Using Sea Surface Temperature to Locate the Antarctic Convergence Zone

Are We There Yet? Using Sea Surface Temperature to Locate the Antarctic Convergence

QUESTION: How can sea surface temperatures be used to determine the location of the Antarctic Convergence Zone?

HYPOTHESIS: _____

_____

_____

TEST YOUR HYPOTHESIS:

Materials: Computer with Xcel Spreadsheet; Antarctic Convergence Data

Procedures:

1. Open the Antarctic Convergence Data set.
2. Select the Southbound Data set.
3. Review the data set to identify the variables you will select to test your hypothesis. List the variables below:
4. Variables to test:

X-axis: _____ Y-axis: _____

5. Highlight the data columns selected in Step 4 and generate a graph of the **Southbound Antarctic Convergence** to illustrate your comparison.
6. Select the Northbound Data set.
7. Highlight the data columns selected in Step 4 and generate a graph of the **Northbound Antarctic Convergence** to illustrate your comparison.

Data Collection: (Insert a Southbound and Northbound Data Table below.)

ANALYZE YOUR RESULTS: (Insert your Southbound and Northbound graphs below.)

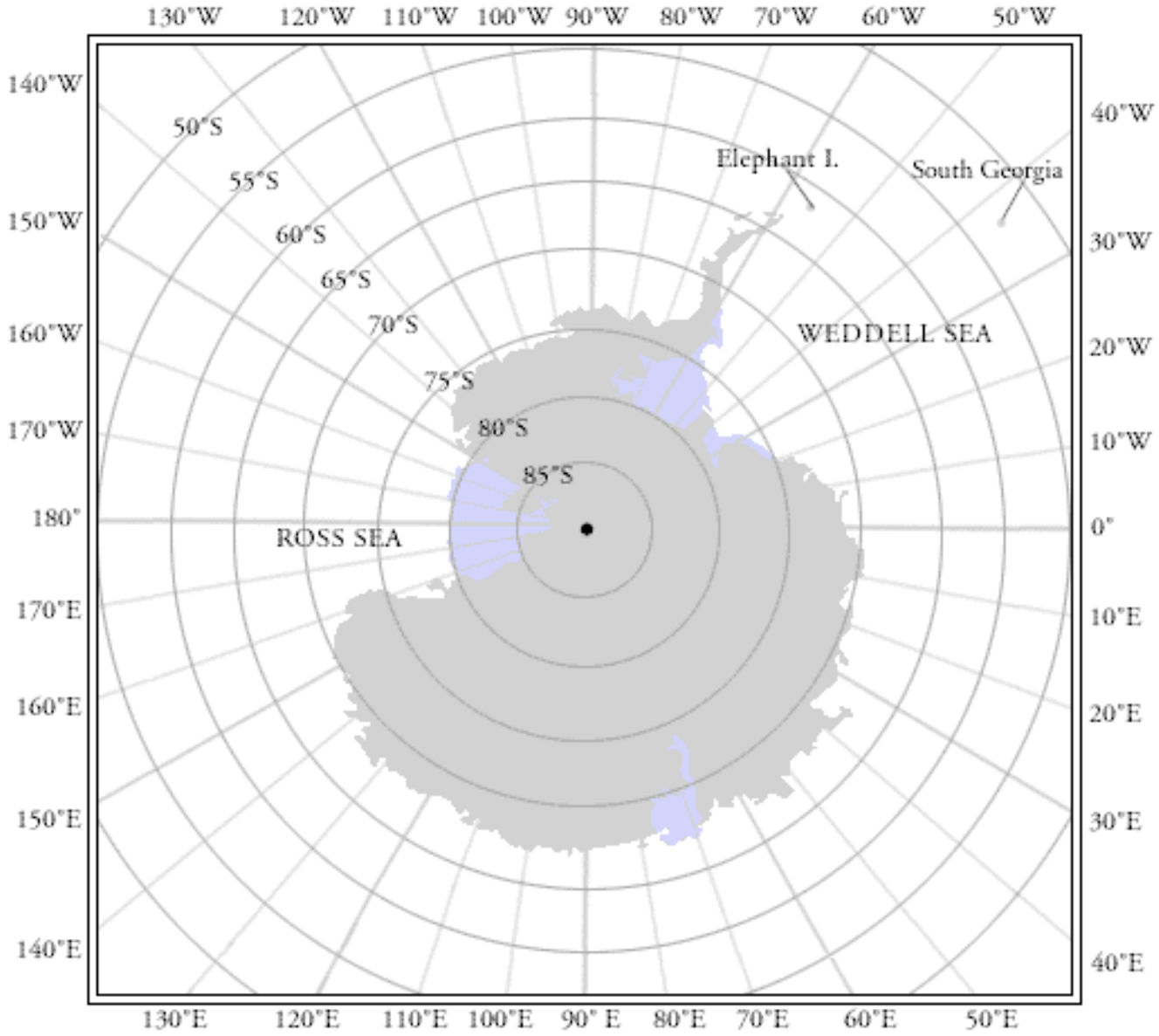
DRAW YOUR CONCLUSIONS: (Readdress the lab question and your hypothesis before describing your findings from this investigation.)

This activity was developed by Miriam Sutton with the support from Lindblad Expeditions/National Geographic's Grosvenor Teacher Fellowship Program during the 2014 expedition: Journey to Antarctica – The White Continent.

Using Sea Surface Temperature to Locate the Antarctic Convergence Zone

What defines the location of the Antarctic Convergence Zone? Use your data to locate the Antarctic Convergence Zone (ACZ) on the map below. Based on your data and the shape of Antarctica, shade in the area that you think might be included in the ACZ. Consider if the line marking the ACZ will be straight or irregular. Why?

Antarctic Map



THE ANTARCTIC CONVERGENCE ZONE

This activity was developed by Miriam Sutton with the support from Lindblad Expeditions/National Geographic's Grosvenor Teacher Fellowship Program during the 2014 expedition: Journey to Antarctica – The White Continent.

Using Sea Surface Temperature to Locate the Antarctic Convergence Zone

Are We There Yet? Using Sea Surface Temperature to Locate the Antarctic Convergence
Teacher Version

BACKGROUND INFORMATION: *The Southern Ocean consists of a broad band of generally turbulent water flowing around the southern hemisphere between about 50°S latitude and the continent of Antarctica. Westerly winds and strong surface currents act upon ships and force them in an easterly direction as they cross the latitudes known as the Roaring 40s and the Furious 50s and enter the screaming 60s. As a ship sails southwards it will encounter a sharp drop in temperature somewhere between 50° and 60°S latitude. If the weather is calm, there may be a sudden fog bank, a line of delineation for the Antarctic Convergence (also called the Polar Front), which completely surrounds the continent. During the Austral Summer, the sea temperature may drop from 6°C to 3°C (43°F to 37°F) at the convergence. During winter months, the differences in sea temperatures may be as great as 10°C (18°F). The Antarctic Convergence is a natural boundary between relatively warm Sub-Antarctic Surface Water and the cold Antarctic Surface Water. The convergence is easily detected by a drop in sea temperature, and can sometimes be detected visually by the sharply-defined edge of a fog bank. The location of the convergence varies only slightly throughout the year, or from year to year, or even century to century. Everything south of the Antarctic Convergence is part of the true Antarctic environment. (Excerpt from: Ritchie, Tom. The Antarctica Primer. New York, NY: Lindblad Expeditions, 2012.)*

QUESTION: How can sea surface temperatures be used to determine the location of the Antarctic Convergence Zone?

HYPOTHESIS: (Answers will vary but should address the question.)

TEST YOUR HYPOTHESIS:

Materials: Computer with Xcel Spreadsheet; Antarctic Convergence Data

Procedures:

1. Open the Antarctic Convergence Data set.
2. Select the Southbound Data set.
3. Review the data set to identify the variables you will select to test your hypothesis. List the variables below:
4. Variables to test: (Students may select any 2 variables from the data set to test their hypothesis. Provide coaching and guidance as needed if students are struggling with their selection.)

X-axis: Latitude Y-axis: Sea surface Temperature

5. Highlight the data columns selected in Step 4 and generate a graph of the **Southbound Antarctic Convergence** to illustrate your comparison. (Students may repeat steps 2 through 5 to investigate the correlation between other variables to determine which data will answer their hypothesis.)
6. Select the Northbound Data set.
7. Highlight the data columns selected in Step 4 and generate a graph of the **Northbound Antarctic Convergence** to illustrate your comparison.

This activity was developed by Miriam Sutton with the support from Lindblad Expeditions/National Geographic's Grosvenor Teacher Fellowship Program during the 2014 expedition: Journey to Antarctica – The White Continent.

Using Sea Surface Temperature to Locate the Antarctic Convergence Zone

Data Collection: (Insert a Southbound and Northbound Data Table below.)

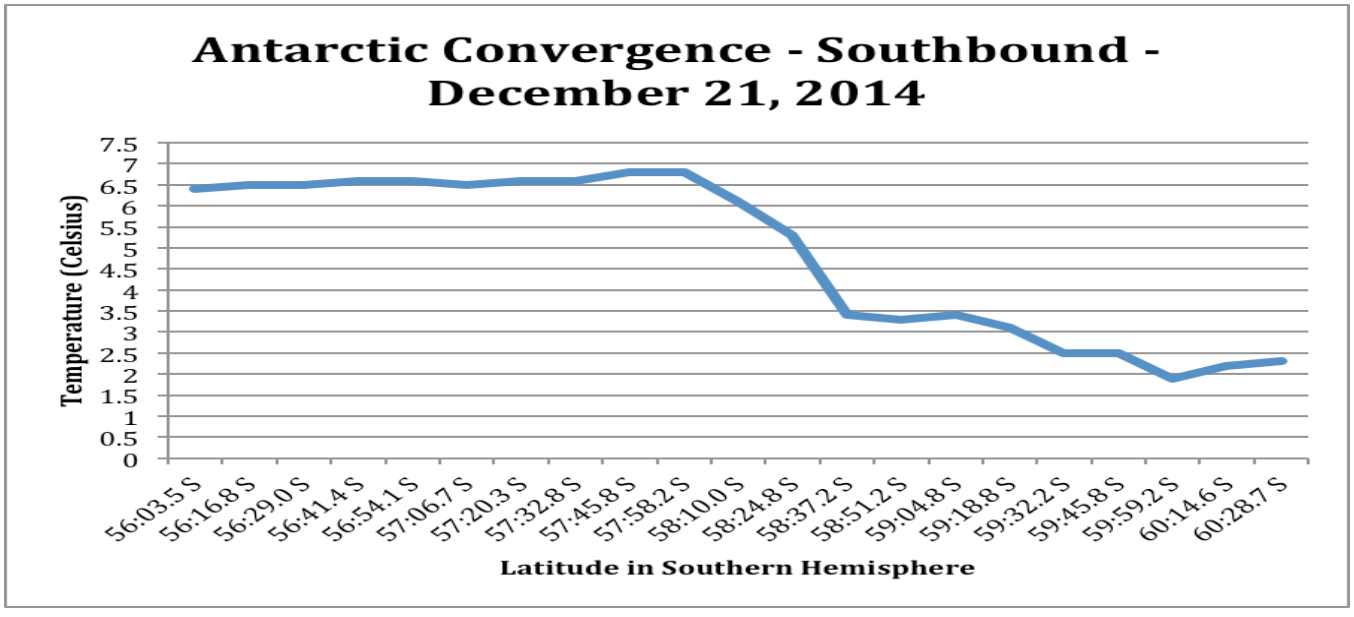
SOUTHBOUND DATA

DATE	TIME	LONGITUDE	LATITUDE	SEA TEMP©
21-Dec	6:00	065:36.6 W	56:03.5 S	6.4
21-Dec	7:00	065:24.4 W	56:16.8 S	6.5
21-Dec	8:00	065:13.8 W	56:29.0 S	6.5
21-Dec	9:00	065:02.5 W	56:41.4 S	6.6
21-Dec	10:00	064:51.2 W	56:54.1 S	6.6
21-Dec	11:00	064:39.9 W	57:06.7 S	6.5
21-Dec	12:00	064:28.0 W	57:20.3 S	6.6
21-Dec	13:00	064:16.3 W	57:32.8 S	6.6
21-Dec	14:00	064:04.4 W	57:45.8 S	6.8
21-Dec	15:00	064:53.0 W	57:58.2 S	6.8
21-Dec	16:00	063:42.1 W	58:10.0 S	6.1
21-Dec	17:00	063:26.7 W	58:24.8 S	5.3
21-Dec	18:00	063:14.6 W	58:37.2 S	3.4
21-Dec	19:00	063:02.5 W	58:51.2 S	3.3
21-Dec	20:00	062:50.1 W	59:04.8 S	3.4
21-Dec	21:00	062:37.2 W	59:18.8 S	3.1
21-Dec	22:00	062:26.3 W	59:32.2 S	2.5
21-Dec	23:00	062:11.2 W	59:45.8 S	2.5
22-Dec	0:00	061:58.5 W	59:59.2 S	1.9
22-Dec	1:00	061:44.3 W	60:14.6 S	2.2
22-Dec	2:00	061:29.9 W	60:28.7 S	2.3

NORTHBOUND DATA

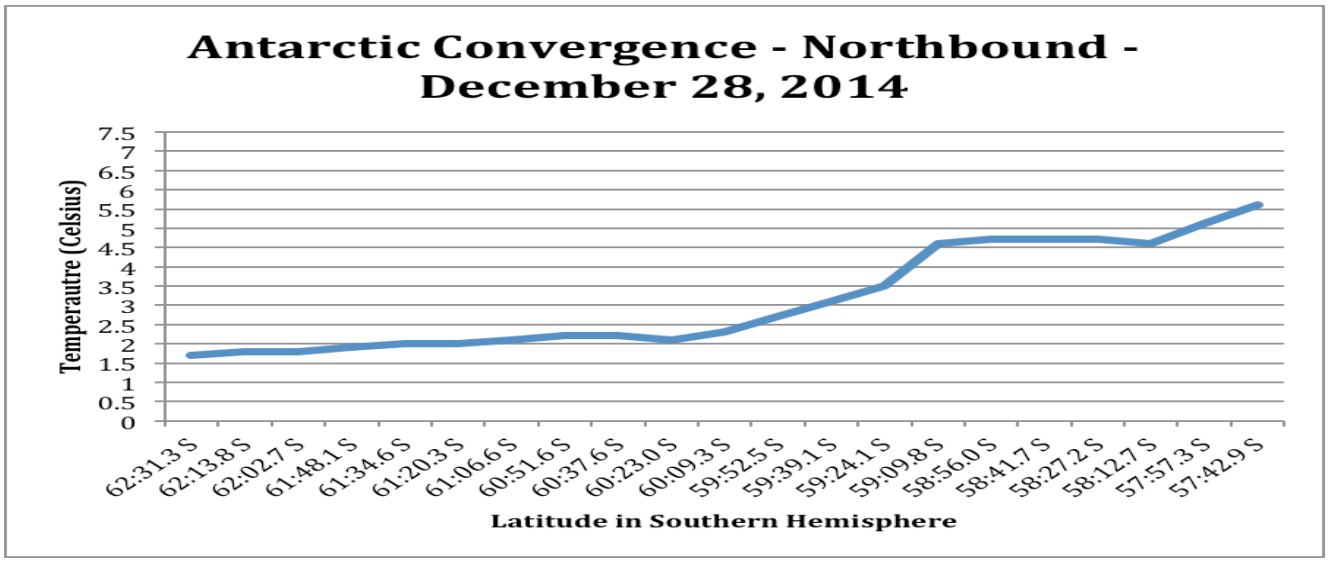
DATE	TIME	LONGITUDE	LATITUDE	SEA TEMP©
28-Dec	6:00	064:37.7 W	62:31.3 S	1.7
28-Dec	7:00	064:46.0 W	62:13.8 S	1.8
28-Dec	8:00	064:51.3 W	62:02.7 S	1.8
28-Dec	9:00	064:57.9 W	61:48.1 S	1.9
28-Dec	10:00	065:04.1 W	61:34.6 S	2
28-Dec	11:00	065:10.4 W	61:20.3 S	2
28-Dec	12:00	065:16.8 W	61:06.6 S	2.1
28-Dec	13:00	065:23.1 W	60:51.6 S	2.2
28-Dec	14:00	065:29.3 W	60:37.6 S	2.2
28-Dec	15:00	065:35.5 W	60:23.0 S	2.1
28-Dec	16:00	065:41.2 W	60:09.3 S	2.3
28-Dec	17:00	065:48.3 W	59:52.5 S	2.7
28-Dec	18:00	065:53.8 W	59:39.1 S	3.1
28-Dec	19:00	066:00.5 W	59:24.1 S	3.5
28-Dec	20:00	066:06.7 W	59:09.8 S	4.6
28-Dec	21:00	066:12.4 W	58:56.0 S	4.7
28-Dec	22:00	066:18.3 W	58:41.7 S	4.7
28-Dec	23:00	066:24.0 W	58:27.2 S	4.7
29-Dec	0:00	066:30.6 W	58:12.7 S	4.6
29-Dec	1:00	066:32.1 W	57:57.3 S	5.1
29-Dec	2:00	066:42.9 W	57:42.9 S	5.6

ANALYZE YOUR RESULTS: (Insert your Southbound and Northbound graphs below.)



This activity was developed by Miriam Sutton with the support from Lindblad Expeditions/National Geographic's Grosvenor Teacher Fellowship Program during the 2014 expedition: Journey to Antarctica – The White Continent.

Using Sea Surface Temperature to Locate the Antarctic Convergence Zone



DRAW YOUR CONCLUSIONS: (Answers will vary but should be similar, include the correct variables, and the latitudinal location for the convergence.)
SAMPLE CONCLUSION: In this investigation, we analyzed different oceanographic variables to determine the location of the Antarctic Convergence Zone (ACZ). The variables most beneficial in locating the zone were Latitude and Sea Surface Temperature. Based on the data collected during the Southbound route, the ACZ began at 57:58.2 S when the temperature began dropping from 6.8C to 3.4C. The ACZ appeared in the Northbound data at 60:23.0 S latitude when the temperature began rising from 2.1C. Based on these results, the Antarctic Convergence Zone is defined by a steady change in temperature that occurs between 57 S and 60 S latitude.

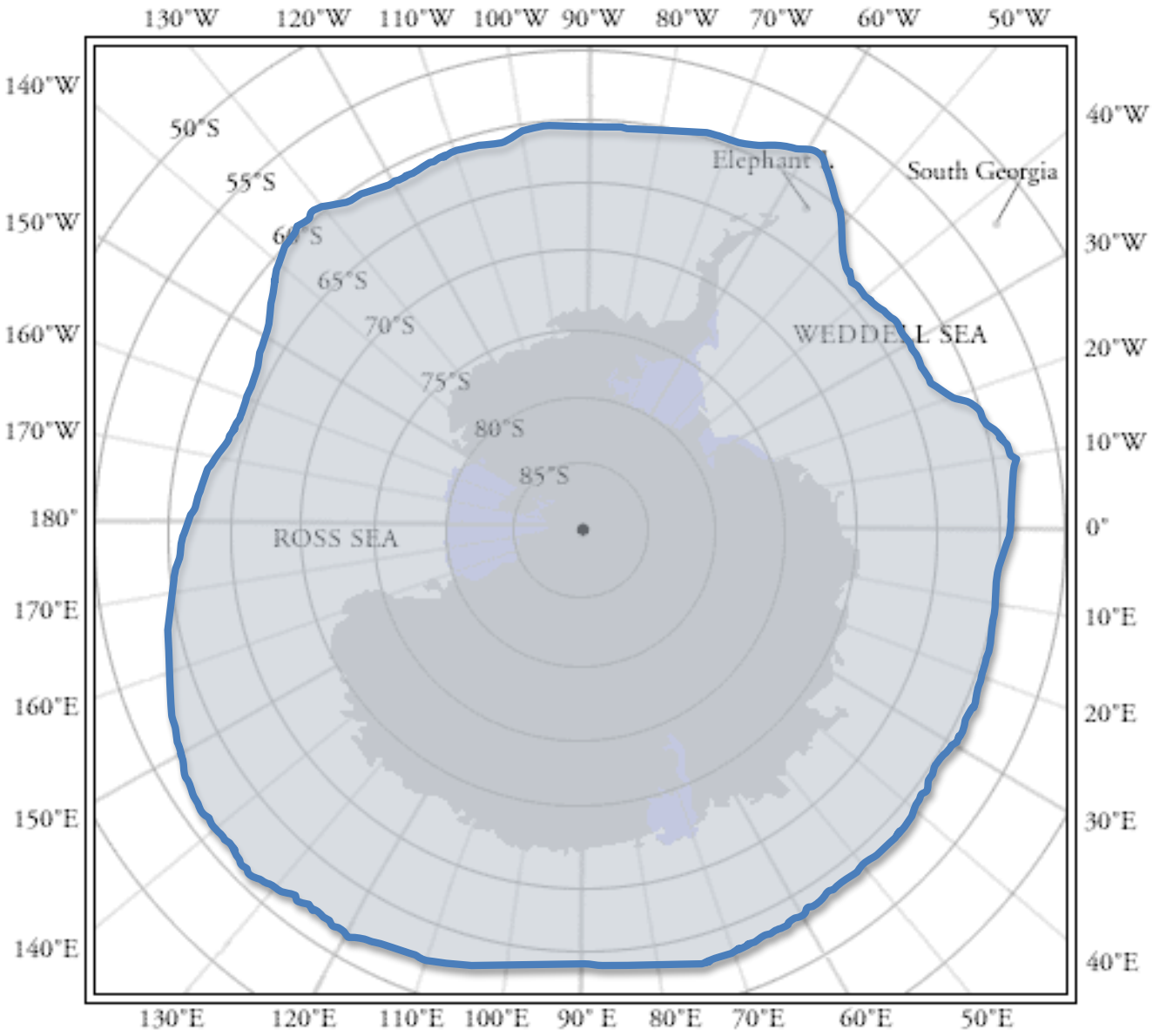
EXTENSION: Distribute a map of Antarctica, showing latitude/longitude from South America to Antarctica and guide students in plotting the Southbound and Northbound Routes with temperature data added at each 1-hour latitude interval plotted. Students may also color code the Antarctic Convergence Zone as outlined on their map, hypothesizing the fluctuations in sea surface temperature based on plausible explanations provided by the student.

This activity was developed by Miriam Sutton with the support from Lindblad Expeditions/National Geographic's Grosvenor Teacher Fellowship Program during the 2014 expedition: Journey to Antarctica – The White Continent.

Using Sea Surface Temperature to Locate the Antarctic Convergence Zone

What defines the location of the Antarctic Convergence Zone? Use your data to locate the Antarctic Convergence Zone (ACZ) on the map below. Based on your data and the shape of Antarctica, shade in the area that you think might be included in the ACZ. Consider if the line marking the ACZ will be straight or irregular. Why? Students should shade in an irregular area to illustrate the ACZ between 57:58.2 South and 60.23.0 South latitude, following the basic outline of the continent.

Antarctic Map



THE ANTARCTIC CONVERGENCE ZONE

This activity was developed by Miriam Sutton with the support from Lindblad Expeditions/National Geographic's Grosvenor Teacher Fellowship Program during the 2014 expedition: Journey to Antarctica – The White Continent.