



Applied Remote Sensing Training (ARSET) Program

Monitoring and Predicting Floods Using Earth Observations for Planning and Preparedness

Homework Questions

Question 1

Which satellites/sensors are used for flood detection in the Global Flood Product?

Answers: (bold correct)

- a. Landsat-8/OLI and Sentinel-1/SAR
- b. Terra/MODIS and NOAA-20/VIIRS
- c. Aqua/MODIS and NOAA-21/VIIRS
- d. a & b
- e. b & c**
- f. a, b, & c

Feedback:

Global Flood Product is based on optical imagery alone, no SAR microwave retrievals are used . It is derived from MODIS onboard Terra and Aqua satellites and VIIRS on NOAA -21 and -21 satellites which have optical bands.

Question 2

There were several flash floods in the Texas Hill Country (USA) on July 4, 2025 due to heavy rainfall. Travis County in Texas was affected the most. If you examine 2- and 3-day composite flood maps from the Global Flood Product in NASA Worldview, it did not show any floods [you may browse all

true color images in [Worldview link](#) - Base Layers for 4 July 2025]. The main reason for this lack of flood detection is which of the following?

Answers: (bold correct)

- a. In Worldview only true color images are available at the time of floods, Global Flood Product is not available as it only provides near real-time flood information
- b. Persistent clouds during flash floods occurrence prevented valid flood detection**
- c. Due to significant terrain shadow effect, flooding could not be identified with certainty
- d. All of the above

Feedback

Global Flood Product data in Worldview are available from 2021 to near-real time, not just in real-time. Global Flood Products are corrected for terrain shadows and Travis County is not in a high-terrain area (eliminating option c). If you examine any or all the true color images in Worldview, you will see the presence of clouds throughout July 3–5, 2025, preventing the satellite optical sensor from observing the surface and the Global Flood Product from detecting floods.

Question 3

OPERA Dynamic Surface Water Extent (DSWx) data products are derived from which of the following?

Answers: (bold correct)

- a. Sentinel-1 SAR imagery
- b. Harmonized Sentinel-1 SAR and Sentinel-2 optical imagery
- c. Harmonized Landsat and Sentinel-2 optical imagery
- d. a & b
- e. b & c
- f. a & c**

Feedback:

OPERA produces two DSWx products, one from microwave SAR data (DSWx-S1) and another from harmonized Landsat and Sentinel-2 optical data (DSWx-HLS). There is no product that combines both SAR and optical data.

Question 4

Examining the OPERA DSWx products at this [Worldview link](#) (Examine Surface Water Extent Layers) for the same floods in the Texas Hill Country on July 4, 2025, why are no floods detected?

Answers: (bold correct)

- a. **DSWx products coverage is not available for this area on July 4, 2025.**
- b. DSWx products have low spatial resolution (250 to 500 m) limiting flood detection
- c. a & b
- d. None of the above

Feedback:

OPERA DSWx-S1 product from Sentinel-1 and DSWx-HLS product from harmonized Landsat and Sentinel-2 optical data have spatial resolution of 30 m, much higher than Global Flood product (250 m) – so floods are easily detected. Because of the narrow swaths, temporal resolution of S1 is 6 to 12 days and HLS is close to 3 days, not available everywhere on a daily basis, missing several areas on a given day – which is why the DSWx products are not available for the case on July 4, 2025.

Question 5

GEOGLOWS River Forecast System (RFS) does not use any information from remote sensing.

Answers: (bold correct)

- a. True
- b. **False**

Feedback:

GEOGLOWS RFS uses weather analysis and forecast model ECMWF Reanalysis version 5 (ERA5) along with hydrologic and river routing models. The ERA5 assimilates data from satellites in the model, so it is NOT true to say that it does not use any satellite information.

Question 6

GEOGLOWS River Forecast System (RFS) Hydroviewer provides easy access and visualization of which of the following?

Answers: (bold correct)

- a. **15-day prediction and retrospective Surface Flood Extent maps**

b. 15-day prediction and retrospective streamflow data

c. a & b

Feedback:

GEOGLOWS provides water discharge information in river streams only; it does not provide spatial flood extent data. GEOGLOWS calculates runoff volume in a river basin from a 15-day meteorological forecast and hydrological model and derives streamflow discharge in a global stream system using a routing model. The Hydroviewer includes 15-day prediction and retrospective streamflow data.

Question 7

On the [GEOGLOWS Hydroviewer](#), map colors of the streams indicate which of the following?

Answers: (bold correct)

a. Flood Duration

b. Flood Return Period

c. Flood Uncertainty

Feedback:

The streamflow map and legend on the left bottom portion of the Hydroviewer clearly show that the colors of the streams indicate return period of flood, blue being normal, while yellow, orange, red, and purple colors indicate return period of 2, 10, 25, and 50 years floods. While flood duration and uncertainty are also available from Hydroviewer, they are not indicated on the stream map.

There are hands-on exercises for each training part. The next three questions will be based on these exercises.

[PART 1 Exercise](#)

[PART 2 Exercise](#)

[PART 3 Exercise](#)

Question 8

Based on Exercise-1 (Examine Global Flood Product for South Sudan from May 15 to 31, 2026), on May 31, which of the following two products shows more insufficient data? (See the color legend and layer colors.)

Answers: (bold correct)

- a. **Flood (3-Day Window) Terra and Aqua/MODIS**
- b. Flood (3-Day Window) NOAA-20 and NOAA-21/VIIRS

Feedback:

Examining the two (3-Day Window) products, the Terra and Aqua/MODIS layer shows more gray area over South Sudan, which indicates more insufficient data.

Question 9

Based on Exercise-2 (Examine Recent Floods in South Sudan using OPERA Dynamic Surface Water Extent Products and Global Flood Product), on May 31, which combination of products would yield better flood coverage data?

Answers: (bold correct)

- a. DSWx-HLS and Flood (3-Day Window) Terra and Aqua/MODIS
- b. **DSWx-S1 and Flood (3-Day Window) NOAA-20 and NOAA-21/VIIRS**
- c. DSWx-S1 and DSWx-HLS

Feedback:

From Worldview Exercise-2, it is evident that both DSWx-HLS and NOAA-20 and -21/VIIRS (3-Day Window) have overlapping data coverage with DSWx-S1 on May 31 over South Sudan. However, DSWx-HLS data mostly show cloud cover and cannot detect the flooded surface. Meanwhile, NOAA-20 and -21/VIIRS (3-Day Window) have less cloud cover than DSWx-HLS and can detect the flooded surface.

Question 10

Based on Exercise-3 (Examine Streamflow using GEOGLOWS River Forecast System in South Sudan) and the retrospective data analysis for the White Nile river segment, what was the discharge value on 31 May?

Answers: (bold correct)

- a. 10.27847 K m³/s
- b. 12.47947 K m³/s**
- c. > 15 K m³/s

Feedback:

From the GEOGLOWS Hydroviewer exercise, an examination of the retrospective time series of discharge over a 1-year period for the selected White Nile segment (Steps 5 & 6 in Exercise-3) reveals the discharge value is 12.47947 K m³/s.