

# MY NASA DATA Lesson:

## Seasons and Cloud Cover, Are They Related?

### Purpose:

To use NASA satellite data to correlate cloud cover over Africa to the solar declination.

**Grade Level:** 6 – 12

### Estimated Time for Completing Activity:

One 50-minute class period

### Learning Outcomes:

- Access NASA data using the MY NASA DATA Live Access Server
- Access data and import into Excel
- Identify the relationship between solar declination and the four seasons
- Relate seasonal solar radiation patterns to cloud formation

### Prerequisite

- Familiarity with producing graphs in Excel

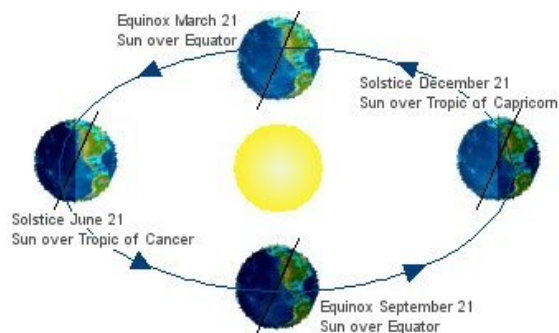
### Tools

- Spreadsheet program
- Atlas or Globe

### Vocabulary:

- [solar declination](#)

### Lesson Links:



- [Microset of solar declination](#)
- [MY NASA DATA Live Access Server](#)
- [Cloud Coverage over Africa for 1995](#)
- [Graph of Solar Declination](#)
- [Opening MY NASA DATA Microsets in Excel](#)

**Background:**

The four seasons on Earth have a scientific basis. The earth is tilted 23.5 degrees from vertical. This tilt and the Earth's orbit around the sun are the reasons for the seasons. Earth's tilt and orbital position cause differing angles at which the sun's rays hit the surface of the Earth. As Earth rotates on its axis, the tilt and orbital position also cause fluctuating lengths of daylight during the year depending on latitude. The latitude on the Earth where the sun is directly overhead at solar noon is called the solar declination. This location is somewhere between 23.5 N and 23.5 S depending on the day of the year. This region defines the Tropics. Where solar radiation is most intense, the warm moist air rises and clouds are frequently formed. In this lesson, it will be shown that the location of these clouds tends to follow solar declination.

**Procedure:**

How to Obtain Cloud Coverage at 23E through Various Latitudes

1. Click on Live Access Server (Advanced Edition). You should be automatically promoted with data set choices. if not, Click on 'Choose Dataset' from the menu at the top of the screen.
2. Then select, Atmosphere, Clouds, Cloud Coverage, and Monthly Cloud Coverage (ISCCP)
3. From the menu to the left of the screen select, 'Latitude-time' under 'Hovmoller Plots'
4. In the compass rose under the navigation map in the North position's box, type 30 N. This sets the northern boundary for the plot. In the South position's box, type 30 S. This sets the southern boundary for the plot. In the East position's box, type 23 E and press Enter on your keyboard. This will automatically set the corresponding West position's box with the same value.
5. Be sure to click the radio button next to 'Update Plot' from the menu at the top of the screen.
6. Change the time entries so that the time period ranges from Jan 1995, to Dec 1995.

How to Obtain Graph of the Solar Declination

1. Save the microset of solar declination numbers to your computer. Import the text file into Excel. (See link above to instructions)
2. Highlight the Declination Angle column.
3. Under the Insert menu, click Chart.
4. Under Chart Type, highlight Line, then click Next twice.
5. Under the Title tab, type Solar Declination in Chart Title, type Solar Day of Year in Category X axis, type Degrees in Value Y axis, then click Next.
6. Select Save as new sheet or same sheet, click Finish.

**Questions:**

1. Why does the equator have cloud coverage year round? Why don't areas further away from the equator have as much cloud coverage?
2. Describe how the graph of cloud cover changes throughout the year. Where is the coverage of clouds the greatest? Where is the coverage of clouds the least?
3. Is there a stable seasonal pattern? Before answering, it may be helpful to see multiple years of data. At step 12, choose different years from the drop down menus, for example, Jan. 15, 1995 – Dec. 15, 2000.
4. Look at the areas between 15N and 15S, how does the cloud coverage differ from north of the equator to south of the equator? Is the cloud coverage the same, somewhat different or completely opposite on either side of the equator?

**Extensions:**

Explain the relationship between the observed cloud cover, solar declination and the seasons.

Relate cloud formation with expected local weather.

Explore the impacts of wet and dry seasons in Africa.

*Lesson plan contributed by Erica Alston, NASA.*

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