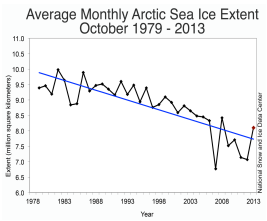
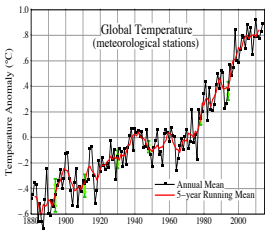
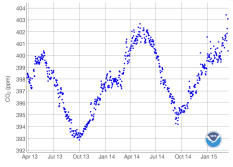
Home Group Name _____ Home Group Members _____ Date _____

2.1 Assessing the Finding Patterns Tool for Earth Systems: How are Earth systems changing?

This tool has "Assessing" in the title because the 6th column, "Cause and Effect," includes questions that the students do not yet have evidence to support. However, the students' answers in columns 2-5 should match the answers in blue. It is ok to hold students accountable for having documented evidence for these answers.

Earth system	Representation	Generalizability (Patterns in space)	Short-term variability (Patterns in time)	Long-term trends (Patterns in time)	Cause and Effect (Unanswered questions)
	1. What variables are represented? 2. What time period is represented?	3. Which of the Earth's regions are included? 4. What does this data tell you about global patterns?	5. Describe the short-term variability in the data. 6. Is it predictable or unpredictable?	7. Describe the long-term trend in the data. 8. Is it predictable or unpredictable?	9. What do you think is the cause of the pattern or trend in the graph?
Arctic Sea Ice 	*Variables represented are year and Arctic sea ice extent. Time period represented is from approximately 1992-2015.*	*This data set represents data from the Arctic Sea. It tells us that Arctic Sea ice is decreasing. This doesn't tell us about what may be happening to sea ice in other places in the world.*	*The short-term variability does not show a regular pattern. It is unpredictable from year to year.*	*The long-term trend is negative, because sea ice is declining. It is predictable because it has been declining over the past 20 years.*	*[Answers may vary; students will not have evidence for this at this time]*
Global Temperature 	*Variables represented are year and temperature anomaly. Time period represented is from approximately 1880-2010.*	*This data set represents combined data of temperature anomalies. Temperature anomalies are increasing globally. Although the global trend is increasing, some local regions may not mirror this trend.*	*The short-term variability does not show a regular pattern. It is unpredictable from year to year.*	*The long-term trend is positive, because temperature anomalies are increasing. It is predictable because it has been increasing over the past 220 years.*	*[Answers may vary; students will not have evidence for this at this time]*

Earth system	Representation	Generalizability (Patterns in space)	Short-term variability (Patterns in time)	Long-term trends (Patterns in time)	Cause and Effect (Unanswered Questions)
	1. What variables are represented? 2. What time period is represented?	3. Which of the Earth's regions are included? 4. What does this data tell you about global patterns?	5. Describe the short-term variability in the data. 6. Is it predictable or unpredictable?	7. Describe the long-term trend in the data. 8. Is it predictable or unpredictable?	9. What do you think is the cause of the pattern or trend in the graph?
Sea Level	*Variables represented are year and sea level change in mm. Time period represented is from approximately 1992-2015.*	*This data set represents combined data from sea level in many places on Earth. It tells us that sea level is rising globally. Although the global trend shows a rise, some local regions may not mirror this trend.*	*The short-term variability does not show a regular pattern. It is unpredictable from year to year.*	*The long-term trend is positive, because sea level is rising. It is predictable because it has been consistently rising over the past 30 years.*	*[Answers may vary; students will not have evidence for this at this time]*
Atmospheric CO_2 – Three Year 	*Variables are time and atmospheric CO_2 concentrations. Time period is April 2013-January 2015.*	*This represents atmospheric CO_2 concentration at Mauna Loa in Hawaii. Because of air circulation in the Northern Hemisphere, this is generalizable to the Northern Hemisphere.*	*The short-term variability shows fluctuation from day to day. These data are unpredictable from day to day.*	*The long-term trend shows a pattern from season to season. These are predictable from season to season due to plant growth and functioning in the northern hemisphere.*	*[Answers may vary; students will not have evidence for this at this time]*
Atmospheric CO_2 – Long Term	*Variables are time and atmospheric CO_2 concentrations. Time period is approximately 1960-2015.*	*This represents atmospheric CO_2 concentration at Mauna Loa in Hawaii. Because of air circulation in the Northern Hemisphere, this is generalizable to the Northern Hemisphere.*	*The short-term variability shows a pattern from season to season. These are predictable due to plant growth and functioning in the Northern Hemisphere.*	*The long-term trend shows a positive trend in CO_2 concentrations in the atmosphere. This is predictable.*	*[Answers may vary; students will not have evidence for this at this time]*

Your Group's Explanation: How do you think changes in these five Earth systems are related to each other?
Students may have ideas at this point about how these systems are related, but they do not yet have evidence that tells them that the increase of atmospheric CO_2 concentration is the driver (the cause) of all other systems.