



Applied Remote Sensing Training (ARSET) Program

Introduction to NASA Earth Observations and Tools for Wildfire Monitoring and Management (2025)

Homework Questions

Question 1

When working with satellite active fire detection data, each pixel that is flagged as containing a fire should always be considered as being entirely on fire.

Answers: (bold correct)

- a. True
- b. False**

Feedback:

Fires are often less than the size of the pixel. We are not able to determine the exact location or size of the fire; what we do know is that at least one fire is located within the flagged pixel.

Question 2

True/False: Satellite active fire detection data can be used to detect industrial heat sources (e.g., gas flares).

Answers: (bold correct)

- a. True**
- b. False

Feedback:

Industrial sources, such as gas wells can be detected as hot spots or active fires. Natural heat sources, such as volcanic eruptions, can also be detected. It should be noted that different thermal anomaly sources are not currently attributed in any active fire detection data product files.

Question 3

Which type of satellite orbit configuration is best for maintaining constant surveillance of a fixed location or particular geographic area 24 hours per day?

Answers: (bold correct)

- a. Polar-orbiting
- b. Geostationary**

Feedback:

Geostationary satellite sensors view the same area of Earth's surface at all times while polar-orbiting sensors, such as MODIS and VIIRS, typically view the same area of Earth's surface twice daily. Consequently, geostationary satellite sensors can provide repeated observations on a sub-hourly basis, making it possible to detect fires which may not be detected at longer temporal intervals.

Question 4

True or false: the footprints of pixels, or pixel sizes, in satellite imagery become more distorted with significant distance from nadir.

Answers: (bold correct)

- a. True**
- b. False

Feedback:

Nadir is the point directly below the satellite. Due to the spherical shape of the Earth, pixel size increases as you get further away from nadir towards the edges of the swath that the sensor observes.

Question 5

Which types of satellites typically have sensors with better spatial resolution?

Answers: (bold correct)

- a. Polar-Orbiting Satellites**
- b. Geostationary Satellites

Feedback:

Polar-orbiting satellites have orbits that are much lower in altitude, or are much closer to the Earth, than geostationary satellites. Lower altitude orbits enable sensors to capture smaller areas on the surface within each pixel, resulting in higher spatial resolution.

Question 6

What is data latency in the context of remote sensing?

Answers: (bold correct)

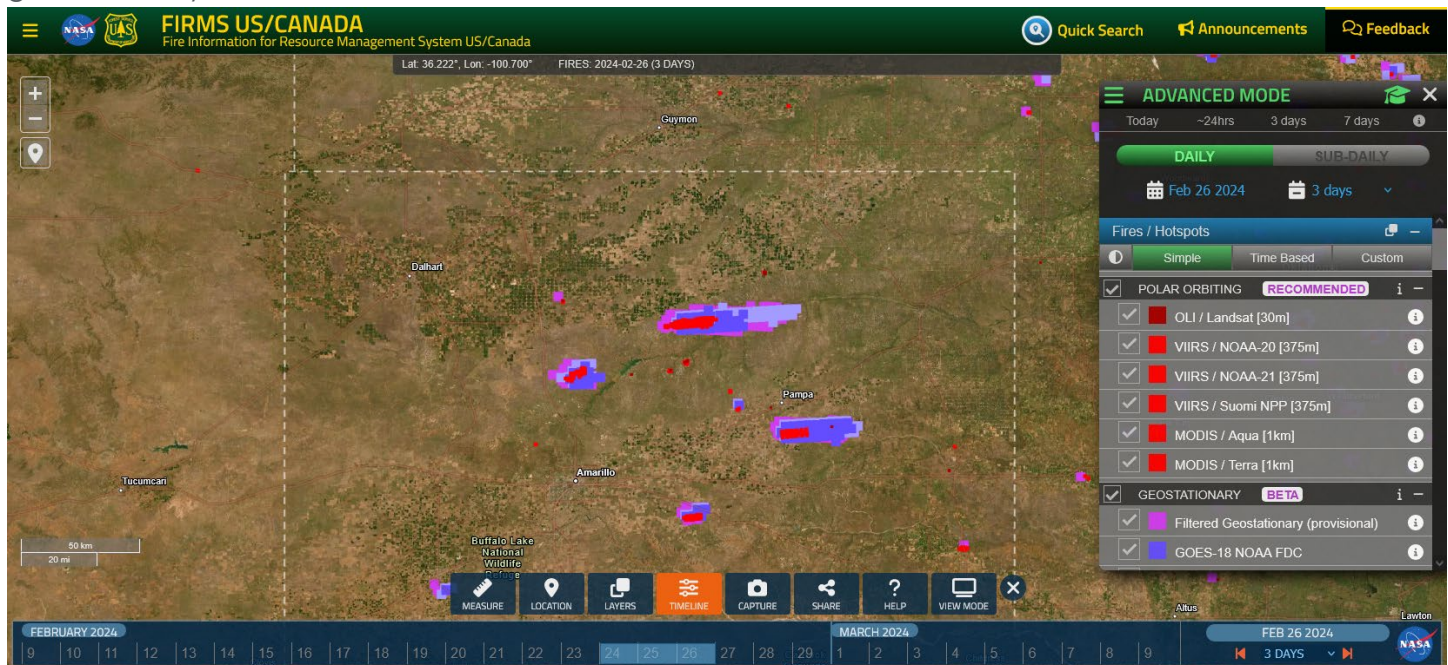
- a. The time it takes for a space-based platform to revisit the same observation area
- b. The time elapsed between when data are acquired by an instrument and when the data are made available**
- c. The time elapsed to generate derivative data products on a computer system

Feedback:

The time it takes for a sensor to observe the same observation area is referred to as the temporal resolution of a sensor. The time elapsed to generate derivative data products on a computer system is referred to as processing time. Data latency is the time elapsed between when data is acquired by an instrument and when the data is made available.

Question 7

Use the FIRMS US/Canada Fire Map application in the Advanced Mode to navigate to and zoom into the Smokehouse Fire in Northern Texas, US on February 26, 2024 (example below, fire in light gray circle). Click to view active fire information from both polar and geostationary sensors to view all available fire detections. Using the Sub-Daily menu option, change the time range to one hour, and step through the time in UTC to identify which type of satellite observed the first detection, polar or geostationary.



Answers: (bold correct)

- a. Polar
- b. Geostationary**

Feedback:

Using the Sub-Daily menu option, you can examine different times of day and identify the type of satellite that first observed the fire.

Question 8

Continue to use the FIRMS map of the Smokehouse Fire. Using the Sub-Daily menu option, identify the time of first detection in UTC. Reminder, you can click on each fire detection to view additional information and, when viewing the active fire information, you can click the option to view the detections times in UTC.

Answers: (bold correct)

- a. February 26, 2024 15:00 UTC
- b. February 26, 2024 19:00 UTC**
- c. February 26, 2024 22:00 UTC

Feedback:

Using the Sub-Daily menu option, and viewing one hour of data at a time, you can step through the day and identify the hour of first detection. You can also view the time since detections and choose 'Hours'.

Question 9

What is a common factor affecting the ability of satellites to detect fire activity?

Answers: (bold correct)

- a. Thick cloud cover**
- b. Light smoke
- c. Lack of sunlight at night

Feedback:

Sensors can typically 'see' through light smoke to detect active fires underneath. Sensors typically detect fires using the mid and longwave IR portions of the electromagnetic spectrum, so they do not require sunlight to detect active fires. Thick cloud cover can obscure the signal from a fire, resulting in a missed detection.

Question 10

If I cannot see VIIRS, MODIS, or Landsat active fire detections in FIRMS for an area where I know a fire is occurring, I should:

Answers: (bold correct)

- a. Check the corresponding true color composite satellite imagery in FIRMS acquired by the sensor for that date to see if cloud cover or thick smoke in the area may be a factor.
- b. Check the orbit tracks layers in FIRMS and 1) verify if the scheduled time of overpass for the sensor(s) has occurred; 2) verify that the area is within the field of view or swath of the sensor(s) for the overpass of interest; and, 3) validate if the expected NRT, RT, or URT active fire detection data is within the post-observation latency period and should be available.
- c. Check "Technical Issues and Outages" page under the "Announcements" menu choice in FIRMS to see if there is a system anomaly affecting the ability of the sensor(s) to acquire data and/or data stream or system processing issues delaying or temporarily halting the processing and delivery of data per schedule.
- d. All of the above**

Feedback:

All of the above choices are actions that you can take to investigate why active fire information is not available in FIRMS, despite knowledge that a fire is occurring.

Question 11

Of the available services in FIRMS, which would you use to receive emails notifying you of fires in your area of interest?

Answers: (bold correct)

- a. Web Feature Service (WFS)
- b. Active Fire Data
- c. Fire Alerts**

Feedback:

You can download active fire information using the Active Fire Data page, and ingest active fire information into a GIS platform using WFS, but neither service will automatically email you when there is new fire information.

Question 12

What is the difference between Web Mapping Service (WMS) and Web Feature Service (WFS)?

Answers: (bold correct)

- a. WFS serves rendered images to the end user; WMS serves the actual geospatial elements to the end user.
- b. WFS and WMS do the same thing, serving images to the end user.
- c. WFS serves geospatial elements to the end user; WMS serves rendered images to the end user.**
- d. WMS and WFS are not related; one is for mapping, but the other is not.

Feedback:

WFS or Web Feature Services serves the geospatial elements, or features, directly to the end users' computer. This would be elements like a line or polygon that would render on the user's map.

On the other hand, WMS or Web Mapping Services serves rendered images to the end user that are placed on top of a map, typically in PNG format. This would show up on a map the same way as WFS would, with the exception for WMS not being selectable on the map.

Check out FIRMS' resources on WFS and WMS.

Question 13

Do some of the web services provided by FIRMS require a MapKey, which could also be called an API key?

Answers: (bold correct)

- a. Yes**
- b. No

Feedback:

The following FIRMS web services: API, WMS and WFS, require use of a MapKey, which can also be known as an API key. FIRMS web services that DO NOT require the use of a MapKey are the downloads of recent active fire data in various formats.

Question 14

Use the [FIRMS home page](#) to open Web Services and select Global.

Select API, and click on the kml_fire_footprints link. From here, you can download KMZ files that contain fire detection centroids and footprints for different sensors and date ranges. Which of the following are valid time frame options for file download?

- I. 12 hr
- II. 24 hr
- III. 48 hr
- IV. 72 hr
- V. 7 days

Answers: (bold correct)

- a. Options I, II, and III
- b. **Options II, III, IV, and V**
- c. Option IV only
- d. Options II and III

Feedback:

You can view available date spans by going to the FIRMS webpage, clicking through Web Services → Global → API - Application Programming Interface → kml_fire_footprints to access the [download page](#). Available time ranges are 24 hours, 48 hours, 72 hours, and 7 days.

Question 15

Navigate to Web Services → API page on FIRMS Global. Click the missing_data link to access. Which Satellite and sensor (Sensor) has missing data from 2024-11-03 through 2024-11-05?

Answers: (bold correct)

- a. Aqua (MODIS)
- b. Terra (MODIS)
- c. **Suomi NPP (VIIRS)**
- d. NOAA-20 (VIIRS)

Feedback:

You can view a [table listing days](#) when there is missing data in the FIRMS database by going to the FIRMS webpage, clicking through Web Services → Global → API - Application Programming Interface → missing data. Using the dates provided in the question, you can locate the satellite and sensor that is missing data for those days.