# MY NASA DATA Lesson:

***See notes at the end of the lesson for data updates with the new Earth System Data Explorer***

## Cloudy vs. Clear

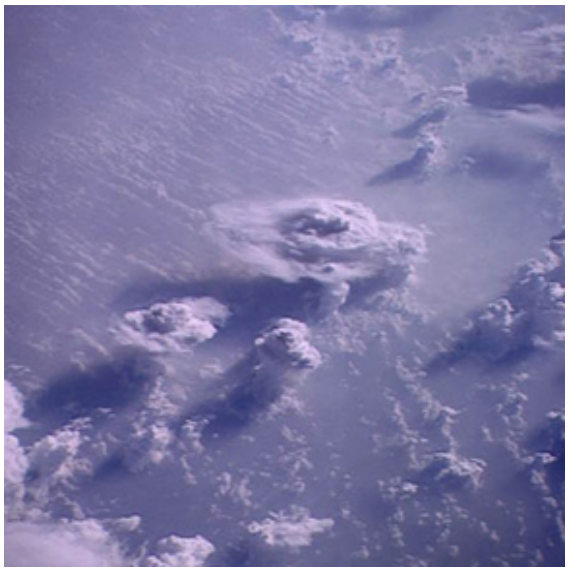

Image courtesy NASA

**Purpose:**
To engage students in basic line plot analysis using authentic NASA data. This lesson also allows students to connect the idea that the sun heats up land, air, and water. Students will practice drawing conclusions based on graphed data of cloudy vs. clear sky observations.

**Grade Level:** 3 – 5

**Estimated Time for Completing Activity:**
One 30 minute class period.

**Learning Outcomes:**

- Students will observe line plot data on Energy from the Sun on clear and cloudy days
- Students will evaluate changes in the amount of energy from the sun that reaches land, water, and air based on cloudy and clear sky data
- Students will draw conclusions about changes in the amount of energy from the sun that reaches land, water, and air
- Students will manipulate data sets from MyNASAData website via printed copy

**Prerequisite**

- Knowledge that the Sun's energy heats land, water, and air of the Earth
- Knowledge of Month abbreviations (or a reference sheet available)

**Vocabulary:**

- energy
- line plot

- sun

**Lesson Links:**

- MY NASA DATA website
- Comparison Graph
- Clear Sky Image
- Cloudy Sky Image
- Reason for the Seasons Applett (interactive)
- The Sun's Energy

**Background:**

Line plots are a useful way to display data especially change over time. The seasons are caused as the Earth, tilted on its axis, travels in its orbit around the Sun each year. The hemisphere that is tilted towards the Sun is warmer because sunlight radiates more directly to the Earths surface. As a result, there is less scattering of the Suns radiation in the atmosphere. During this lesson, students will view NASA data displaying the amount of the Sun's energy absorbed in one calendar year during clear and cloudy sky conditions.

**Procedure:**

Tips provided under teacher notes section

Watts per meter can be explained to the students as energy from the Sun. This will help them understand that as the line on the graph goes up, the energy from the Sun is what is increasing without the need to explain the units to the students.

1. Display provided line plots for student viewing (China-cloudy and China-clear).
2. Ask students to identify the titles of the graphs.
3. Ask students if they think it is easy to compare the graphs as they are. (Answers may vary)
4. Introduce an easier way to compare two line plots, by plotting them on the same graph.
5. Display double line plot.
6. Have students make a list with a partner of things that are similar and different between this plot and a single line plot (Some examples of what the students might answer include, 2 lines, the lines look different, there is another color on the plot, and

the numbers on the side are different).
7. Bring class back together to view the double line plot.
8. Ask students to identify 2 locations on the plot that are similar in cloudy and clear sky conditions. (January, February, November, December)
9. Ask students to find the month with the biggest difference in cloudy and clear sky conditions. (June)
10. Ask the students which line has the higher amount of energy from the sun throughout the year. (Clear Sky) Why? (Clouds block some of the sunlight.)
11. What other things might affect how much of the sun\'s energy reaches the Earth\'s surface? (Pollution, aerosols, ozone layer)

**Questions:**

(Embedded in lesson)
Identify 2 locations on the plot that are similar in cloudy and clear sky conditions. (January, February, November, December)

Which month has the highest difference between clear and cloudy skies? (June)

Which line has the higher amount of energy from the sun throughout the year? (Clear Sky) Why? (Clouds block some of the sunlight.)

What other things might affect how much of the sun's energy reaches the Earth's surface? (Pollution, aerosols, ozone layer)

**Extensions:**

After the students have completed the activity have them write a summary in their notebooks or science journals about what they learned.

Making a generalization: During what season is it most cloudy in China? Provide think time and allow students to share with a classmate

If there is time left in the lesson, it may be useful for the students to see this information from the local area to compare to China.

Use the Lesson Link to the Sun's Energy to learn more about the Sun and what it provides.

*Lesson plan contributed by Becky Schnekser, MY NASA DATA Team*

Click here for Teachers Notes

View lesson without Standards

Teacher Feedback

***Data Notes from Dr. Brad (12/2018):***

Top-of-atmosphere data can also be used for this lesson (Atmosphere->All Data->Monthly Net Flow of Energy Towards Earth by Longwave and Shortwave Radiation with(without) Clouds. The reasons for the differences between these plots is refection of solar radiation by clouds/aerosols or a white surface, and the reduction of outgoing longwave radiation to space by clouds.