Applied Remote Sensing Training (ARSET) Program

Measuring Atmospheric Carbon Dioxide from Space in Support of Climate Related Studies (2022)

Homework Questions

Question 1

OCO-2 has the following observation modes:

Answers: (bold correct)

a. Nadir, Glint, and Azimuth
b. Nadir, Glint, and SAM
c. Nadir, Glint, and Target
d. Nadir, Glint, and Alpha

Question 2

OCO-3 has an additional mode called the Snapshot Area Map (SAM) mode.

Answers: (bold correct)

a. True
b. False

Question 3

XCO2 is the column average volume mixing ratio, which is a measure of the amount of carbon dioxide in the atmosphere.

Answers: (bold correct)

a. True
b. False

Question 4

Which observation mode significantly improves the signal-to-noise ratio over the ocean?

Answers: (bold correct)

a. Nadir
b. Glint
c. Target
d. SAM

Question 5

What are the limitations of the OCO measurements?

Answers: (bold correct)

a. Clouds
b. Optically thick aerosols
c. High solar zenith angles
d. All of the above

Question 6

The XCO2 measurement from OCO-2/OCO-3 is directly comparable to an in situ measurement at a surface site.

Answers: (bold correct)

a. True
b. False

Feedback:
They are not directly comparable because the satellite observation is a measurement of the average CO2 concentration in the atmospheric column while the in situ measurement is not.

Question 7

The OCO-2 Level-3 data are global daily products that have been gap-filled?

Answers: (bold correct)

a. **True**
b. False

Question 8

When were OCO-2 and OCO-3 launched into space?

Answers: (bold correct)

a. OCO-2 was launched in 2014 and OCO-3 in 2020
b. OCO-2 was launched in 2012 and OCO-3 in 2020
c. OCO-2 was launched in 2020 and OCO-3 in 2013

d. **OCO-2 was launched in 2014 and OCO-3 in 2019**

Question 9

OCO-2 and OCO-3 data are freely available and can be accessed through the National Snow and Ice Data Center (NSIDC).

Answers: (bold correct)

a. True
b. **False**

Feedback:
The data is indeed freely available. They can be accessed through the Goddard Earth Sciences Data and Information Services Center (GES DISC).

Question 10

Which OCO files are recommended for analysis because they are smaller in size and contain just the XCO2 data and quality flags?

Answers: (bold correct)

a. **The Lite files**
b. The Full Physics files
c. The Beta files
d. The X files

Question 11

OCO-3 spatial coverage spans between 52 degrees North and South latitudes.

Answers: (bold correct)

a. **True**
b. False

Question 12

OCO-2 has the following characteristics:

Answers: (bold correct)

a. **Its temporal repeat is every 16 days and observations are made at ~1:30 p.m. local time**
b. Its temporal repeat is every 12 days and observations are made at ~8:30 a.m. local time
c. Its temporal repeat is every 10 days and observations are made at ~10:30 a.m. local time
d. Its temporal repeat is every 16 days and observations are made at ~5:30 p.m. local time

Question 13

Inverse modeling allows us to estimate CO2 fluxes that agree with observed atmospheric CO2 concentrations.

Answers: (bold correct)

a. True
b. False

Question 14

Terrestrial Net Carbon Exchange (NCE) is the:

Answers: (bold correct)

a. Net flux of carbon between the terrestrial biosphere and the atmosphere, including biomass burning. It includes anthropogenic and natural processes.
b. The burning of fossil fuels and release of carbon due to cement production, representing a flux of carbon from the geologic reservoir to the atmosphere.
c. Net flux of carbon between the surface and atmosphere.
d. All of the above

Question 15

Data from OCO-2 indicated that during the 2015/2016 El Nino event, there was a reduction in outgassing from the tropical Pacific.

Answers: (bold correct)

a. True
b. False

Question 16

CO2 emitters from large point sources cannot be detected by OCO-2 or OCO-3.

Answers: (bold correct)

a. True
b. False

Feedback:
CO2 emissions from large point sources can be detected with OCO-2/OCO-3.

Question 17

Which observation mode is ideal for studying urban emissions?

Answers: (bold correct)

a. Nadir
b. Glint
c. Target
d. SAM

Question 18

An atmospheric transport model is used for:

Answers: (bold correct)

a. Tracking the accumulation of snow.
b. Tracking the movement of air to estimate the location of emission sources.
c. Tracking the position of the sun to estimate total solar irradiance.
d. None of the above.

Question 19

Studies using OCO data found that the denser the city the greater its CO2 emissions.

Answers: (bold correct)

a. True
b. False

Feedback:
The study found that the denser the city the less the CO2 emissions because such cities tend to have better public transportation systems and are more walkable.

Question 20

What is the recommended number of swaths from OCO-2 that would need to be aggregated in order to study urban emissions?

Answers: (bold correct)

a. 80-100
b. 25-30
c. 15-20
d. 5-6