

Activity 3.2

A tale of two hemispheres

Thermal inertia, a measure of how difficult it is to change the temperature of a material, has a strong effect on how Earth stores and releases solar energy. Water has a high thermal inertia, typically four times that of soil or air. Thus, the upper layer of the ocean stores much more solar energy and it changes temperature much more slowly than does the land or the atmosphere. For this reason, the ocean is cooler during the day and warmer during the night relative to the atmosphere or land.

1. Based on your current understanding, circle the words that you think best complete the following statement:
“The land heats up more quickly / slowly and cools off more quickly / slowly than the ocean, so the range of temperatures over the land should be greater / smaller than over the ocean.”

In this investigation, you will explore temperature patterns in the atmosphere and oceans around the world to better understand the role the ocean plays in moderating global climate.

Seasonal temperature variation

- ▶ Launch ArcView GIS, then locate and open the **etoe_unit_3.apr** project file.
- ▶ Open the **Global Energy** view.

The **Seasonal Avg Air Temp Range (C)** theme shows the difference between the average surface air temperatures during June, July, and August (JJA) and the average temperatures during December, January, and February (DJF). Warm summers and cold winters result in a wide temperature range, whereas mild summer and winter temperatures or consistently cold or hot temperatures result in a narrower range.

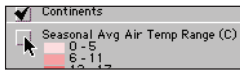
Look at the distribution of the seasonal temperature ranges in the Northern and Southern Hemispheres.

2. In general, where does the seasonal temperature variation appear to be the:
 - a. Largest?
 - b. Smallest?
 - c. Why do you think this pattern occurs?

JJA = June, July, and August

DJF = December, January, and February

To turn a theme on or off, click its checkbox in the Table of Contents.



Visual estimation

To learn more about visually estimating the percentage of coverage, see the section on **Making visual estimations** in the Introduction to this guide.

- ▶ Turn off the **Seasonal Avg Air Temp Range (C)** theme.

To better understand these temperature range variations, you will examine the distribution of land and ocean in the Northern and Southern Hemispheres.

The distribution of land and ocean

Over 70% of the world’s surface is covered by ocean, with land covering the remaining 30%. However, the land is not distributed evenly over the globe.

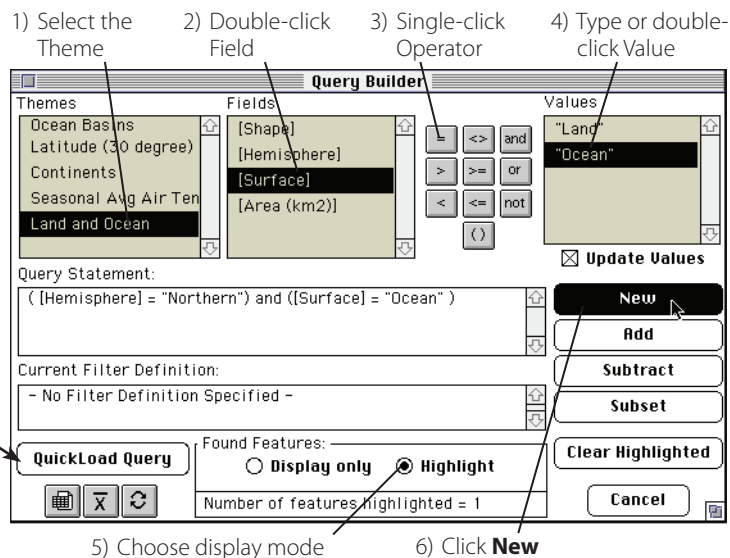
- 3. Visually estimate the percentage of ocean and land in each hemisphere and enter your estimates in Table 1.

Table 1—Estimated percentages of land and ocean by hemisphere

Hemisphere	% Land	% Ocean	Total
Northern			100%
Southern			100%

You will evaluate your estimate by calculating the actual percentage of each hemisphere that is covered by ocean.

- ▶ Click the Query button to open the Query Builder.
- ▶ Query the **Land and Ocean** theme for **([Hemisphere] = "Northern") and ([Surface] = "Ocean")** as shown in steps 1–6:



QuickLoad Query

If you have difficulty entering the query statement correctly:

- Click the QuickLoad Query button and load the **Northern Hemisphere Ocean** query.
- Select the **Highlight** option.
- Click **New**.

- ▶ Do not close the Query Builder window.

The oceans in the Northern Hemisphere should be highlighted yellow.