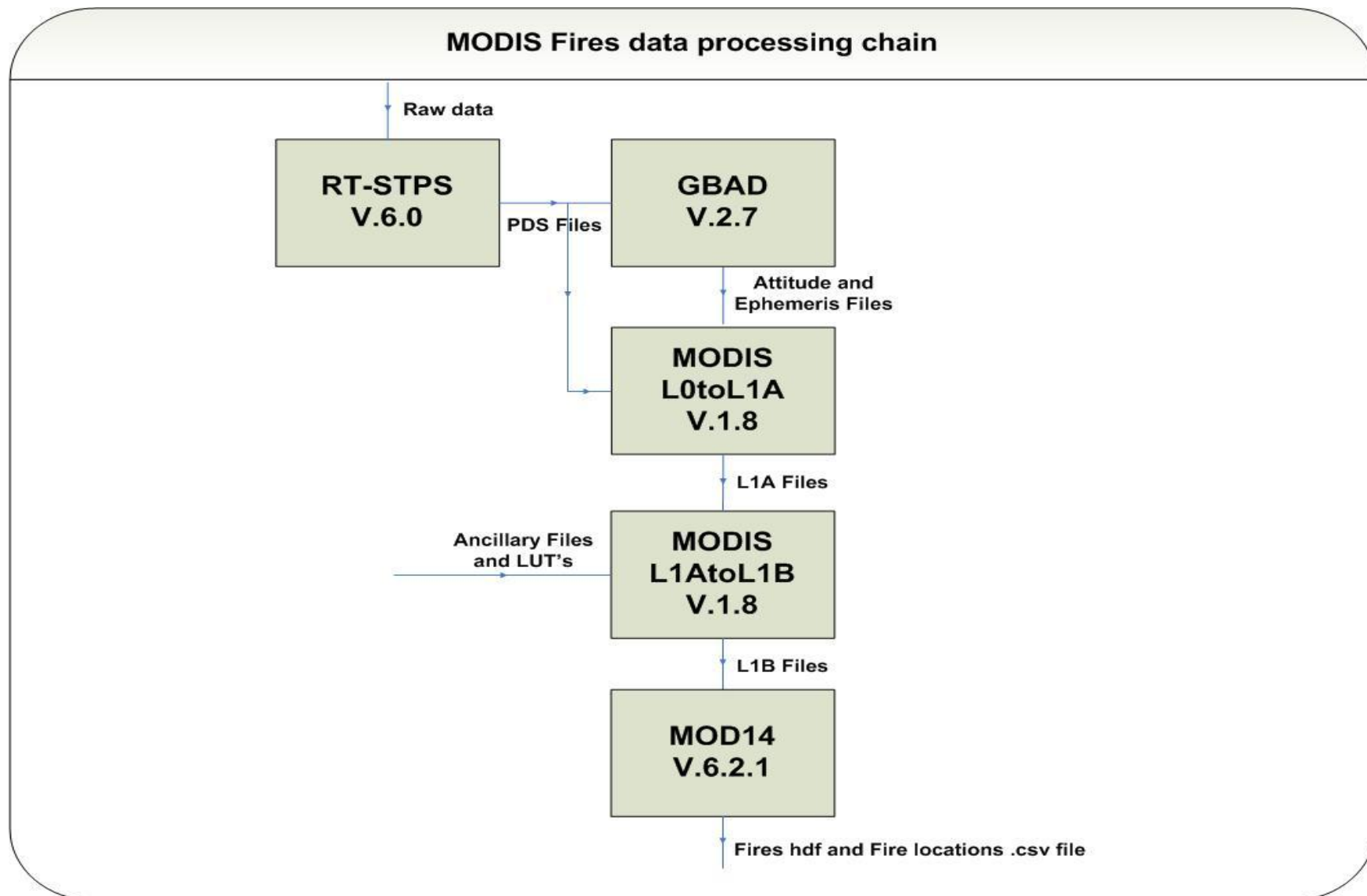
VIIRS 375m. V.2.5.1 Fires data processing chain

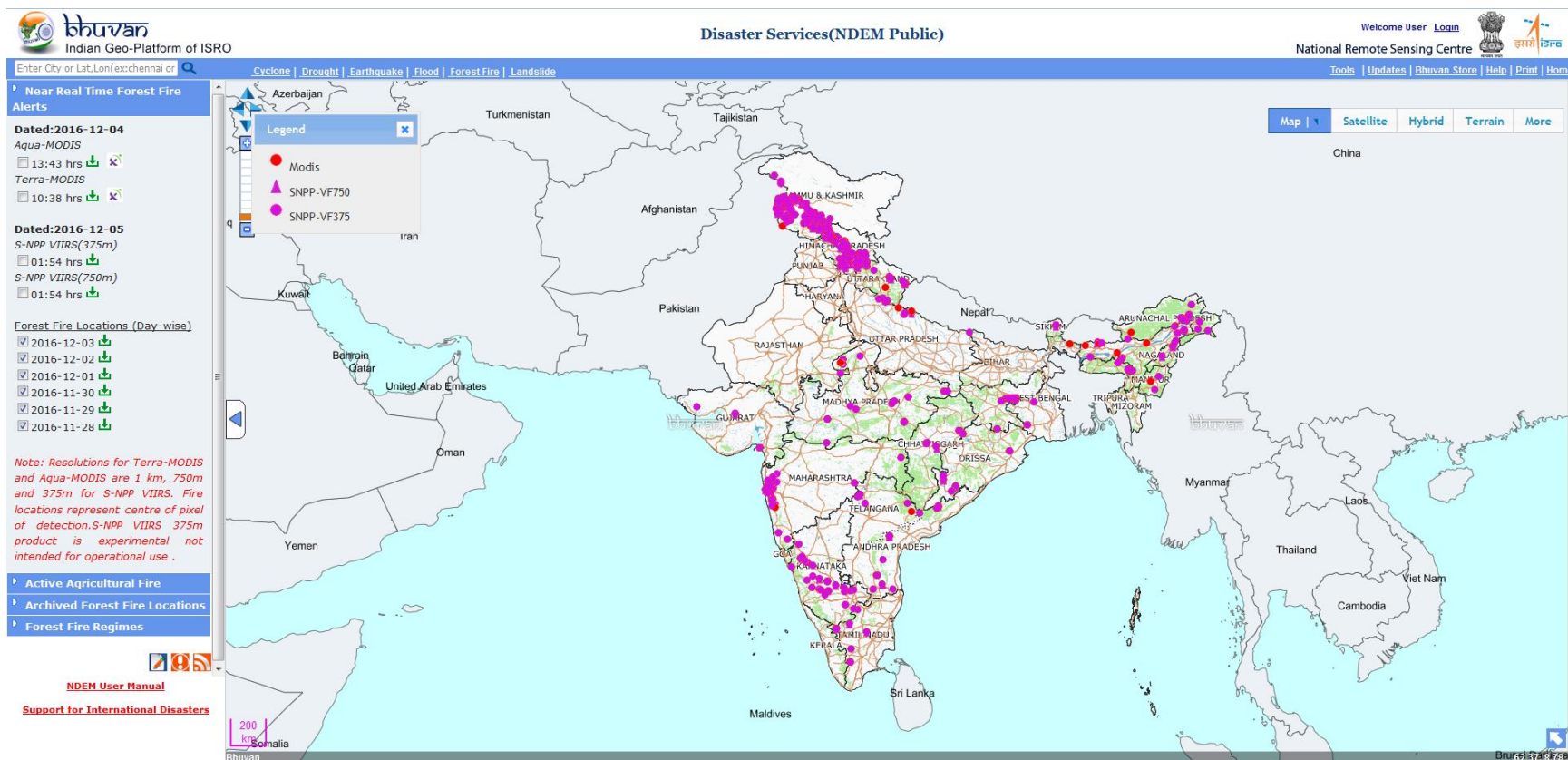


VIIRS 375m. V.3.0 Fires data processing chain



MODIS Fire products generation- data processing chain





- ~16 satellite passes (MODIS & VIIRS, day/night passes) processed per day
- Active fire alerts sent in < 30 mins. of each pass to FSI from MODIS sensor and in <90 mins. for VIIRS sensor .
- Fire alerts are web-published via BHUVAN portal for geo-visualization
- SMS alerts sent to nodal officers of state forest departments

Issues observed with VFIRE375_2.5.1 SPA

Issues observed with VF375 V2.5.1 SPA

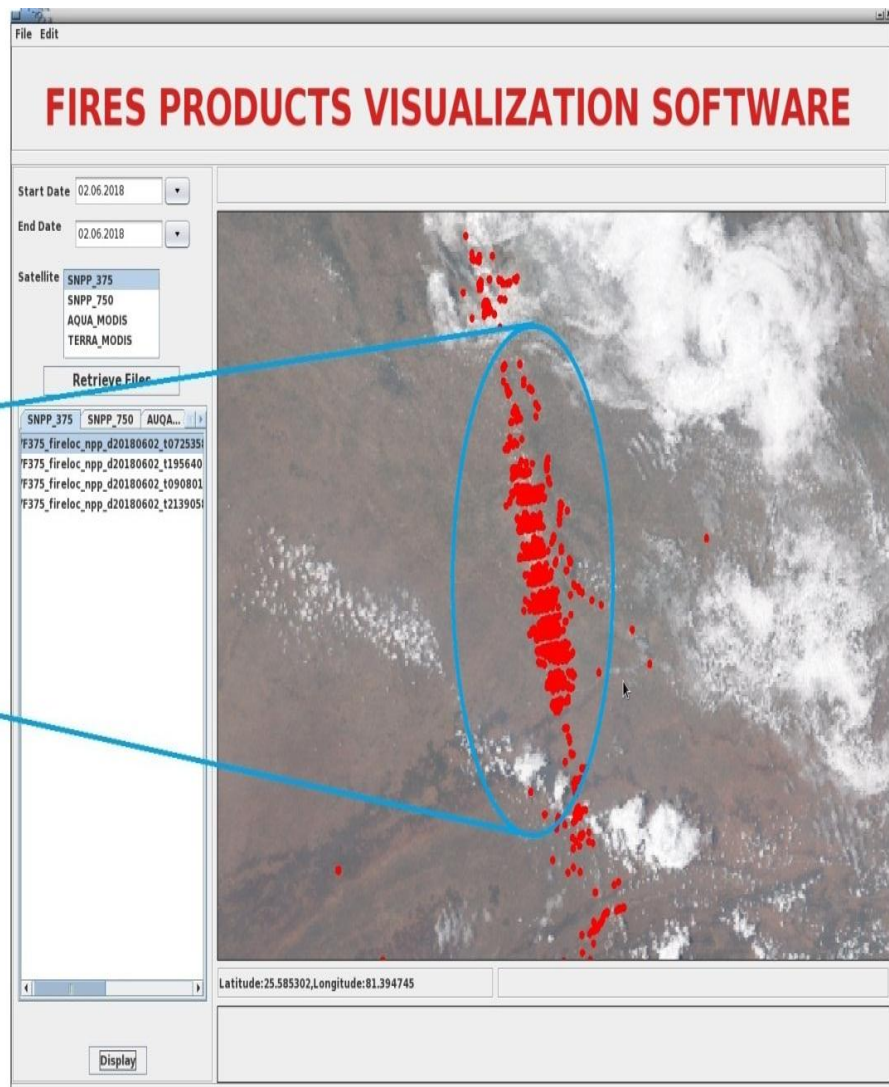
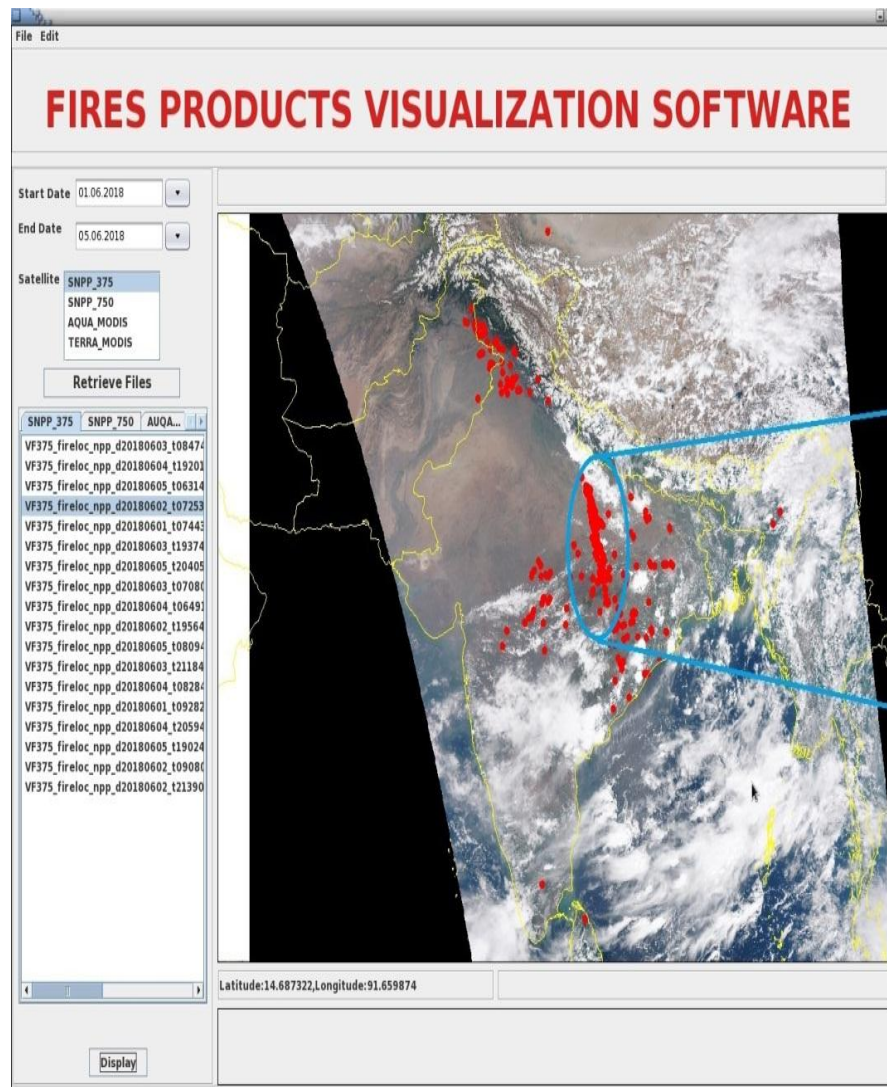
Observed some issues in the 375m. Fire products generated using VF375 SPA V2.5.1 SPA in the month of June, 2018.

They are mainly categorized as

- Spurious fires detected in sun glint affected areas over land.
- Spurious fires detected in the data break areas.

Analysed data sets of June, July, August 2018

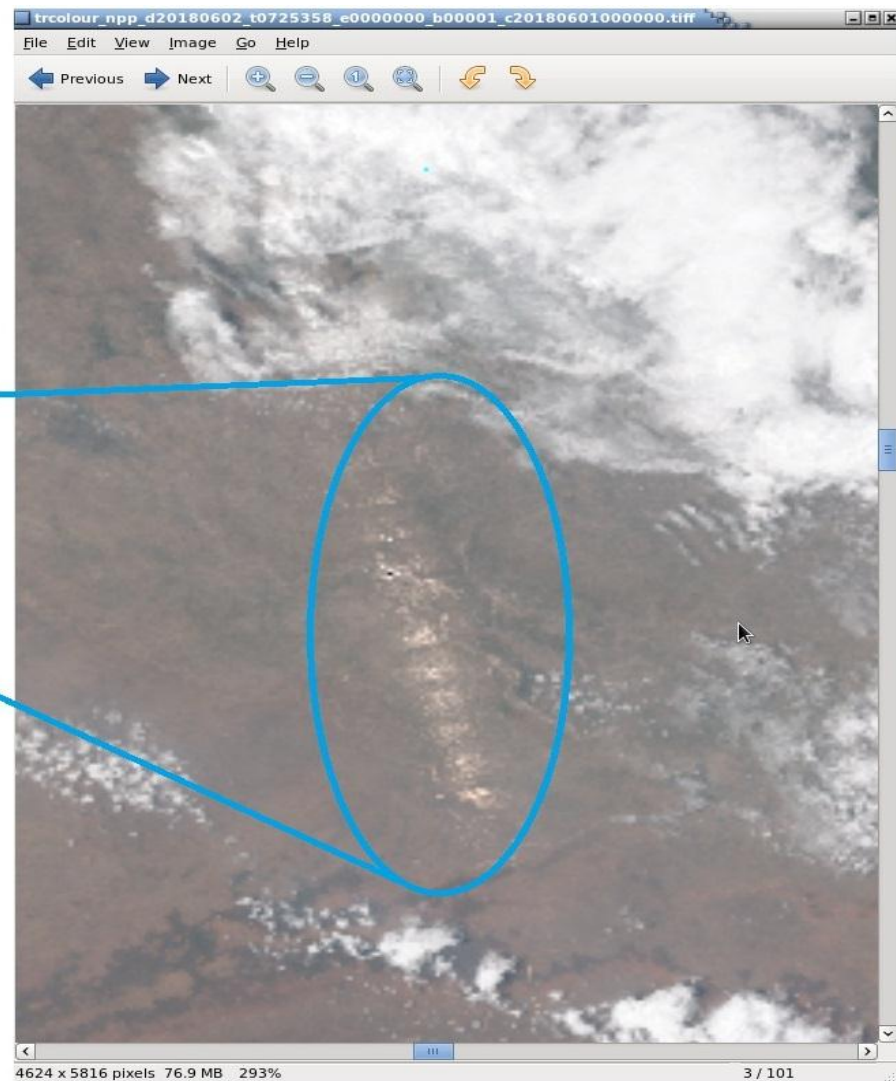
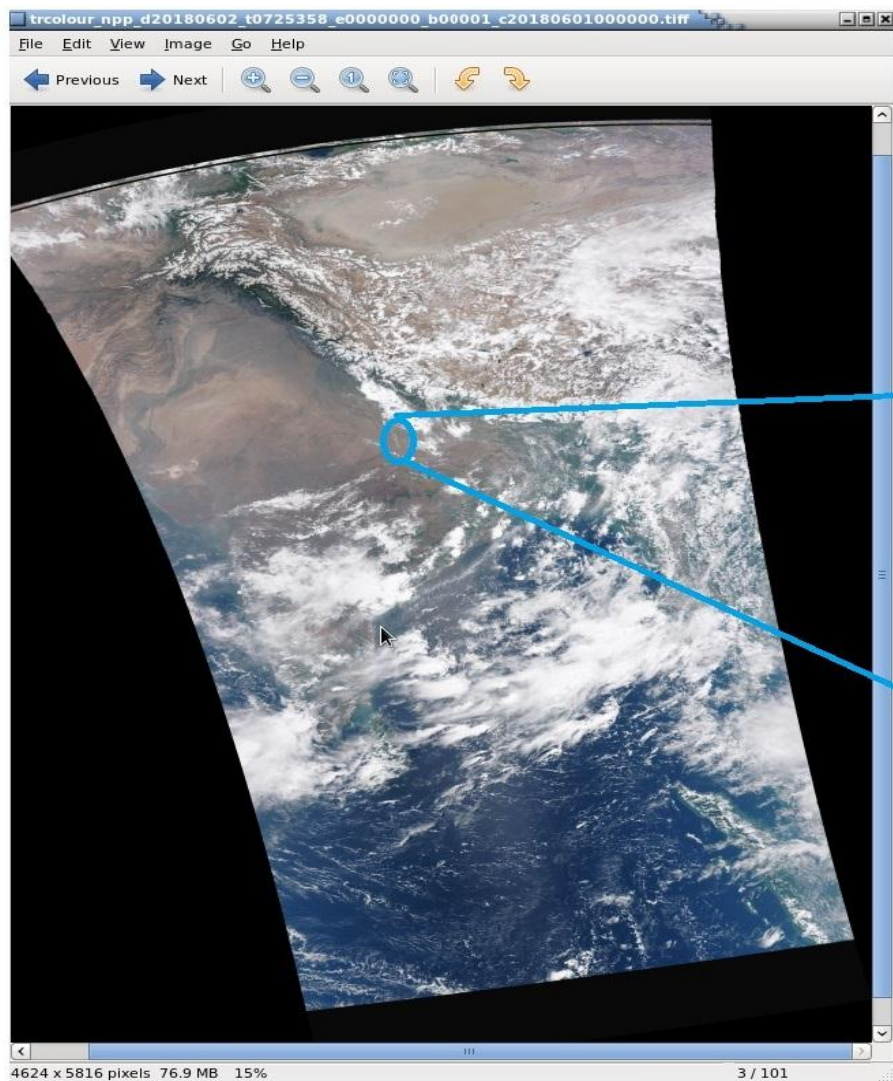
Sun glint



2018-06-02 07:25 UTC

Issues observed with V2.5.1 cont.

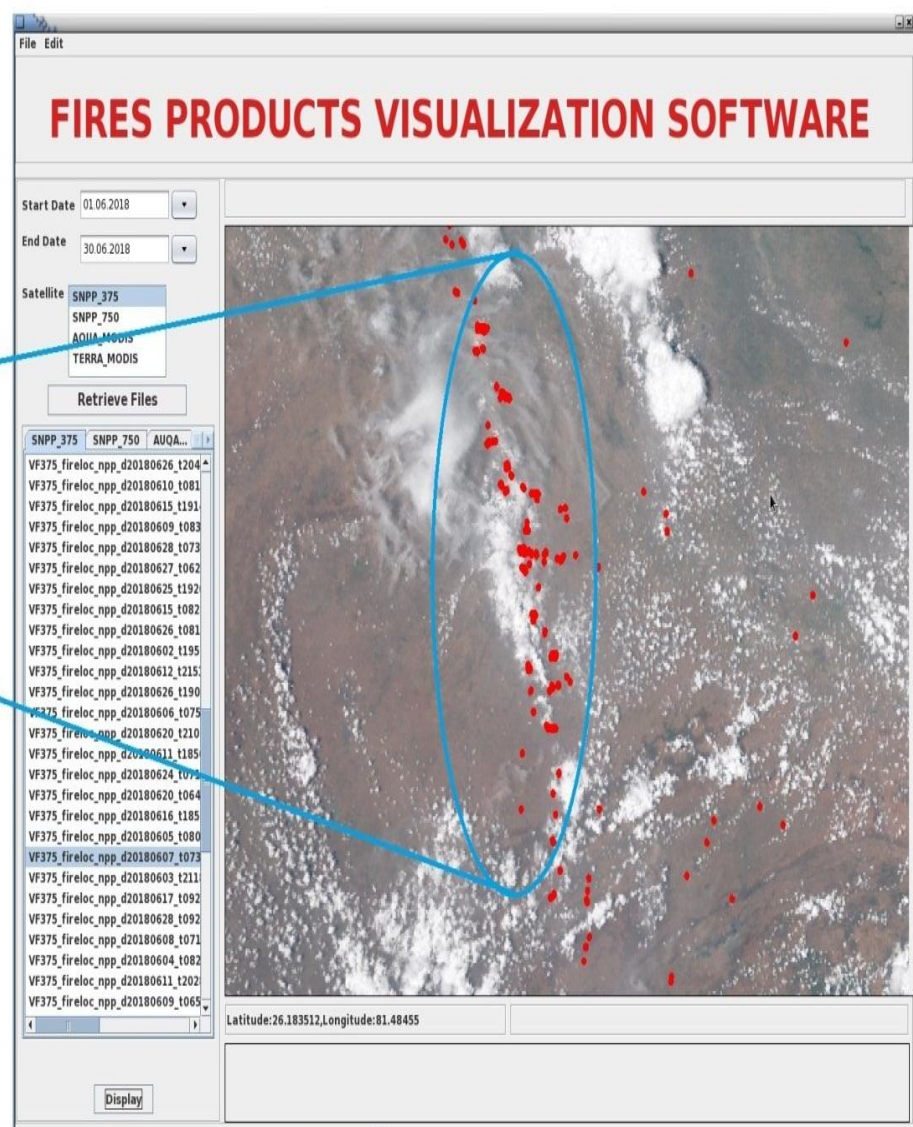
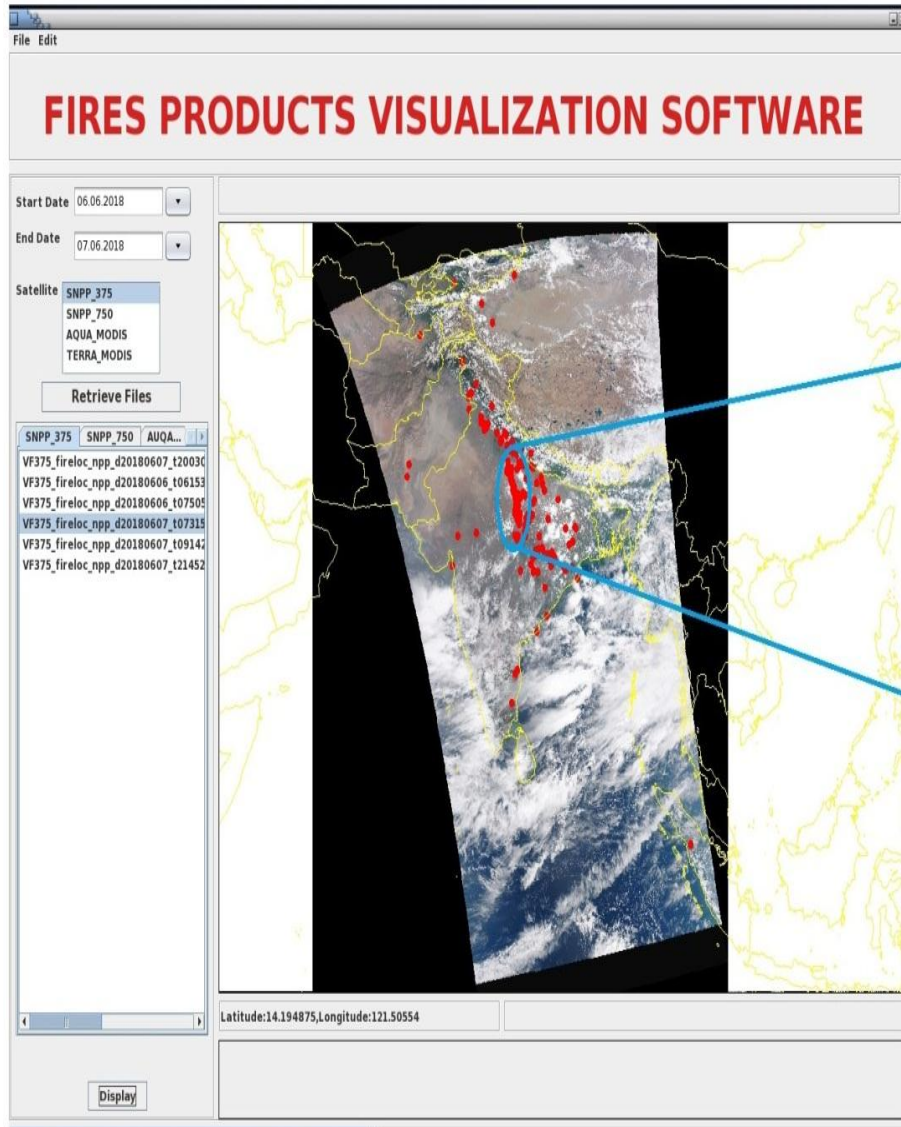
Sun glint



2018-06-02 07:25 UTC

nrsc Issues observed with V2.5.1 cont.

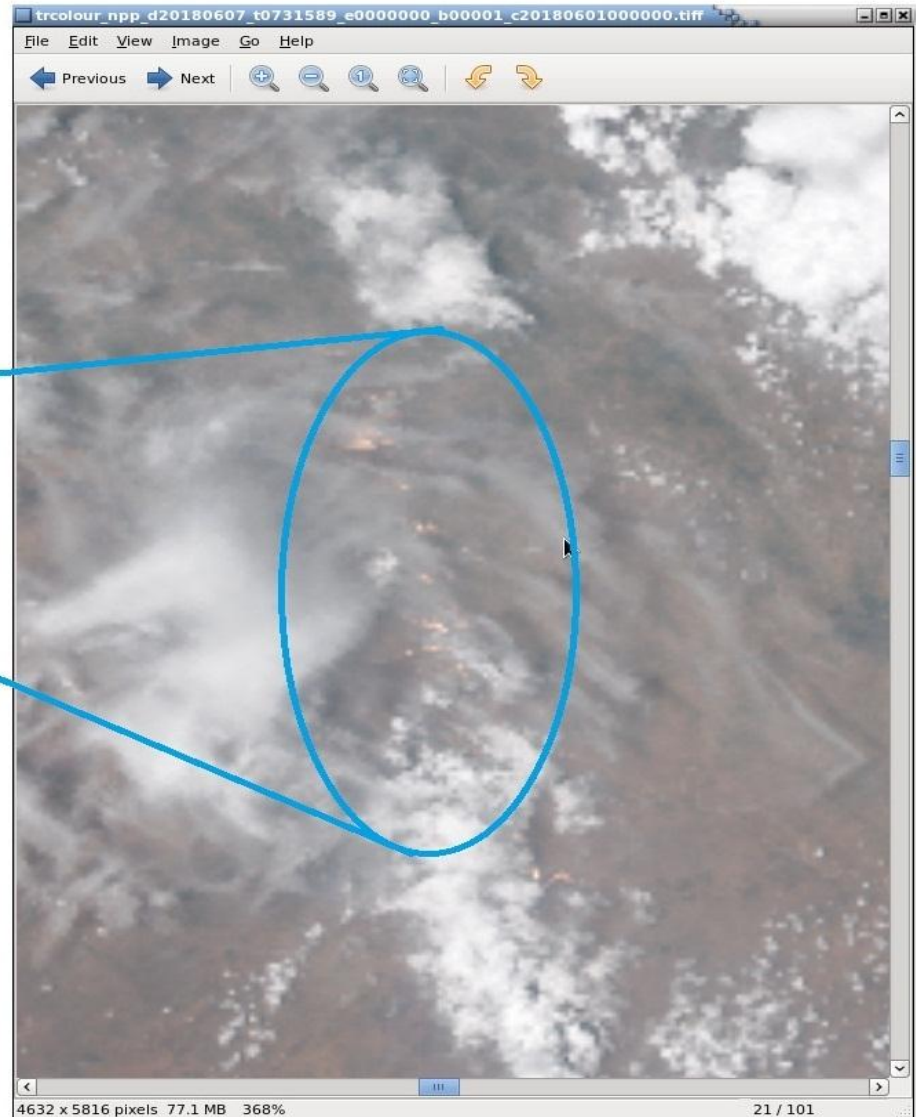
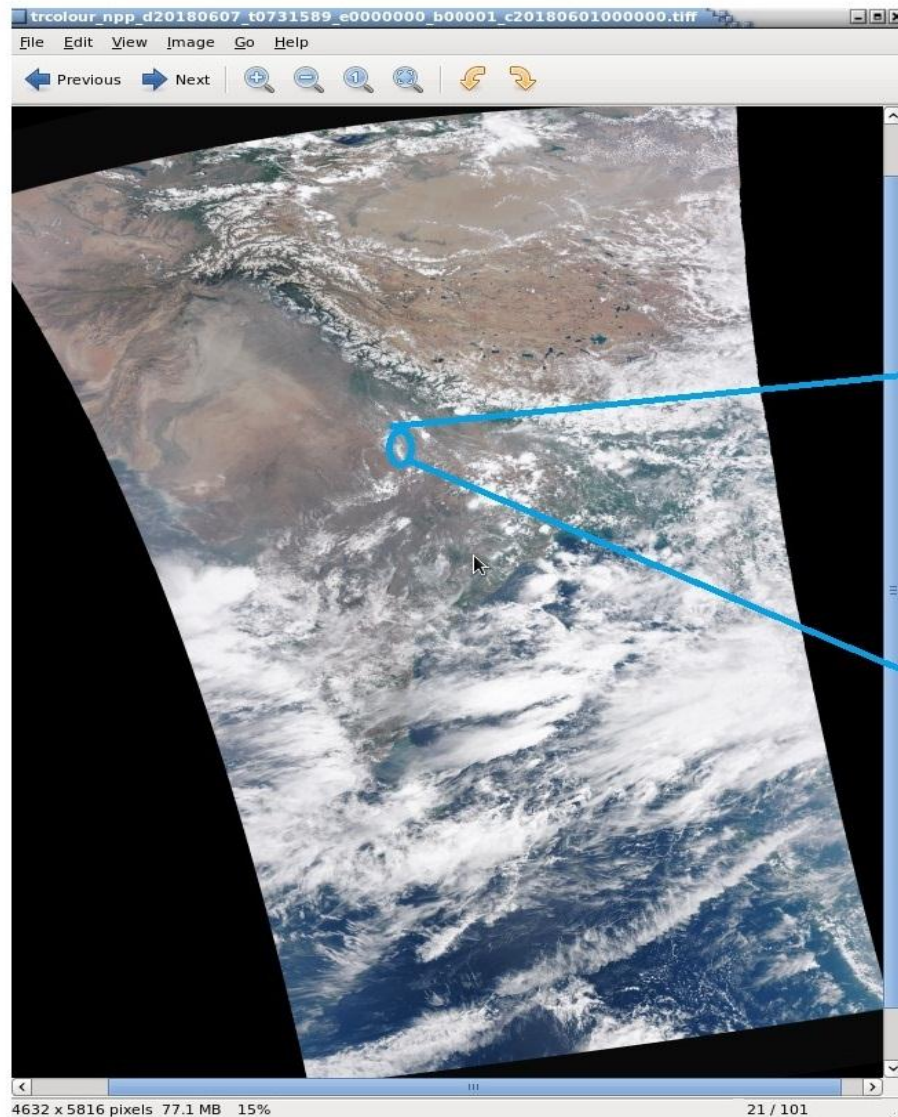
Sun glint



2018-06-07 07:31 UTC

nrsc Issues observed with V2.5.1 cont.

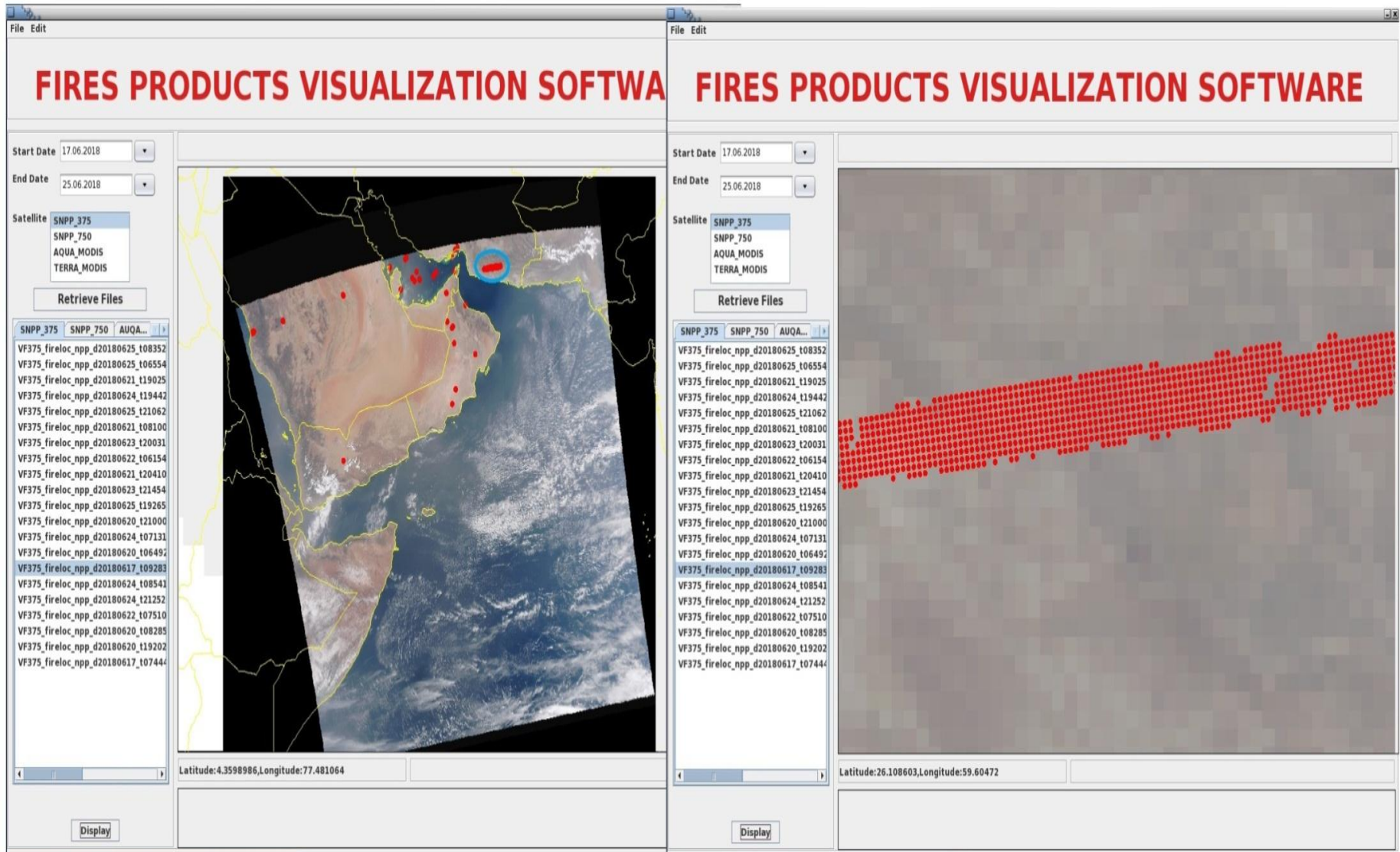
Sun glint



2018-06-07 07:31 UTC

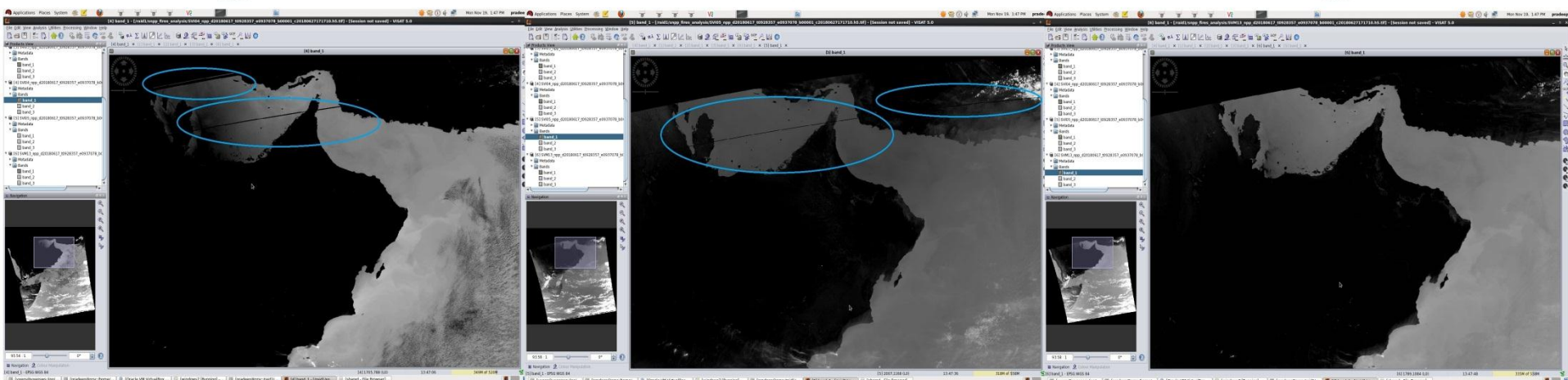
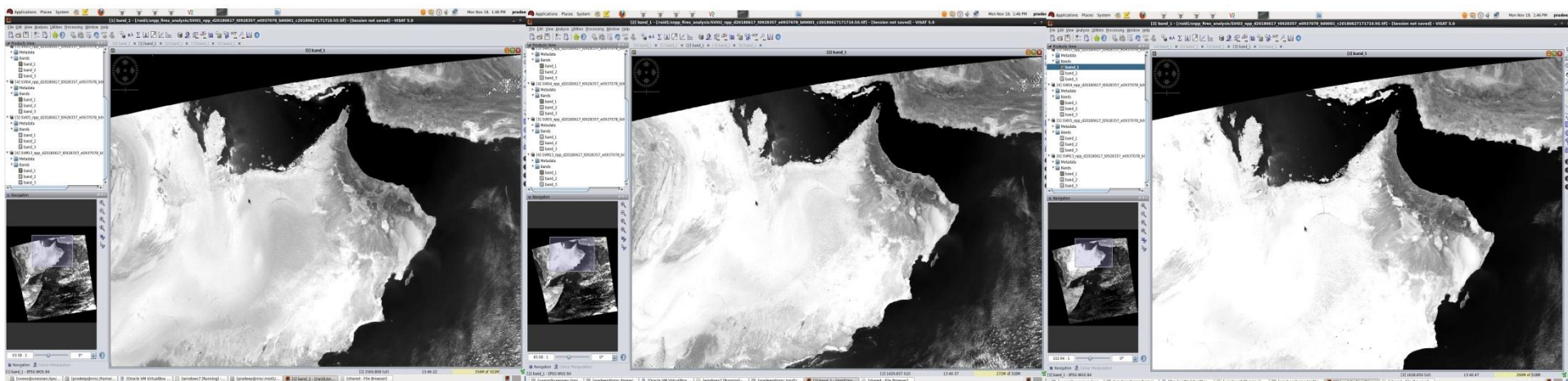
nrsc Issues observed with V2.5.1 cont.

Data breaks



Issues observed with V2.5.1 cont.

Data breaks



SVI 04

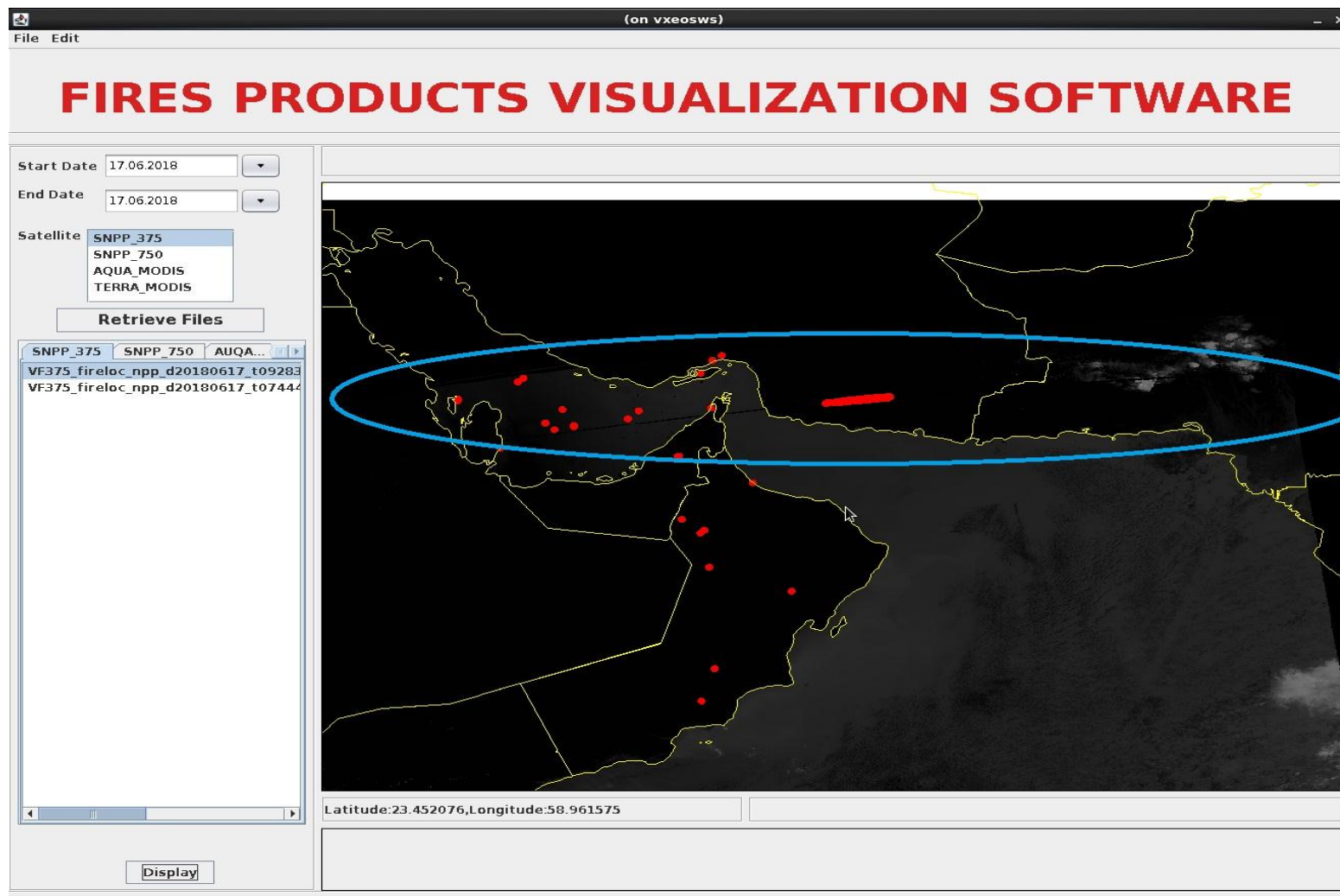
SVI 05

SVM 13

2018-06-17 09:28 UTC

Issues observed with V2.5.1 cont.

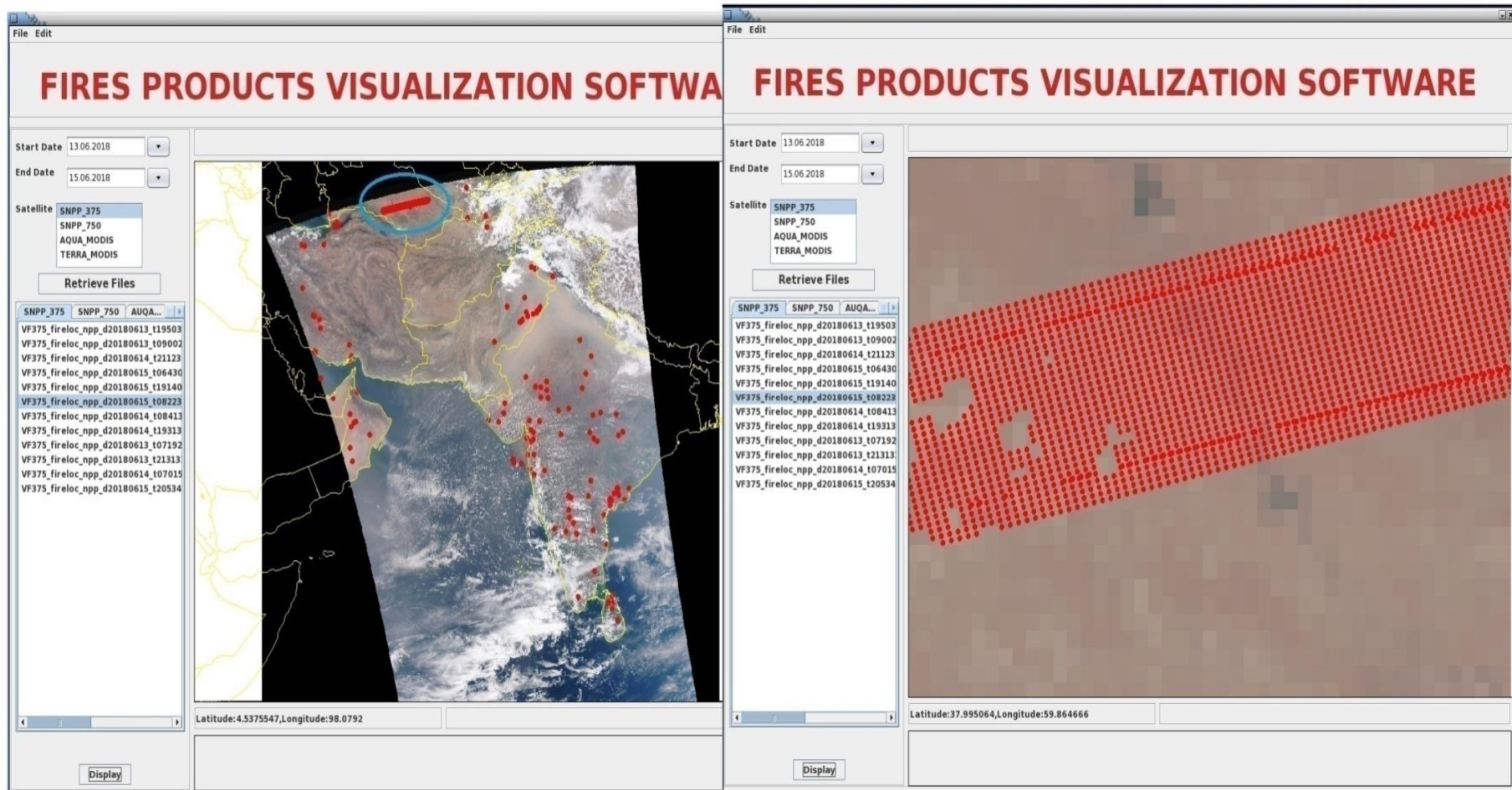
Data breaks



2018-06-17 09:28 UTC, Fire pixels overlay on SVI 04

Issues observed with V2.5.1 cont.

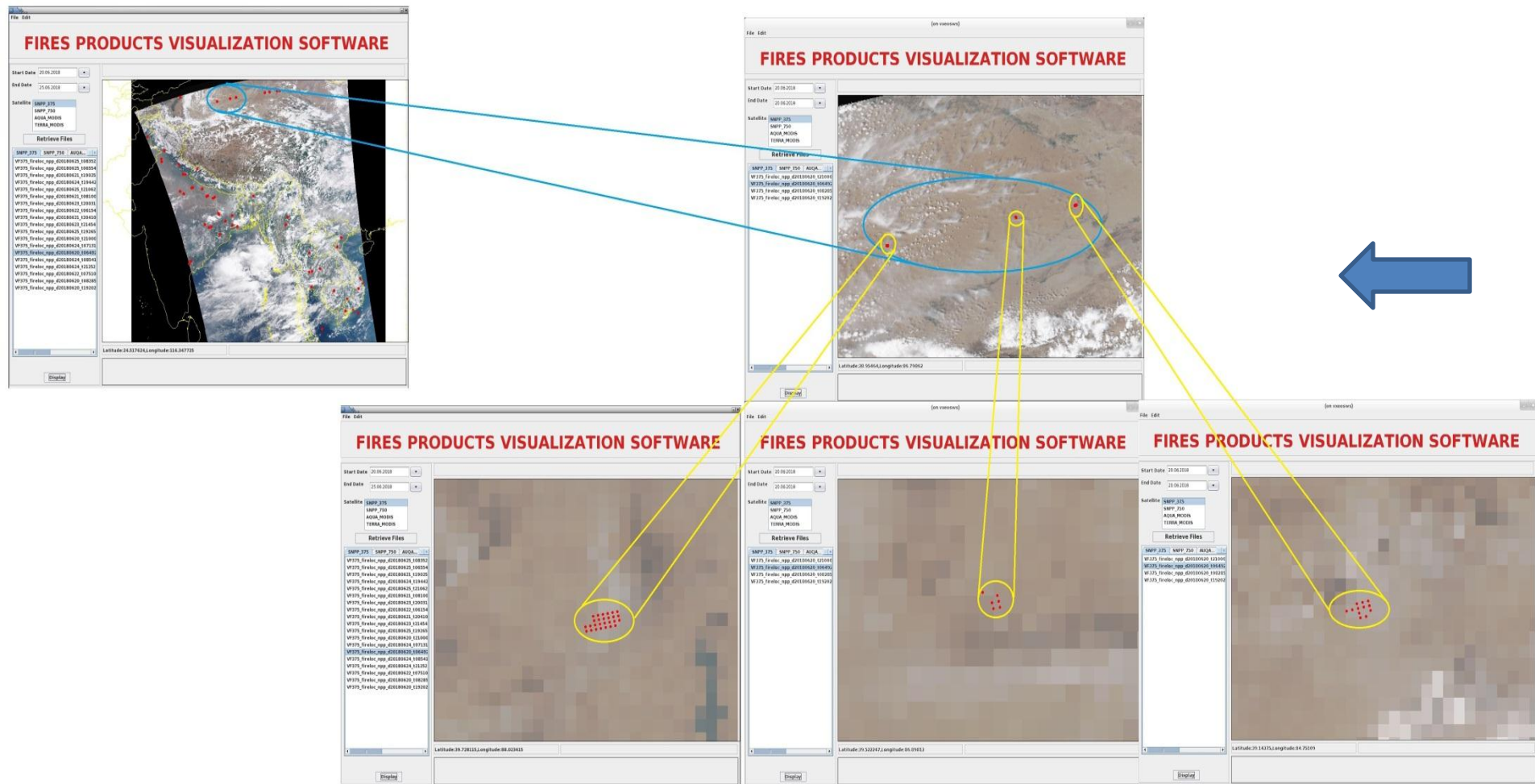
Data breaks



2018-06-15 08:22 UTC

Issues observed with V2.5.1 cont.

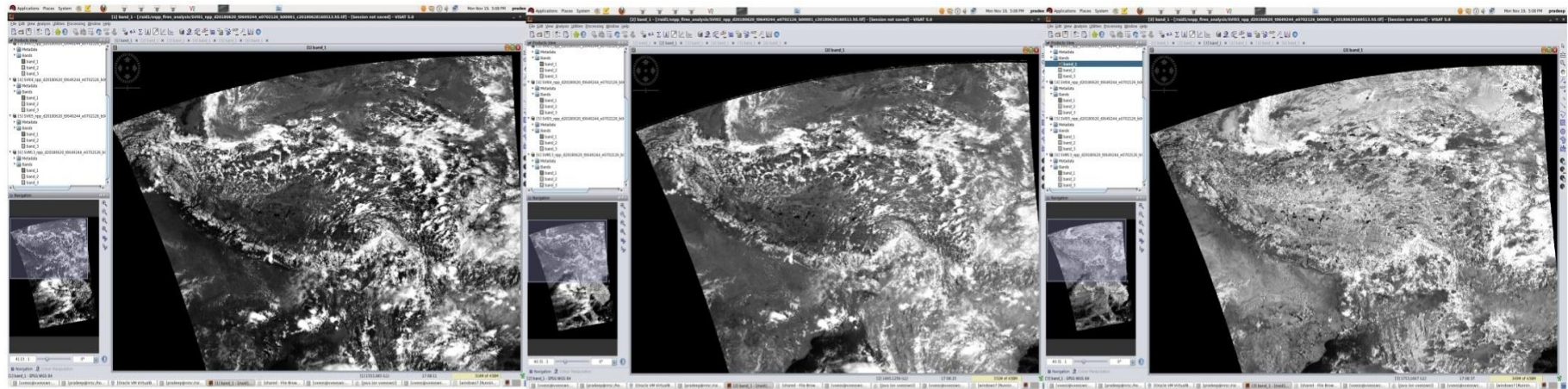
Data breaks



2018-06-20 06:49 UTC

Issues observed with V2.5.1 cont.

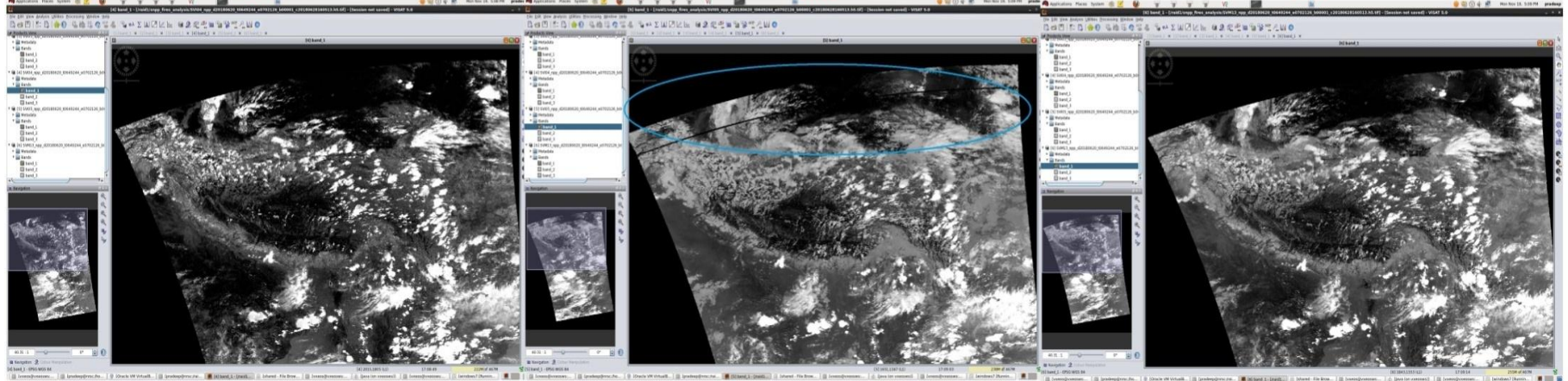
Data breaks



SVI 01

SVI 02

SVI 03



SVI 04

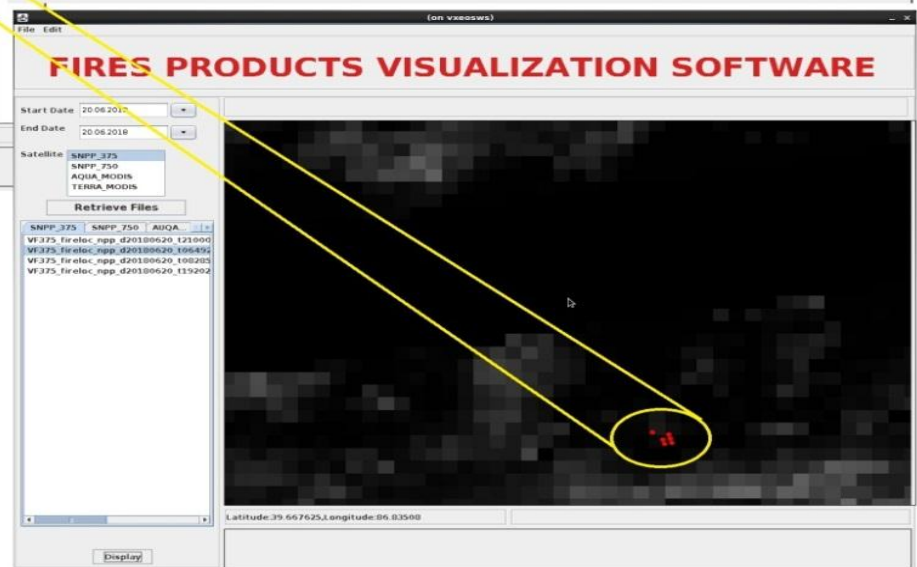
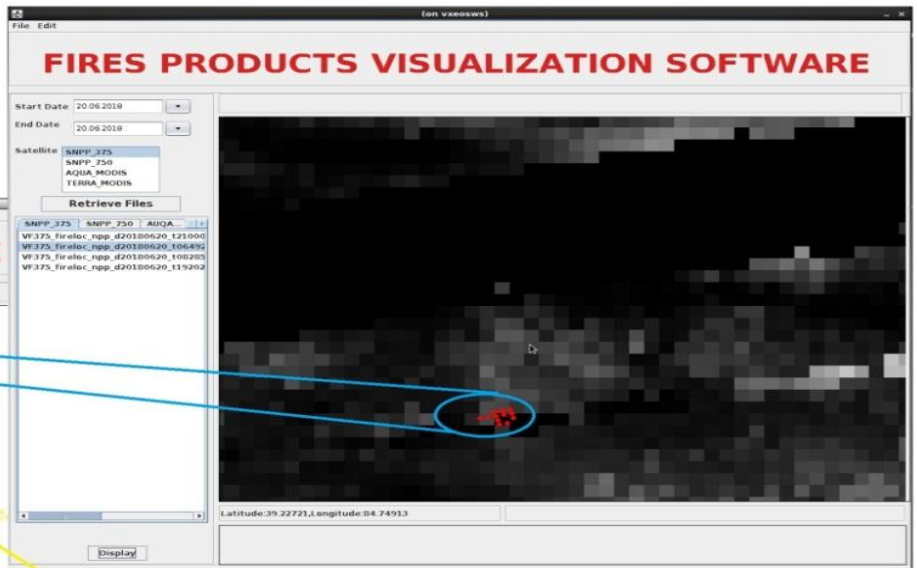
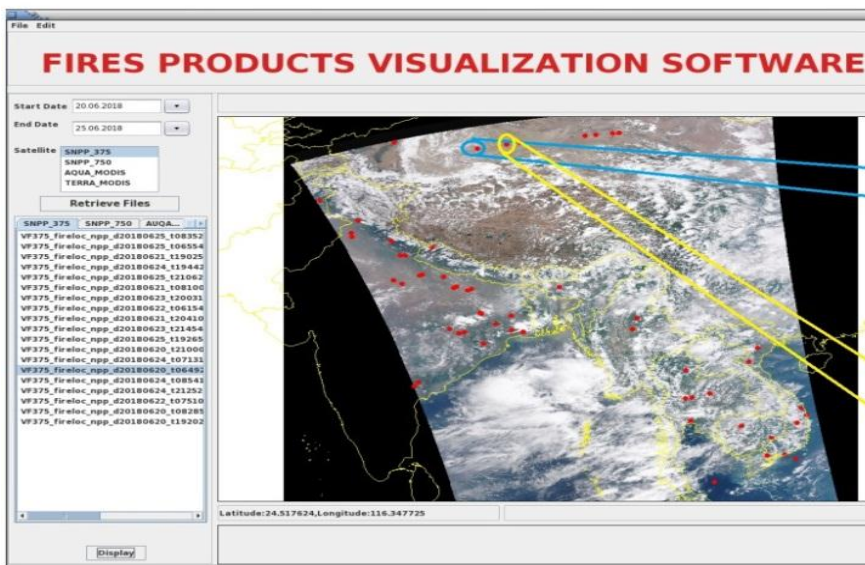
SVI 05

SVM 13

2018-06-20 06:49 UTC

nrsc Issues observed with V2.5.1 cont.

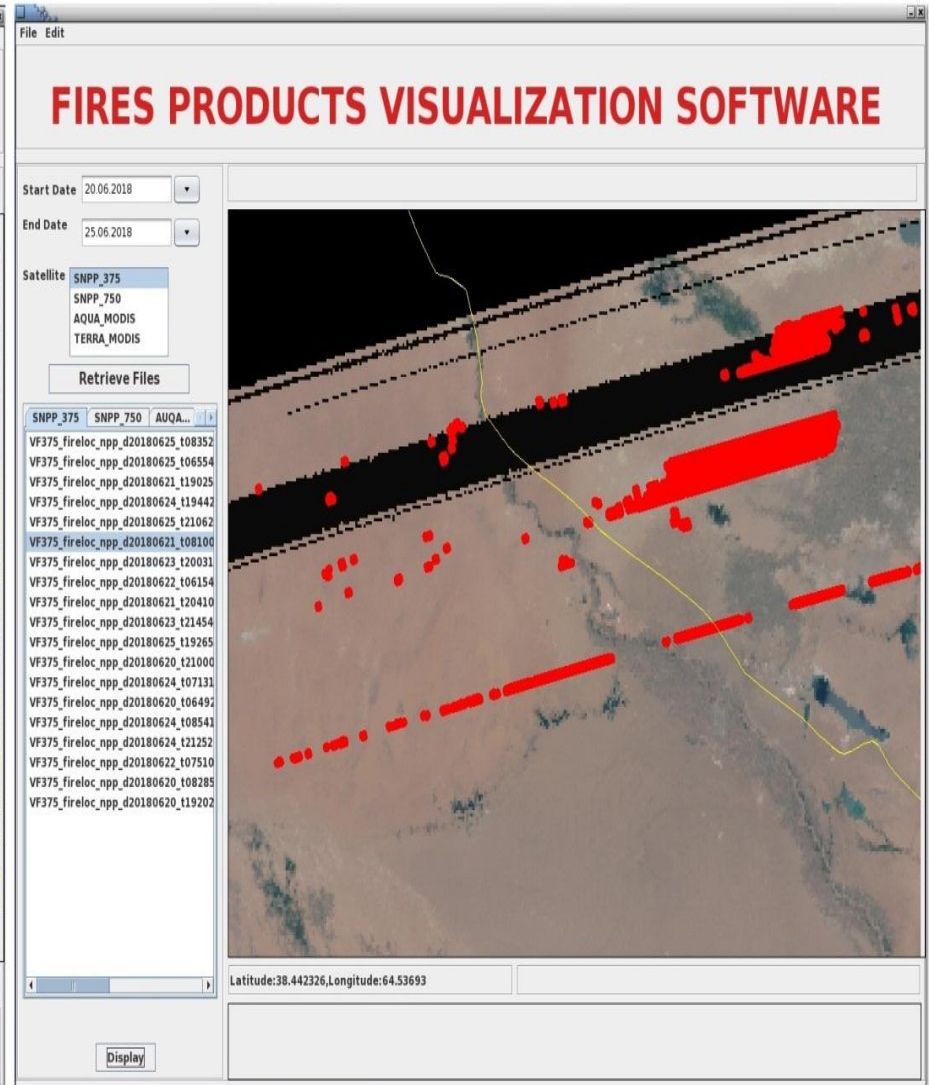
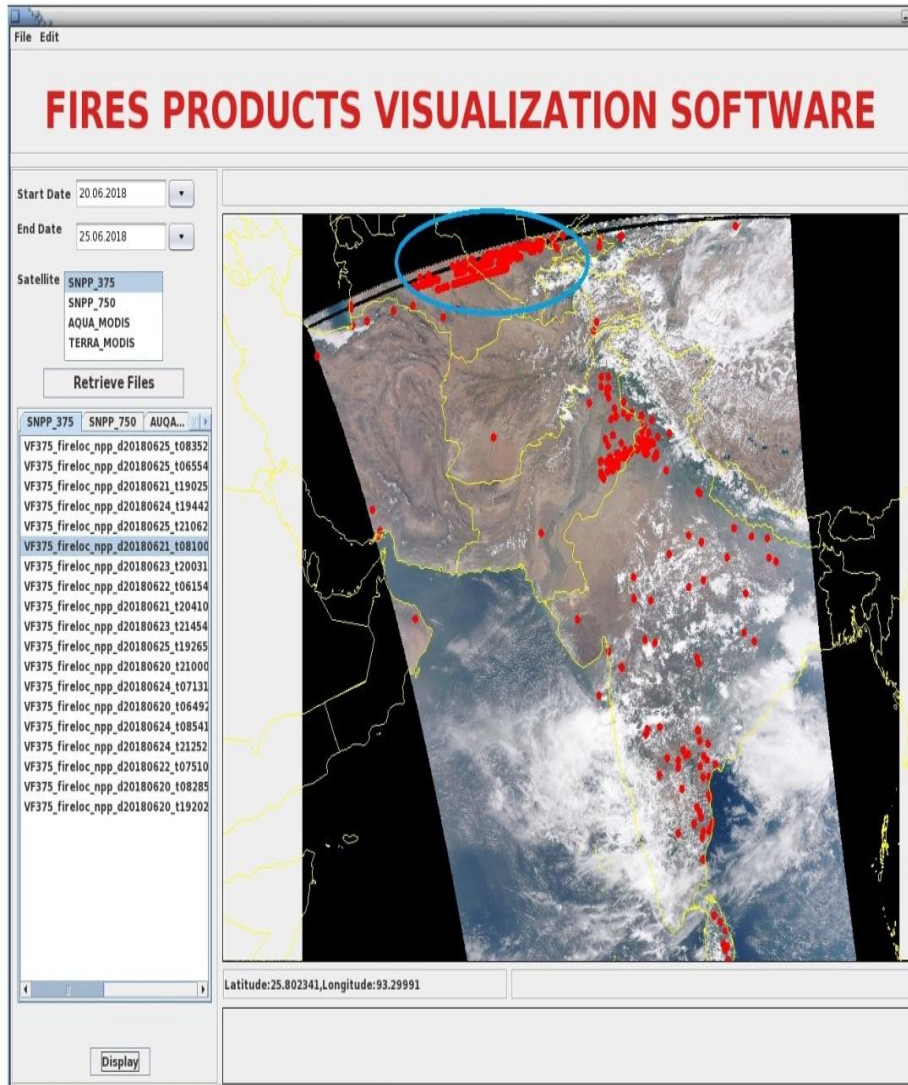
Data breaks



2018-06-20 06:49 UTC Fire pixels overlay on SVI 05

nrsc Issues observed with V2.5.1 cont.

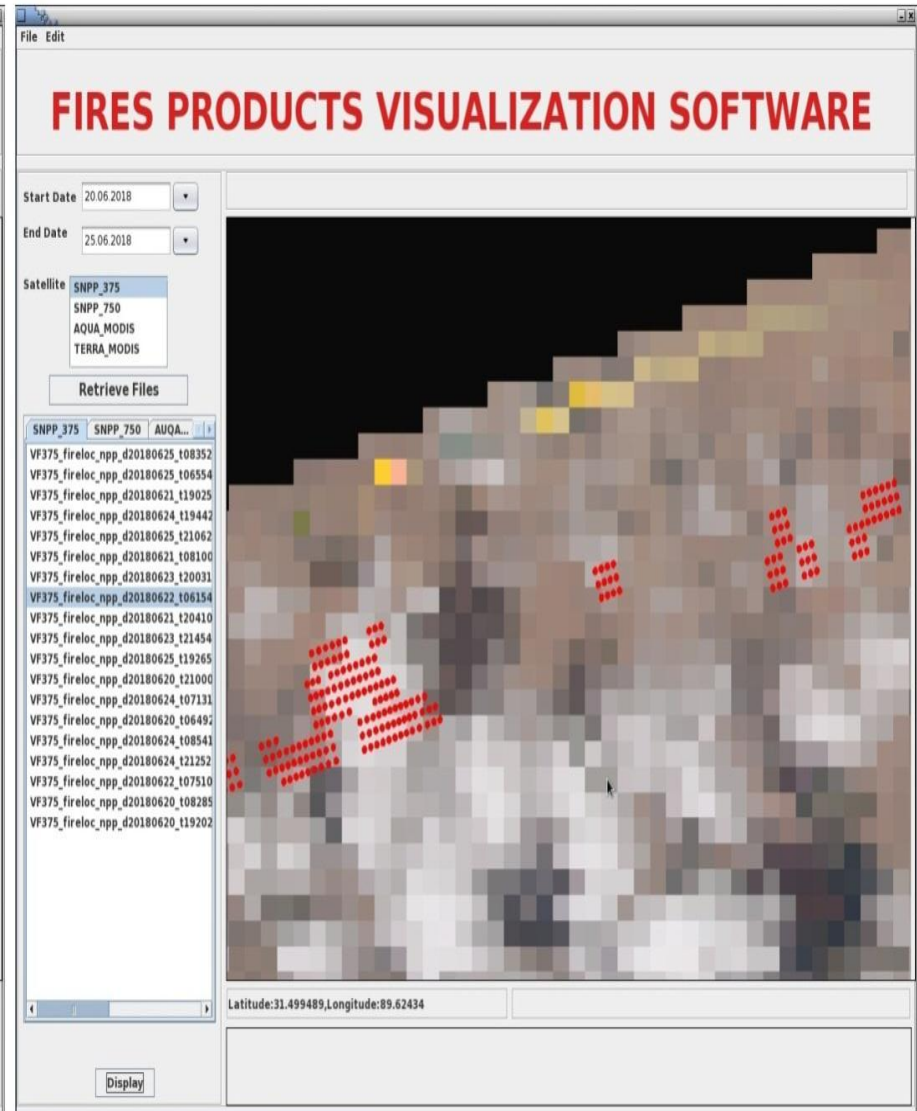
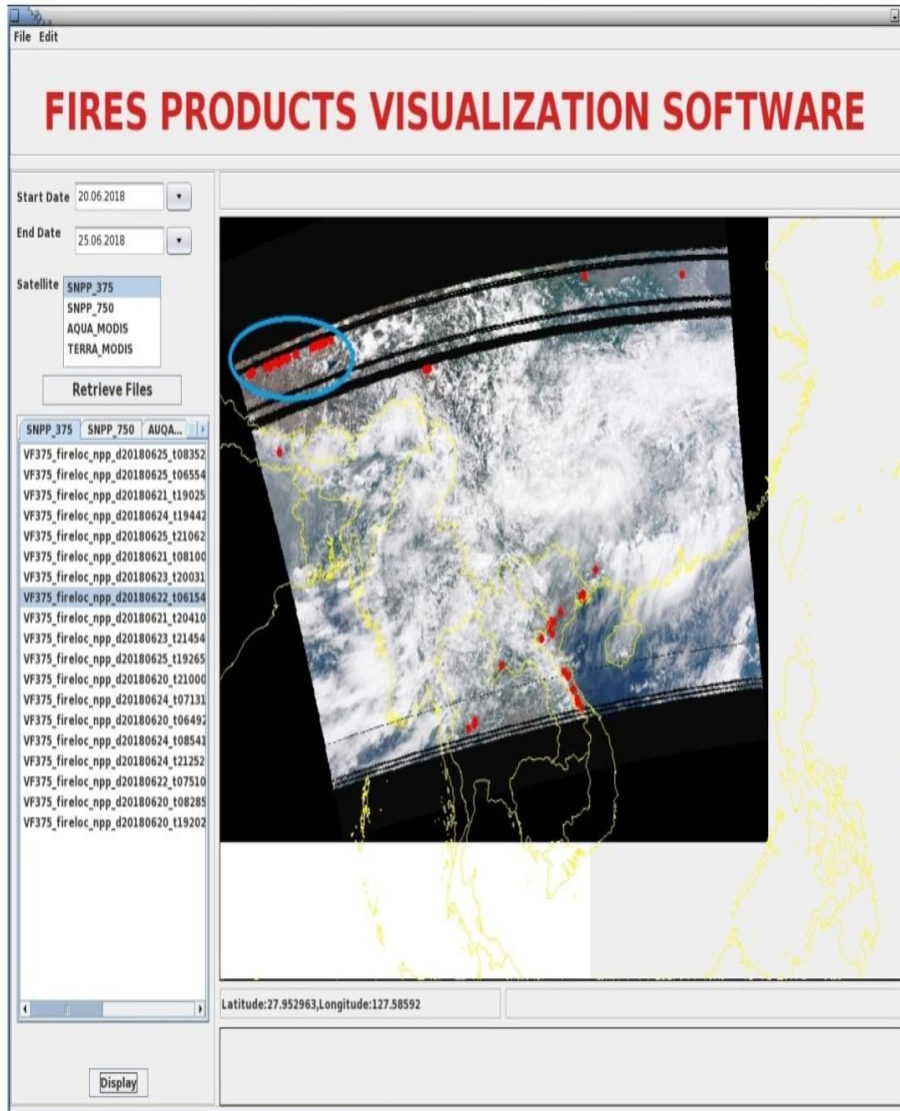
Data breaks



2018-06-21 08:10 UTC

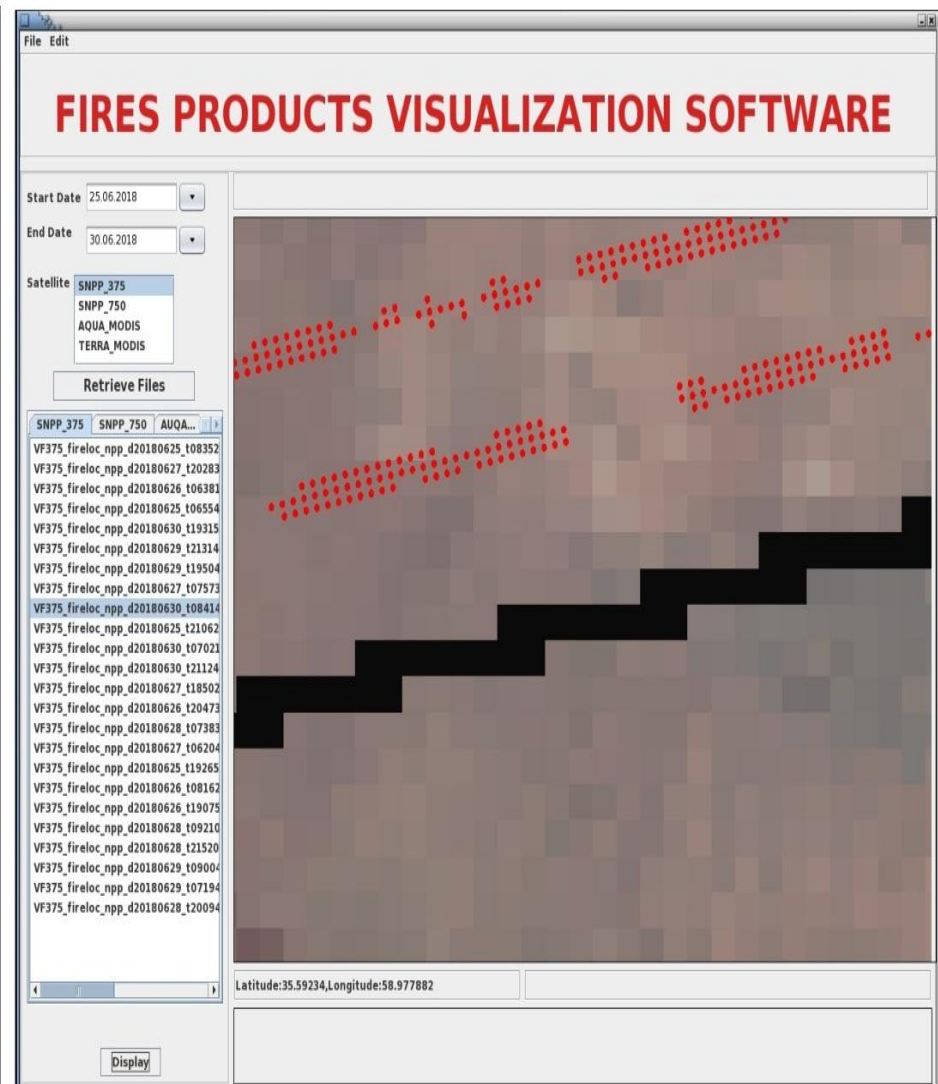
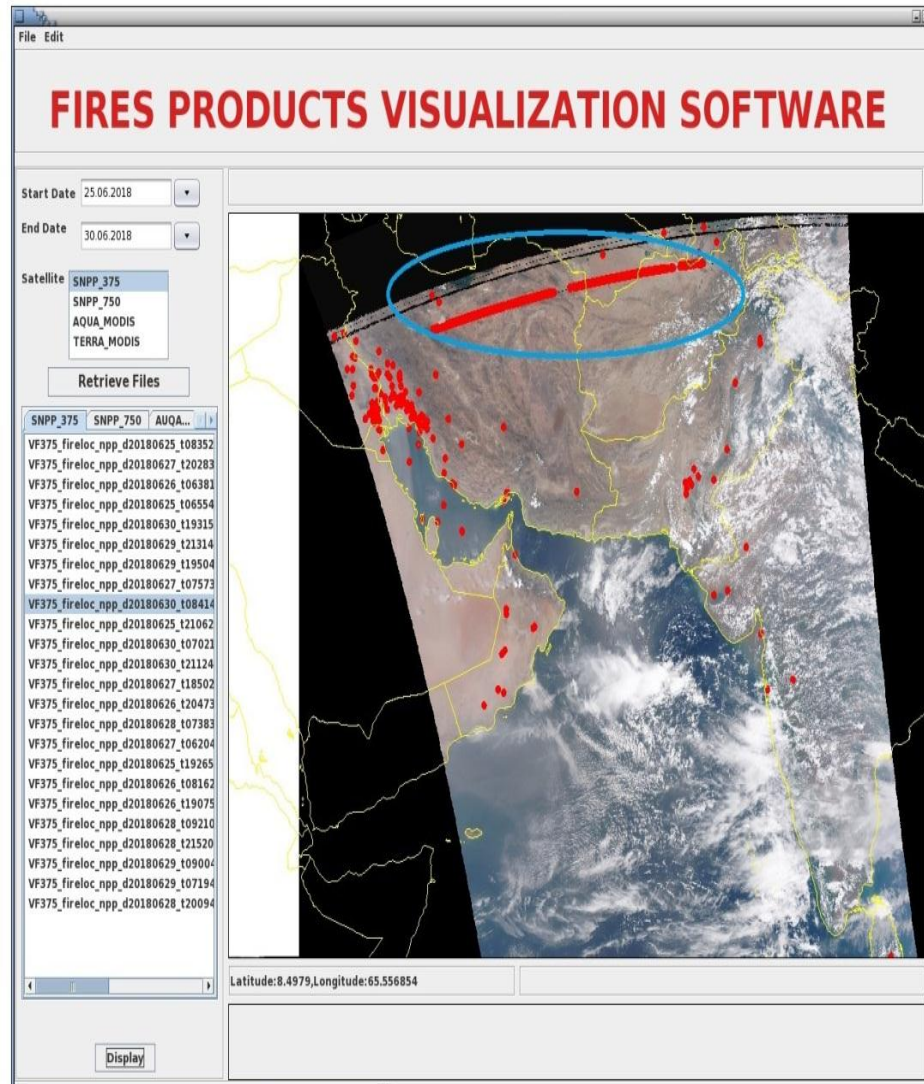
nrsc Issues observed with V2.5.1 cont.

Data breaks



nrsc Issues observed with V2.5.1 cont.

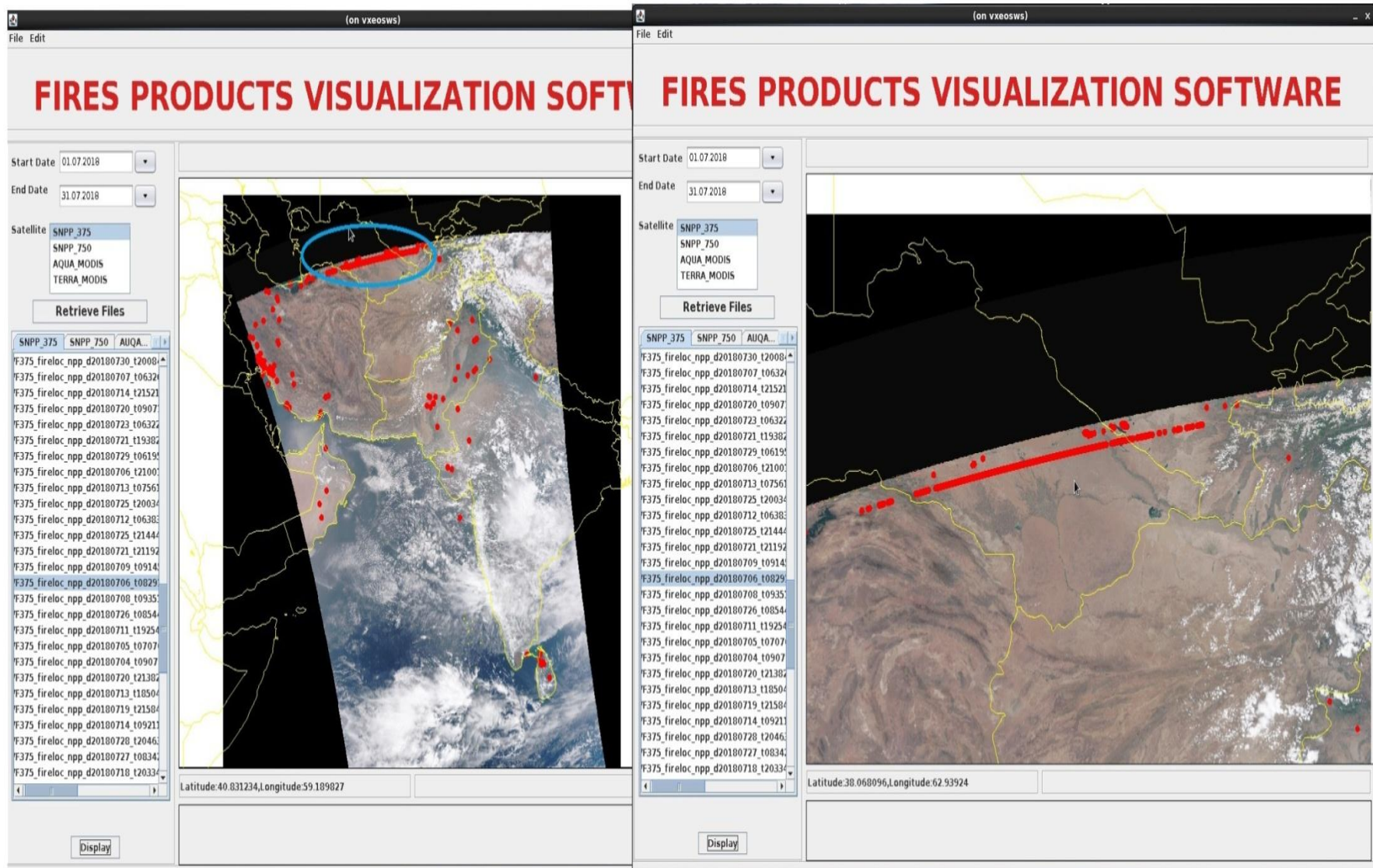
Data breaks



2018-06-30 08:41 UTC

nrsc Issues observed with V2.5.1 cont.

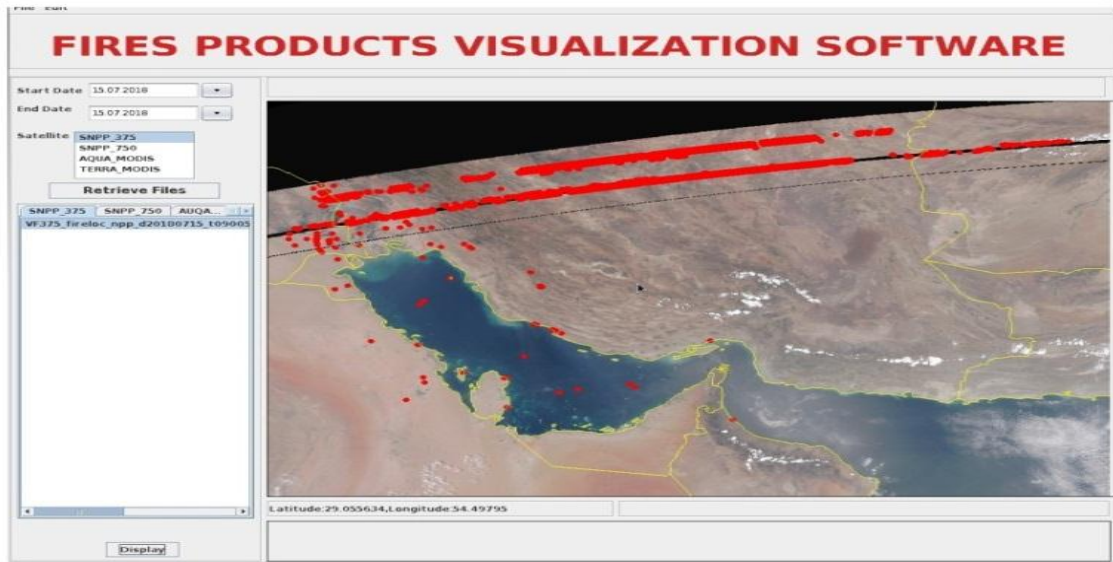
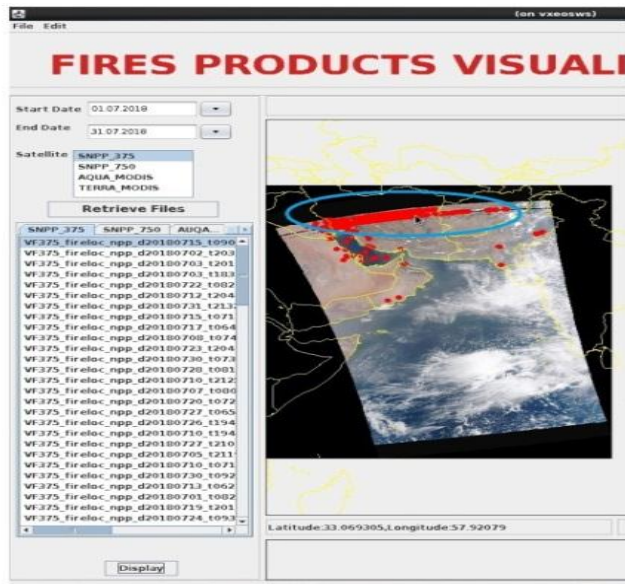
Data breaks



2018-07-06 08:29 UTC

nrsc Issues observed with V2.5.1 cont.

Data breaks



Improvements/Observations with VFIRE375_3.0 SPA

nrsc Improvements/Observations with VF375 V3.0 SPA



Generated fires products of same dates with VIIRS L1 and VF375 V3.0 SPA's and analysed the products

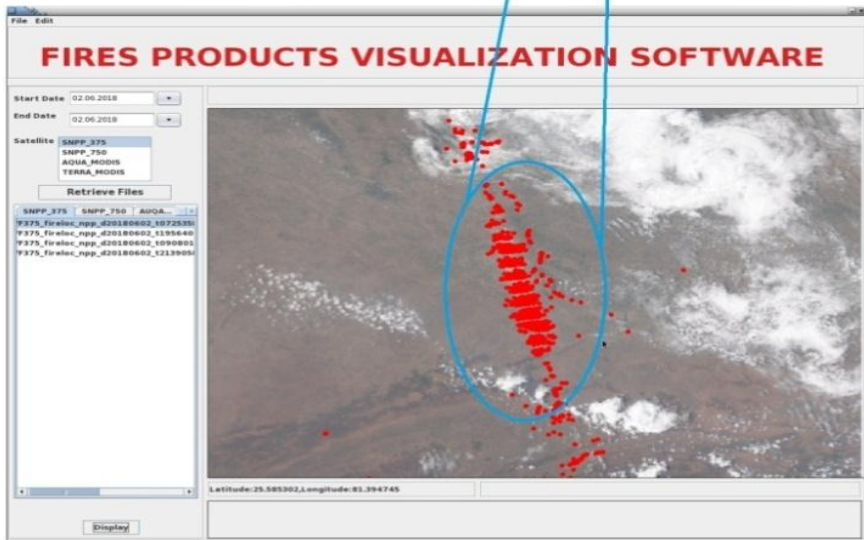
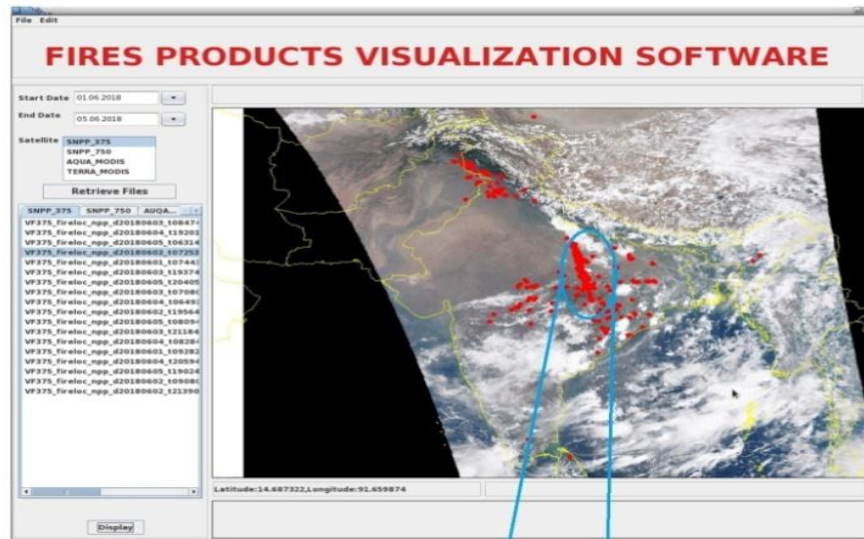
(VIIRS_L1 and VFIRE375_3.0 SPA's are not released for public as on 06May2019. NRSC received them under alpha site program)

The improvements/observations are as follows

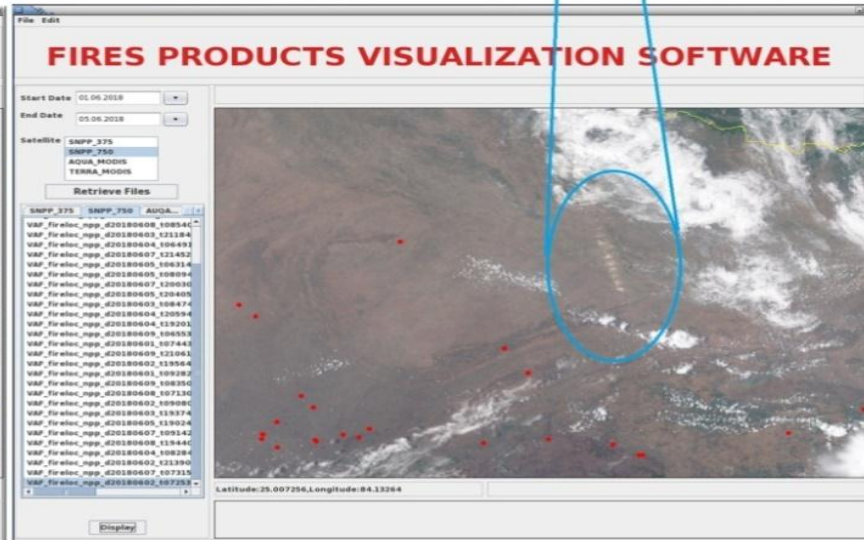
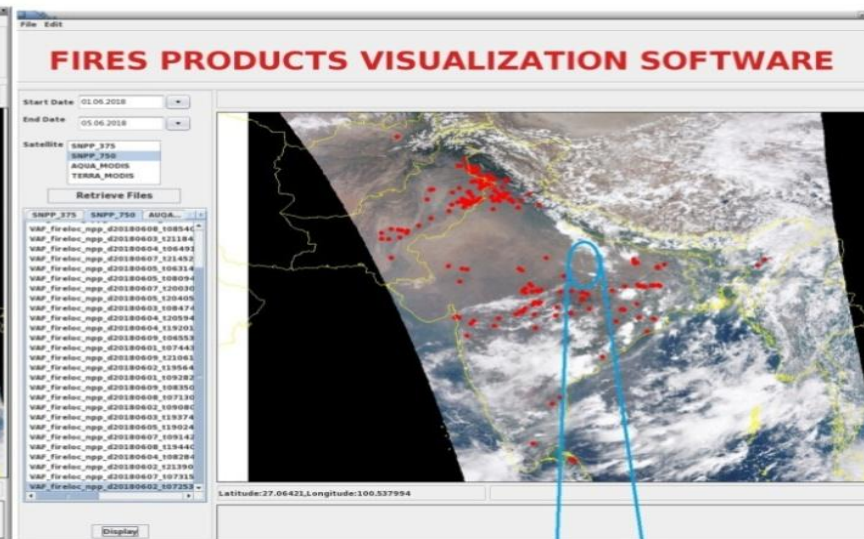
- Spurious fires detected in sun glint affected areas over land are eliminated.
- Spurious fires detected in data break areas are eliminated.
- Processing time is improved by 8-10 minutes in generating fire products with VIIRS L1 SPA and VF375 V.3.0.
- Marked/Observed fire pixel differences w.r.t V2.5.1 SPA

Improvements with V3.0 SPA

Sun glint



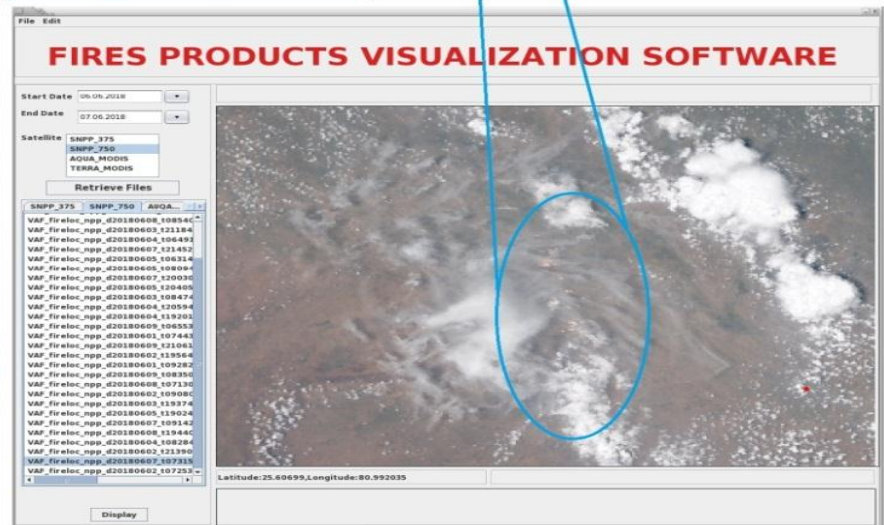
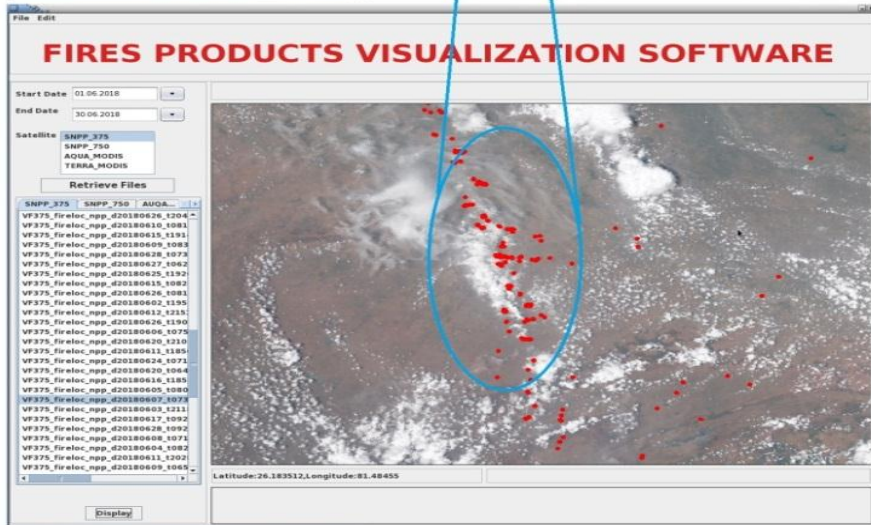
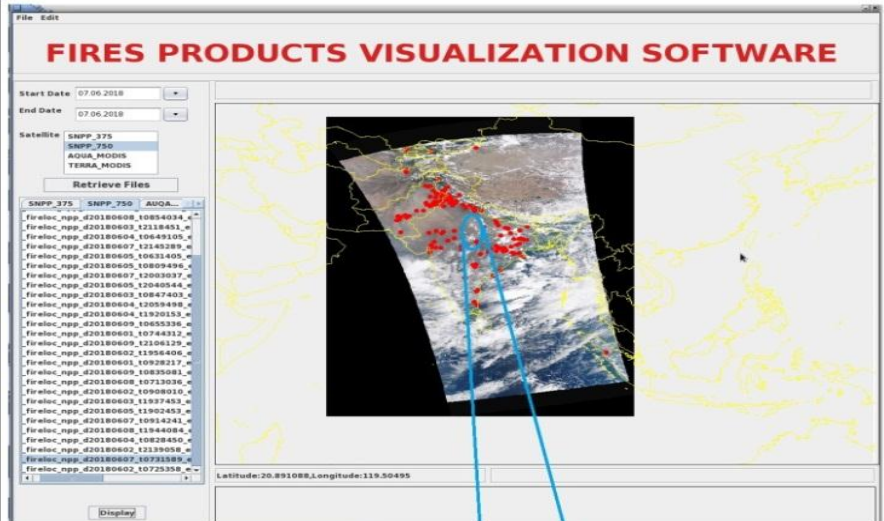
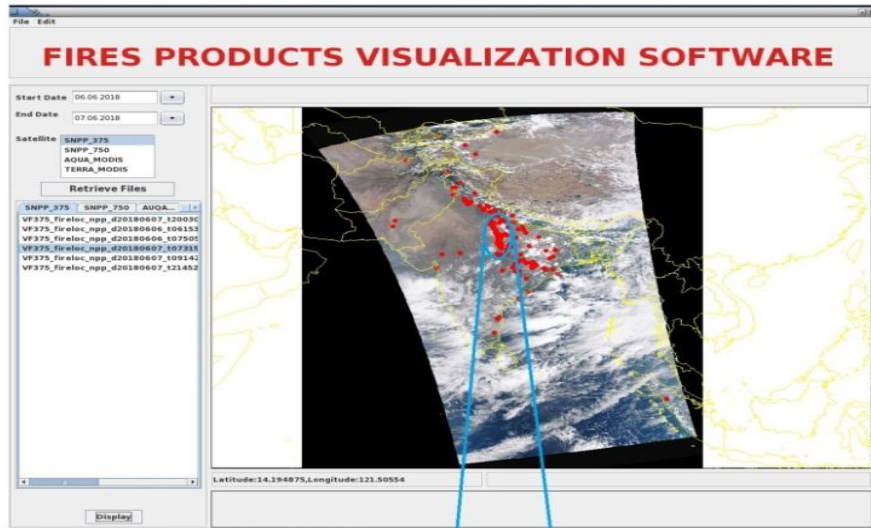
SPA V2.5.1



SPA V3.0

nrsc Improvements with V3.0 SPA cont.

Sun glint



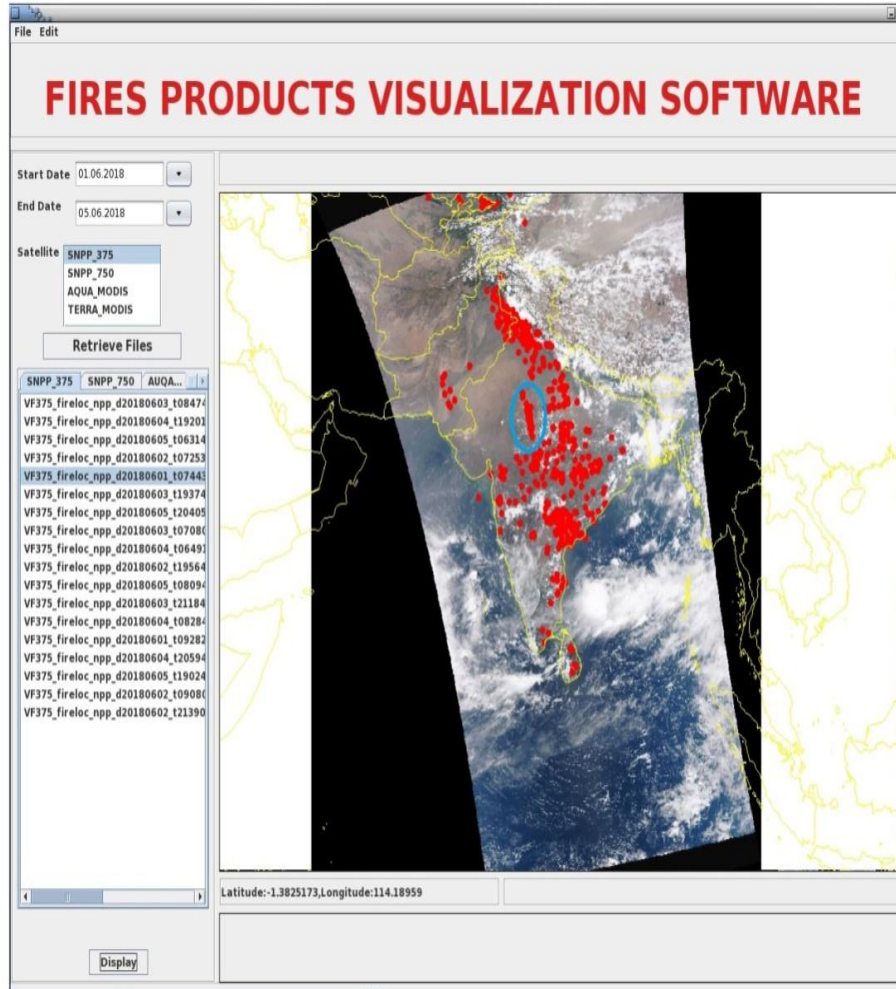
SPA V.2.5.1

2018-06-07 07:31 UTC

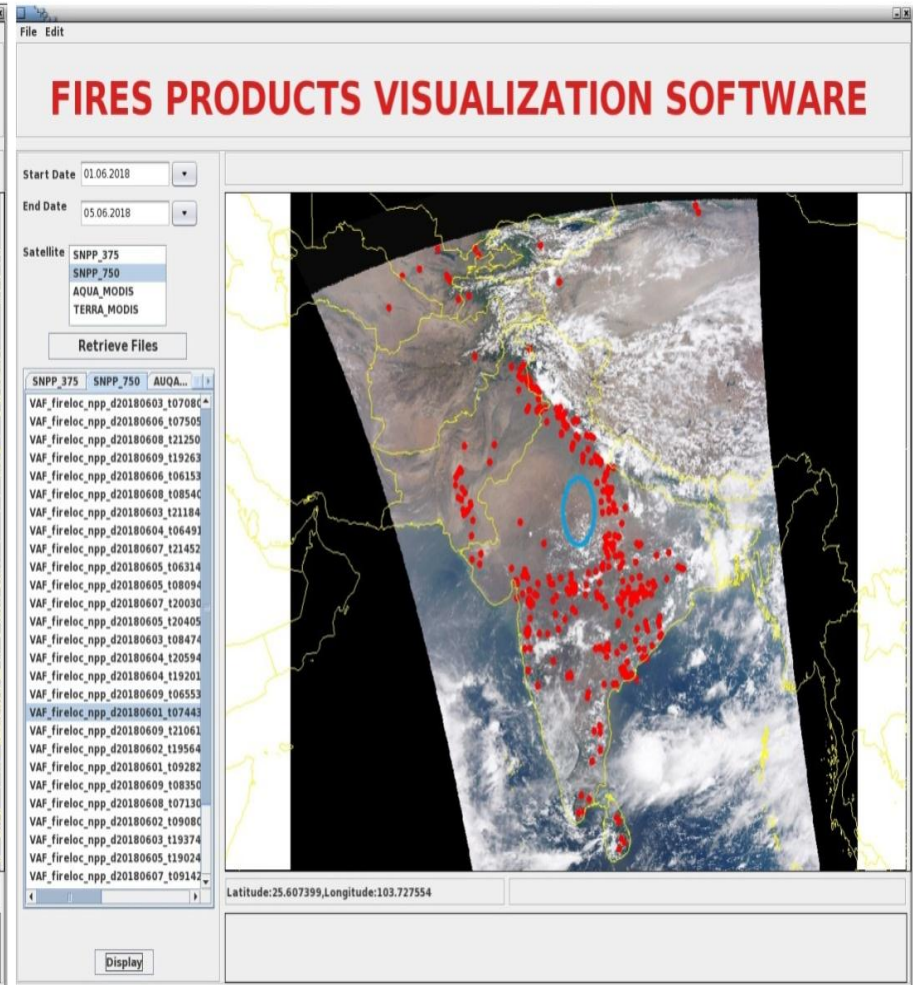
SPA V.3.0

nrsc Improvements with V3.0 SPA cont.

Sun glint



SPA V2.5.1

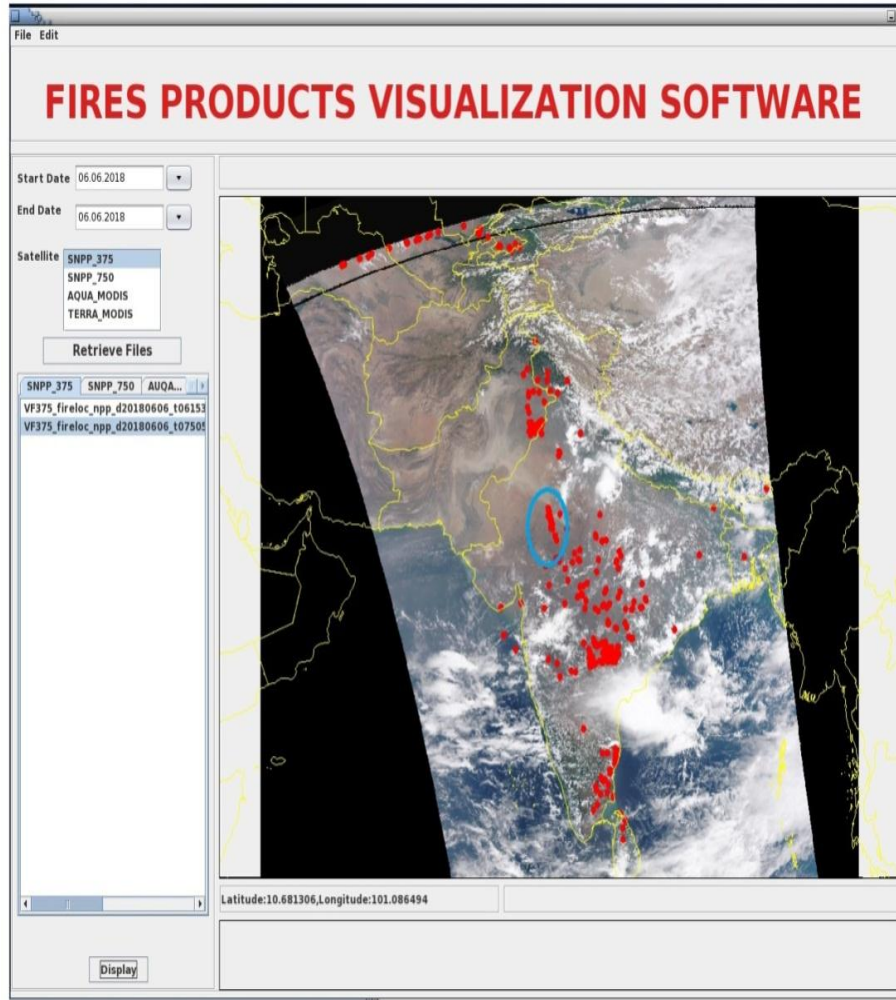


SPA V3.0

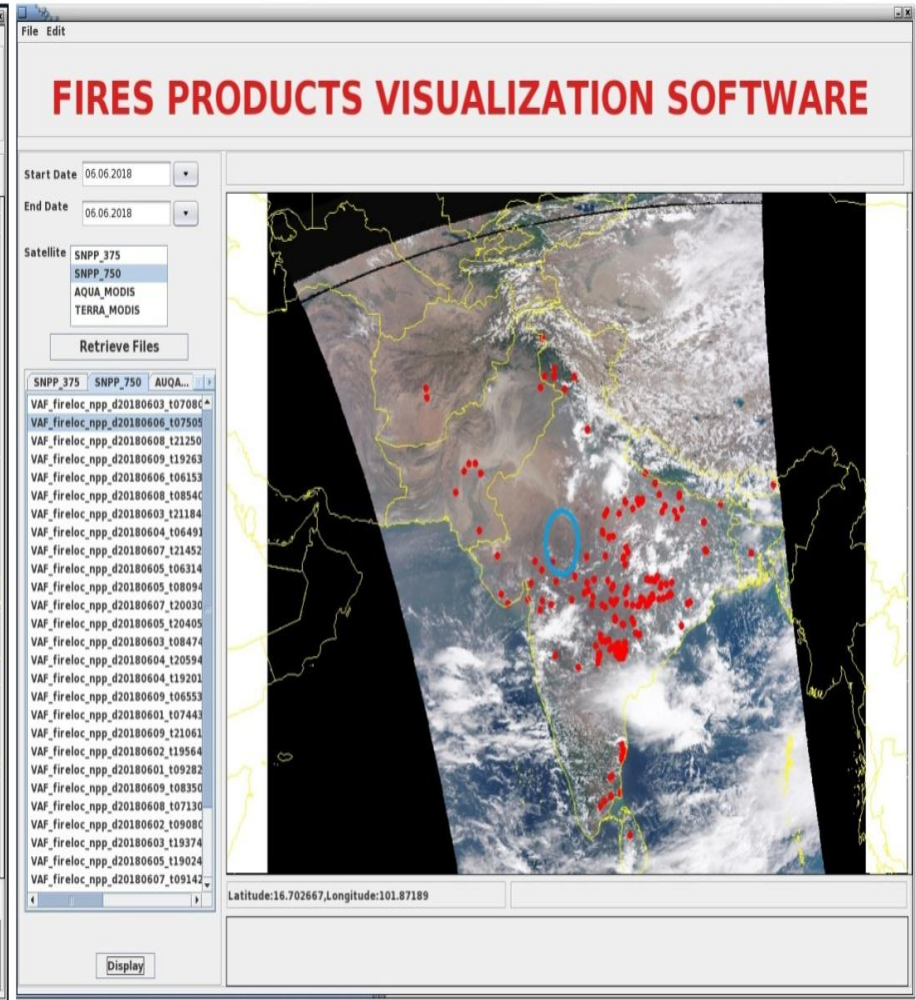
2018-06-01 07:44 UTC

nrsc Improvements with V3.0 SPA cont.

Sun glint



SPA V.2.5.1

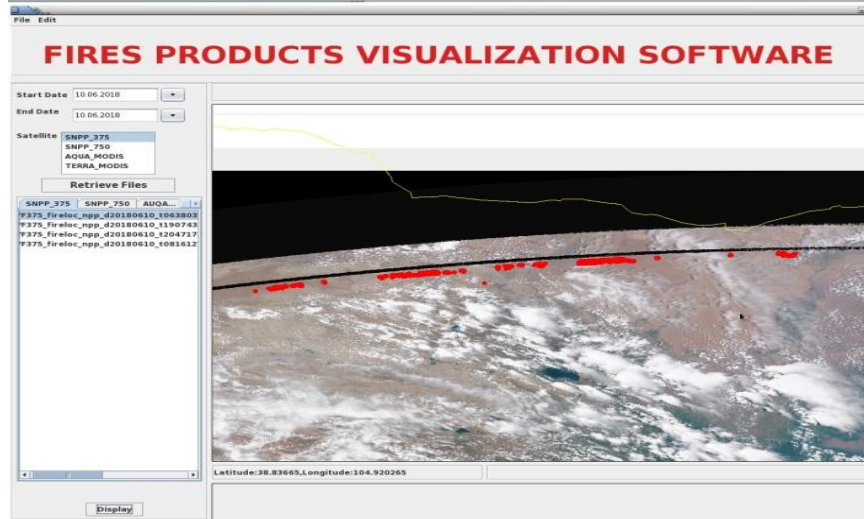
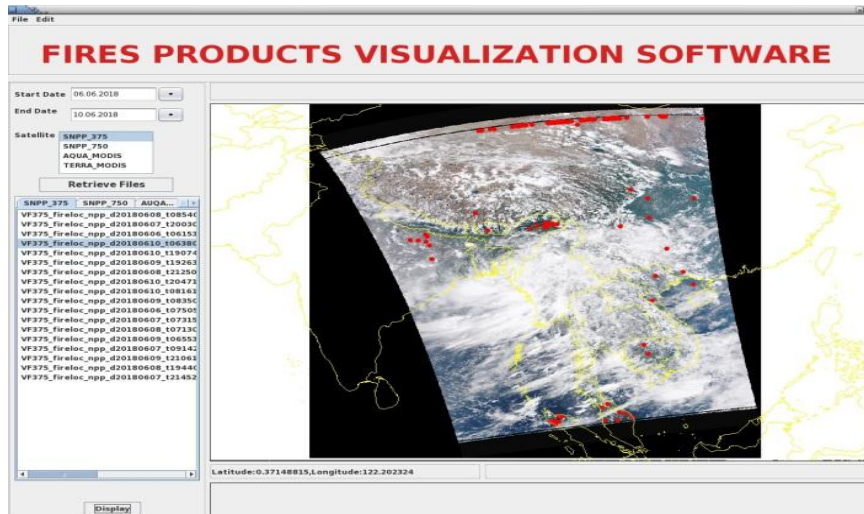


SPA V.3.0

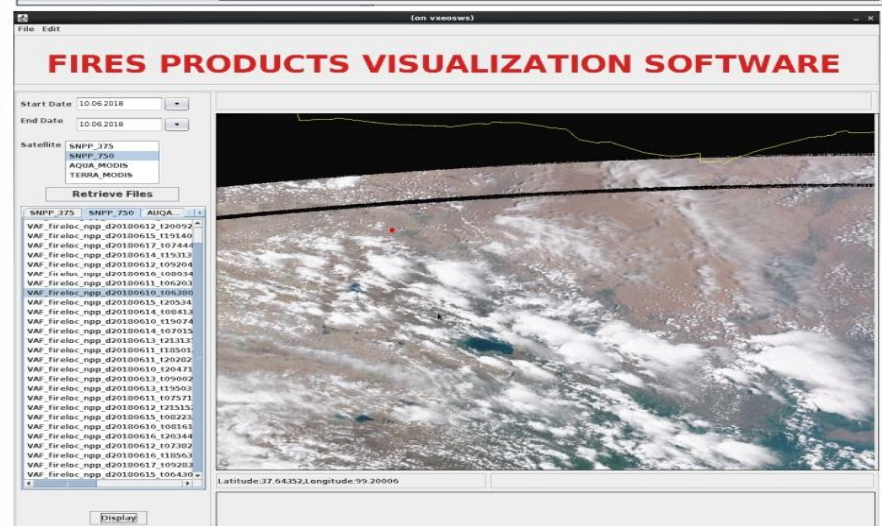
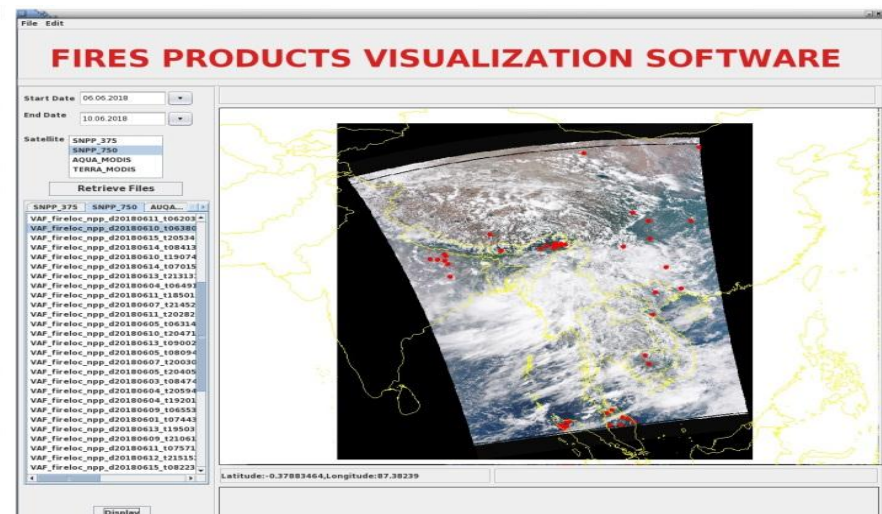
2018-06-06 07:50 UTC

nrsc Improvements with SPA V3.0 cont.

Data breaks



SPA V2.5.1

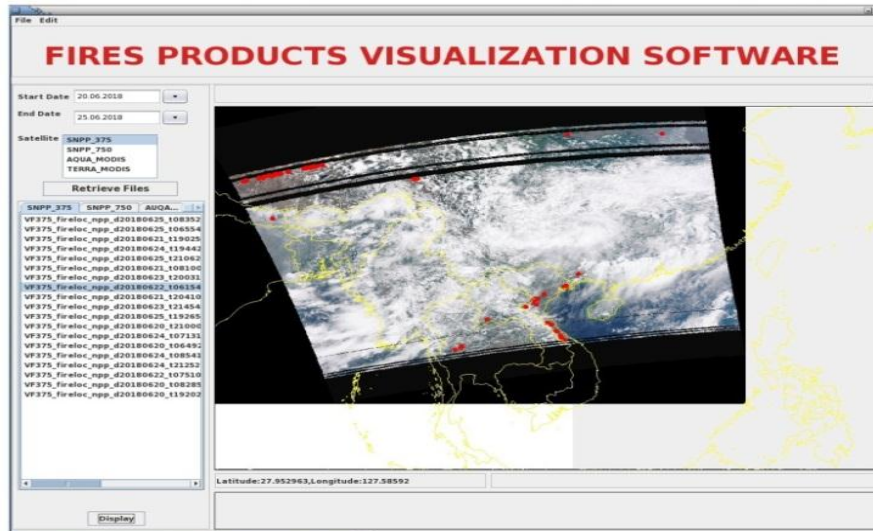


SPA V3.0

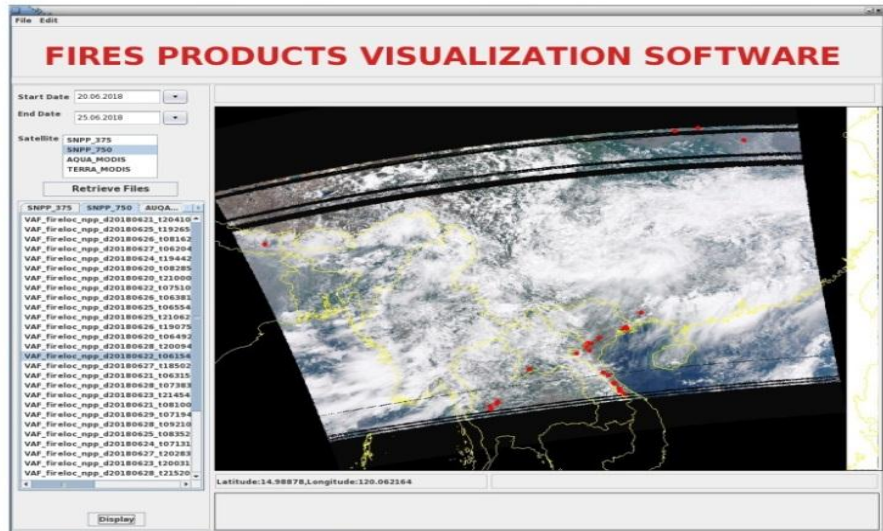
2018-06-10 06:38 UTC

nrsc Improvements with SPA V3.0 cont.

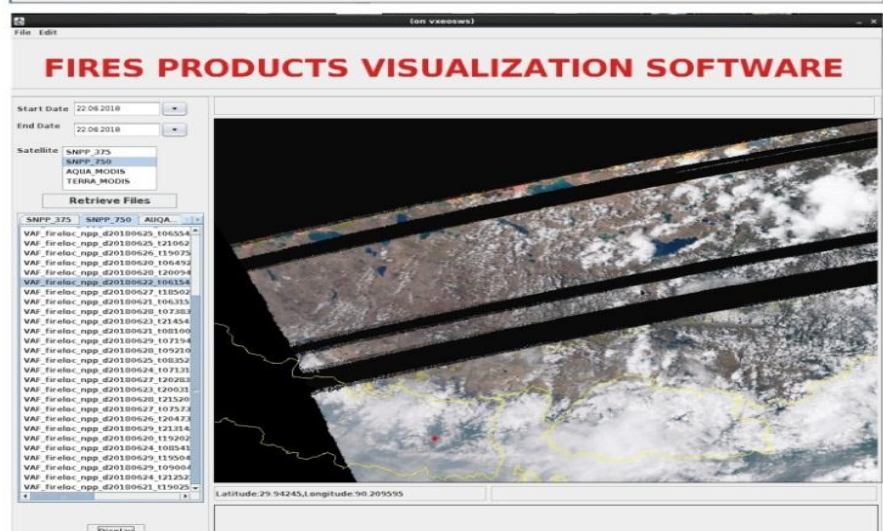
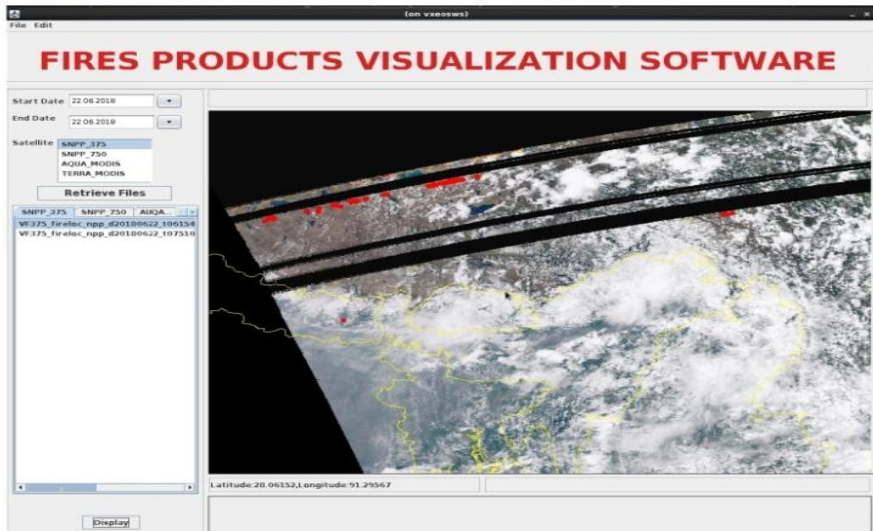
Data breaks



SPA V2.5.1

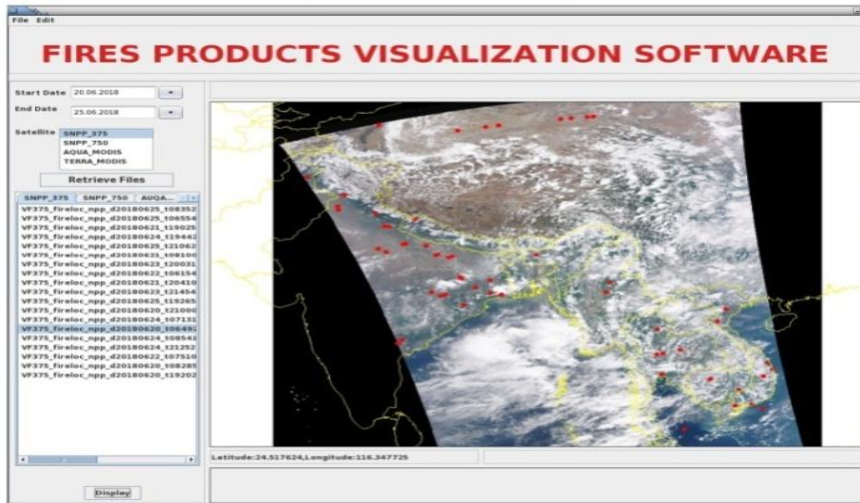


SPA V.3.0

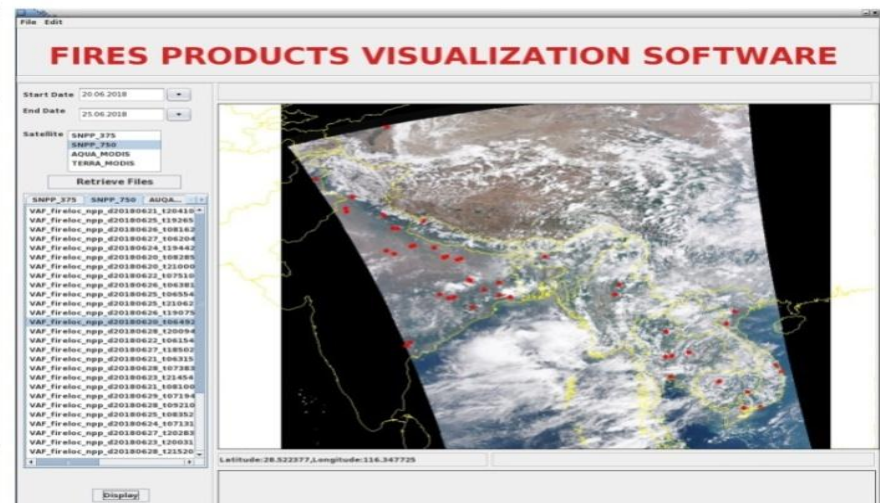


nrsc Improvements with V3.0 SPA cont.

Data breaks



SPA V2.5.1



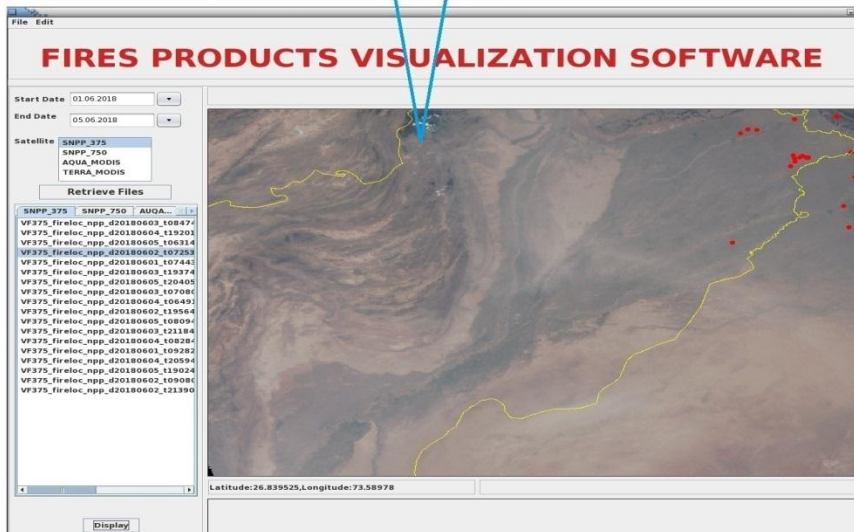
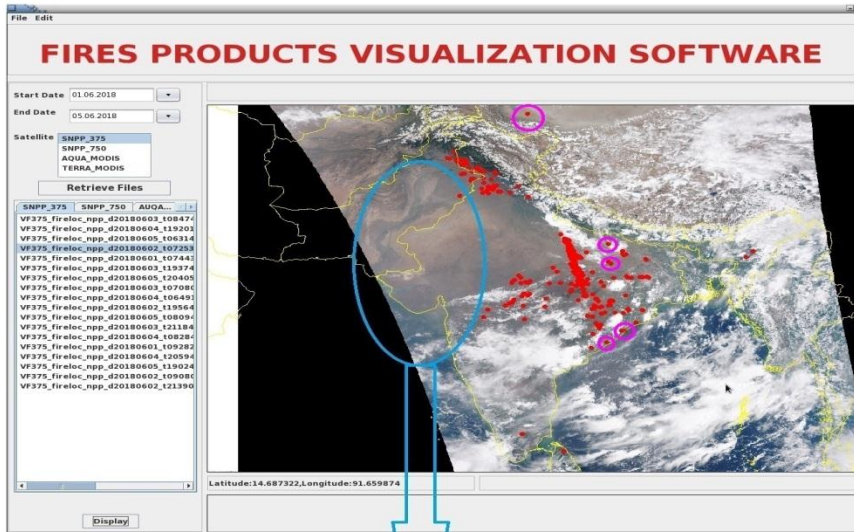
SPA V3.0

2018-06-20 06:49 UTC

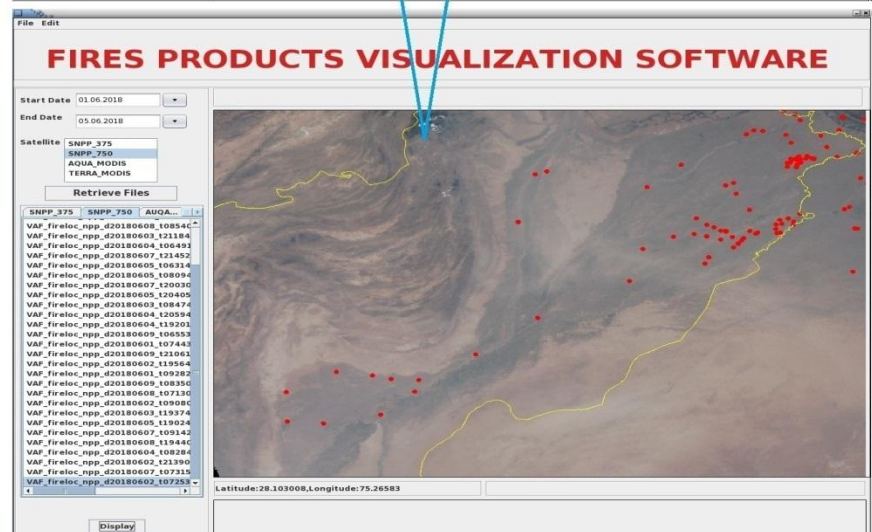
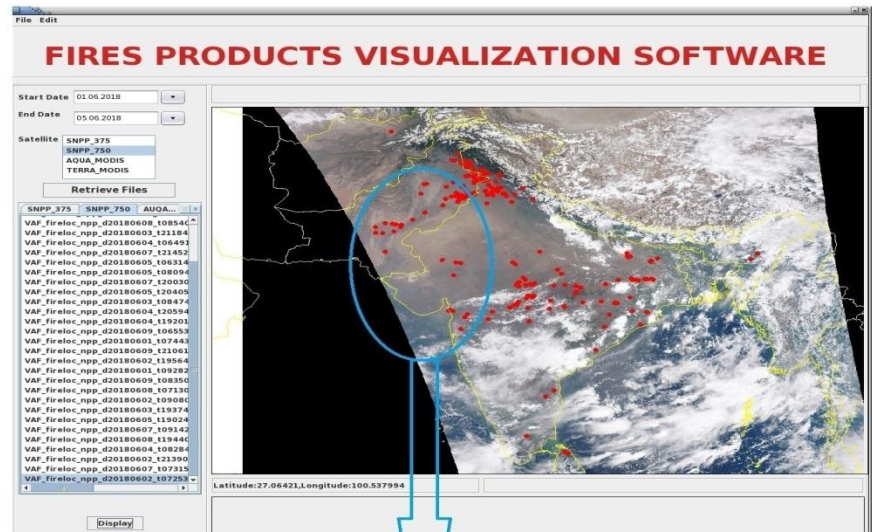


Observations with V3.0 SPA

New/Missed Detections



SPA V.2.5.1



SPA V3.0

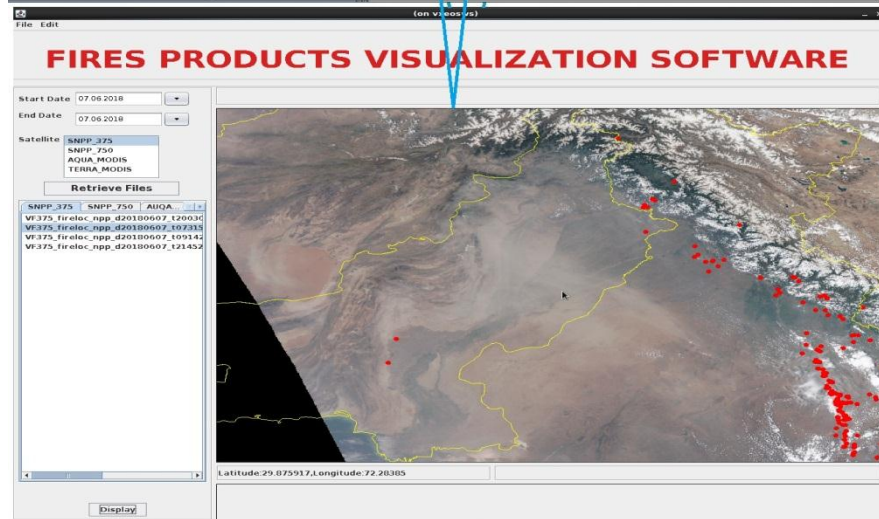
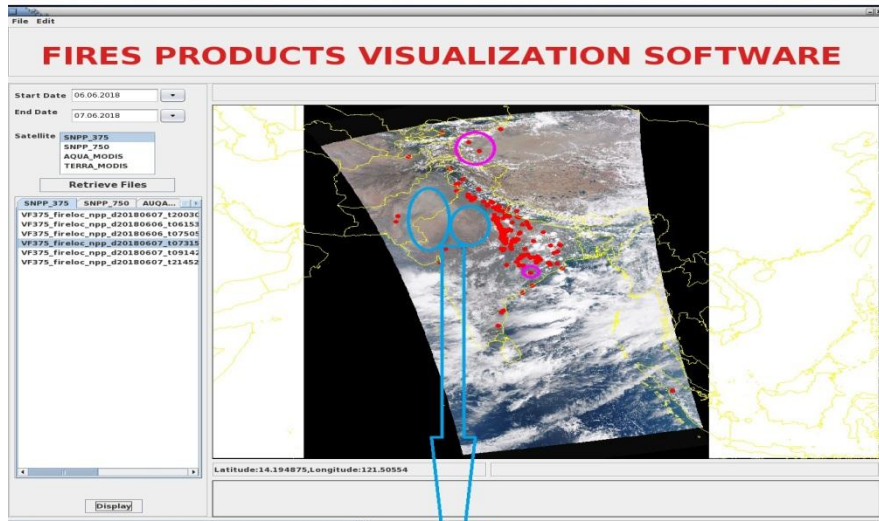
2018-06-02 07:25 UTC

New Detections

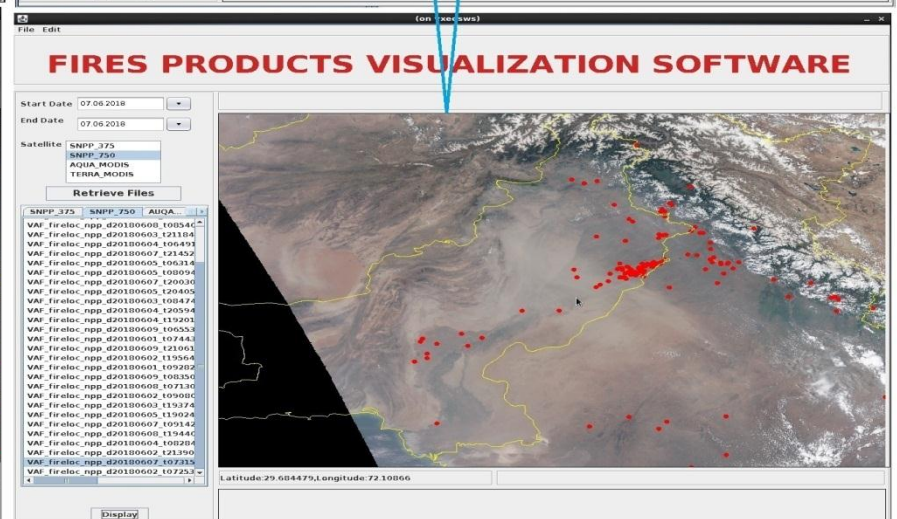
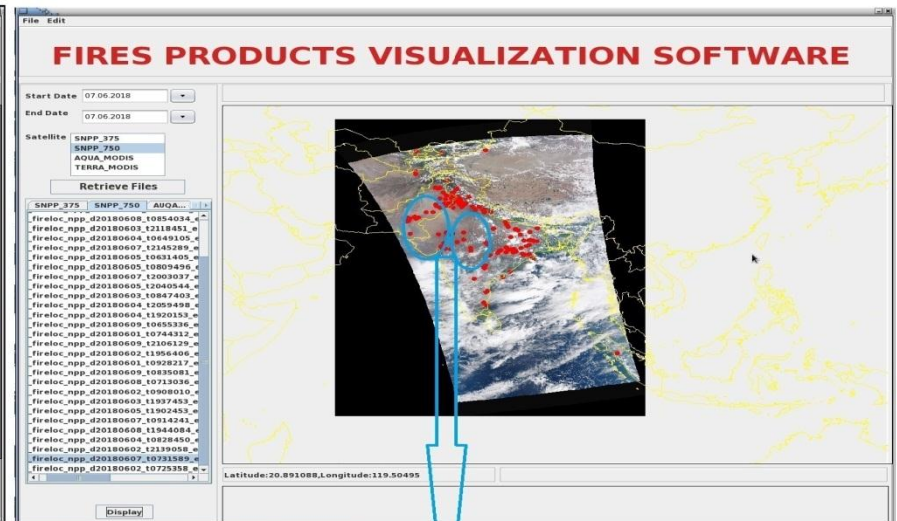
Missed Detections

nrsc Observations with V3.0 SPA cont.

New/Missed Detections



SPA V2.5.1



SPA V3.0

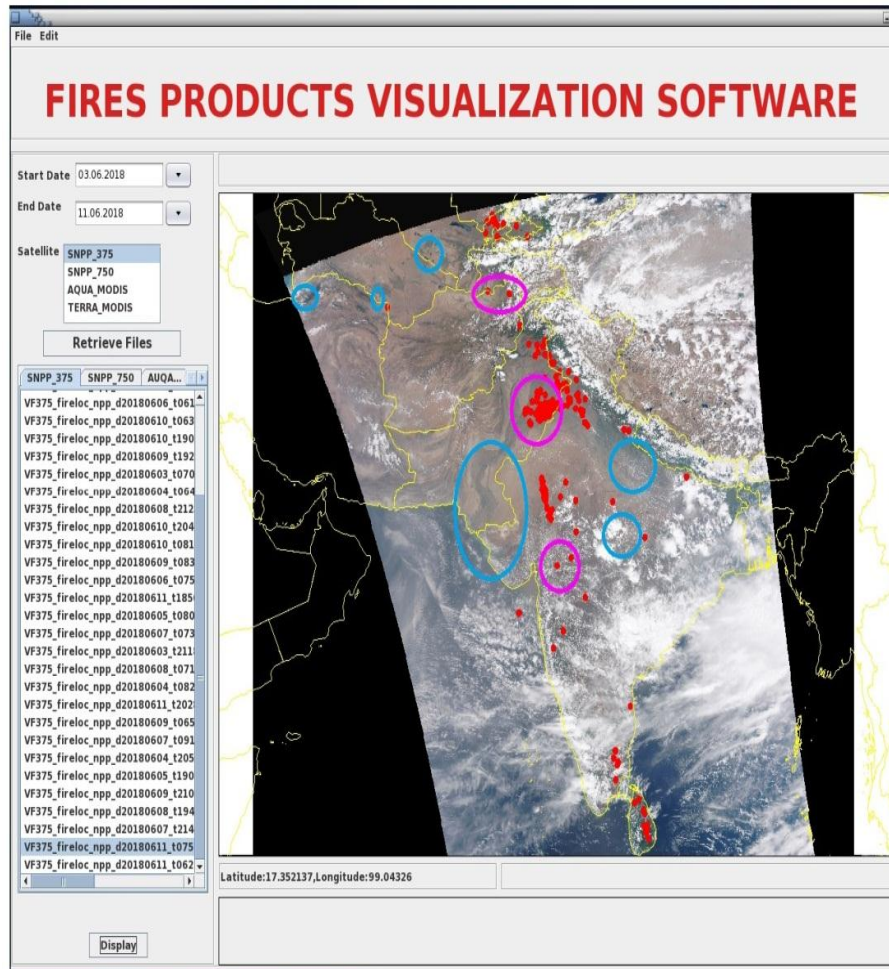
2018-06-07 07:31 UTC

— New Detections

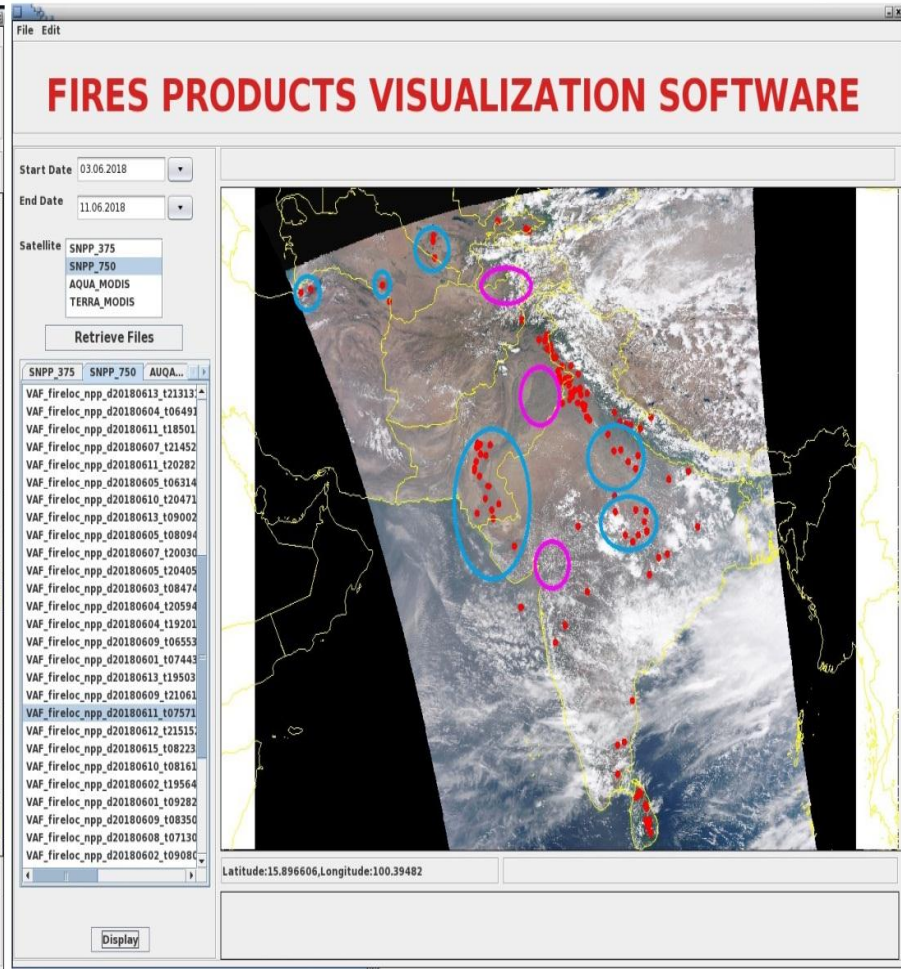
— Missed Detections

Observations with SPA V3.0 cont.

New/Missed Detections



SPA V.2.5.1



SPA V.3.0

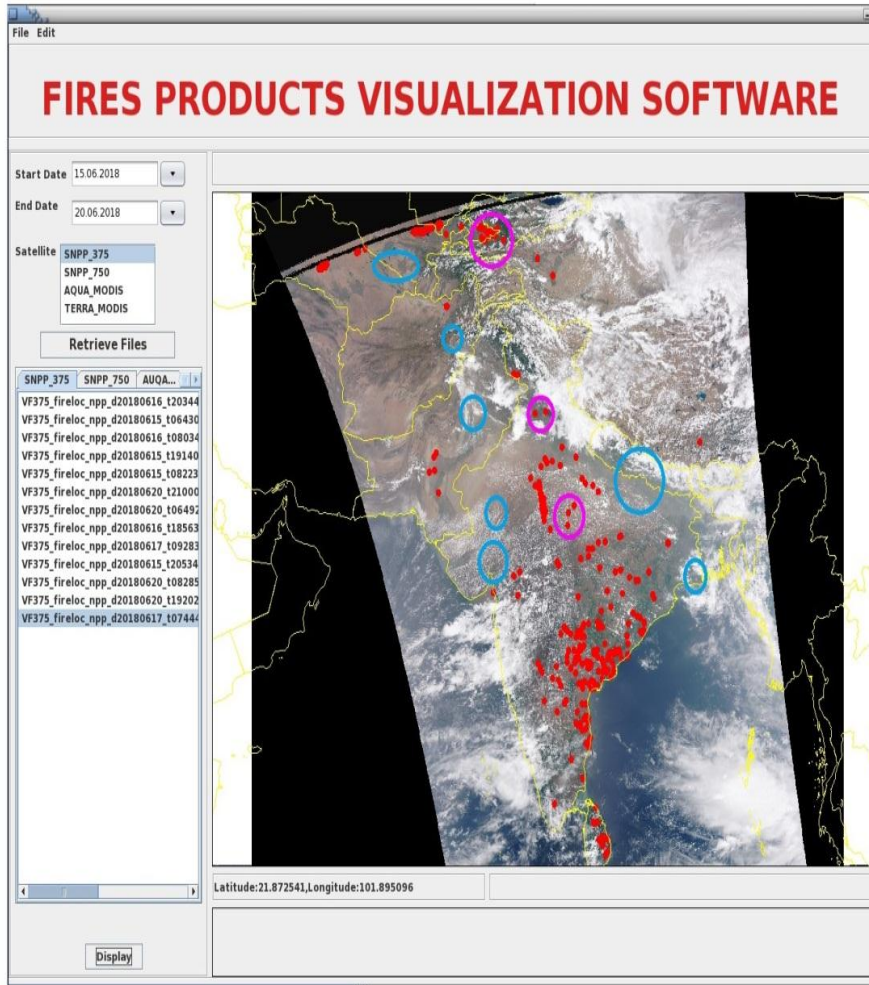
2018-06-11 07:57 UTC

— New Detections

— Missed Detections

Observations with V3.0 SPA cont.

New/Missed Detections



SPA V.2.5.1

2018-06-17 07:44 UTC

SPA V.3.0

— New Detections

— Missed Detections

Conclusion

- Spurious fires detected over sun glint affected areas on land are eliminated with VF375 V.3.0 SPA
- Processing time is improved by 8-10 minutes in generating fire products with VIIRS L1 SPA and VF375 V.3.0 SPA's.
 - DRL may consider to continue similar line for fire products generation with VIIRS L1 SPA instead of C-SDR SPA.
- Spurious fires detected over data breaks region are eliminated completely.
- Reasons for missed/new fires detection between fire products generated from VF375 V.2.5.1 and V.3.0 are to be investigated further.

THANK YOU...
&
QUESTIONS?...