Using Different Models of Earth

Category

Geography, Science

Real World Connection

Commerce, Transportation

Materials

Scissors, Glue or Tape, String, Globe Map of the World

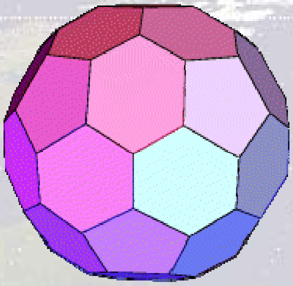
Copies of a Two Dimensional Map (Flat) - Icosahedron Pattern - to Construct a Model of Earth (Included)

Optional: String to Suspend Model of Earth

Problem Question

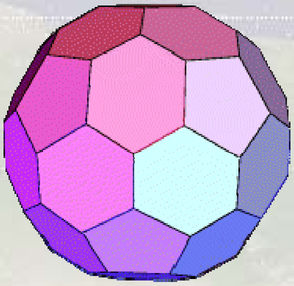
How do the shapes, sizes, and distances of land masses appear to be different on two different models of Earth? (An icosahedron and a flat map)

Prior Knowledge What I Know *Based on your prior knowledge, answer the problem question to the best of your ability.*	Conclusion What I Learned *Answer the problem question after completing the activity. Include an example in your answer.*



FYI

An icosahedron is a three dimensional figure with the maximum number of faces that can be cut out and assembled into a spherical shape from a flat piece of paper.

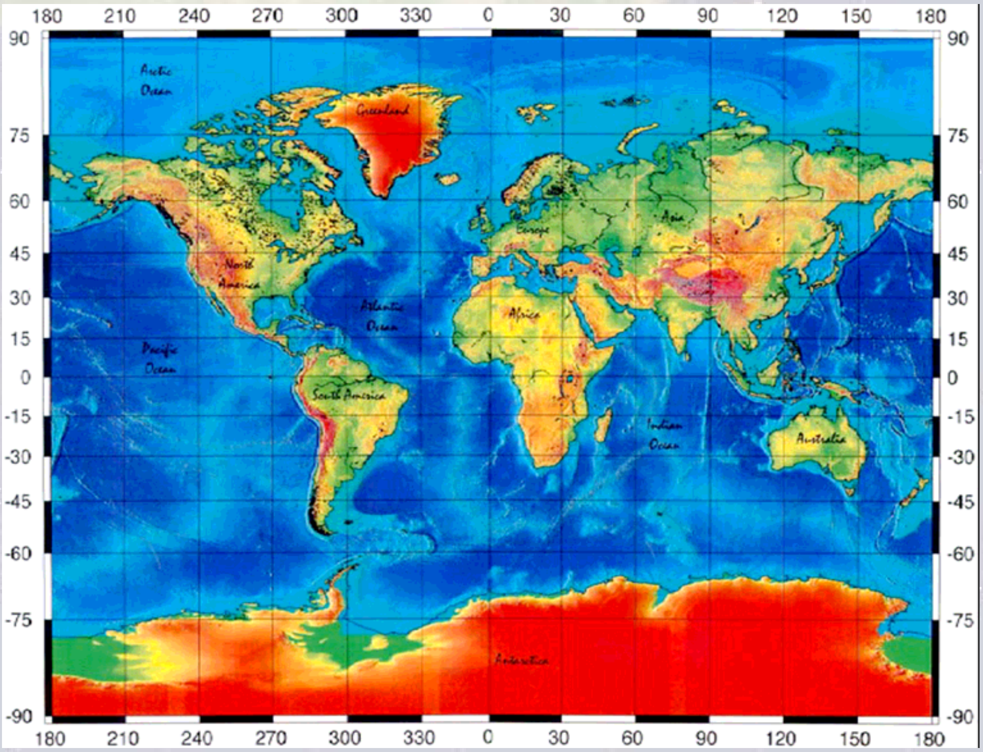


Background

Using a globe map of the world and a piece of string, find the shortest distance between New York, New York and Paris, France. You can accomplish this by stretching the string tightly between these two cities (points) on the globe. The resulting route is called a Great Circle. It is the shortest possible route on the surface of a sphere.

For Thought

Which route would save fuel for airlines flying between these two major cities – a circle route or a flat map route?



Miller Projection World Map

Procedure - Part 1

1. If your icosahedron model of Earth (Figure 2-1) is black and white, color your model according to the teacher's master color template (Figure 2-1) that comes with this activity.

2. Assemble the icosahedron model of Earth (Figure 2-1). (Hint: Cut the tabs larger so that the sections of the icosahedron fit together more easily for gluing or tape.)

3. Answer the following questions as you construct your icosahedron model of Earth.

Questions - Part 1

1. How are the icosahedron map and the flat map similar and different?

2. How does Antarctica appear different on the flat map compared to the icosahedron map?

3. How does Greenland appear different on the flat map compared to the icosahedron map?

4. What can you say (conclude) about shape and size on a icosahedron map compared to a flat map? Why?

5. Is the icosahedron map or the flat map more true to scale?

Questions - Part 1 (Continued)

6. Why were you asked to construct a model of Earth using an icosahedron instead of constructing a sphere (globe)?

7. Describe the Great Circle route between Cape Horn, South America and Tasmania, Australia. Is the route on the icosahedron map or on the flat map more direct?

8. Find the Great Circle route between Seattle, Washington and the country of Kazakhstan on both the flat map and on the icosahedron map. Describe the most direct route.

9. What can you say (conclude) about the sizes and shapes of land masses on a globe (represented by an icosahedron map) compared to a flat map?

Procedure – Part 2

Using your icosahedron map model (Figure 2-1), answer the following questions.

FYI

To find the antipode on any model of Earth, add 180 degrees to the longitude and flip the sign of the latitude

Questions - Part 2

10. Name the antipode (country or a body of water) that is opposite from the United States.

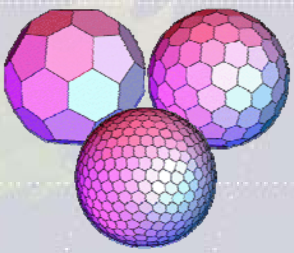
11. Name the antipode (country or a body of water) that is opposite from Antarctica.

12. Name the antipode (country or a body of water) that is opposite from Australia.

13. Does the icosahedron or the map make it easier to accurately identify the “opposite” location? Why?

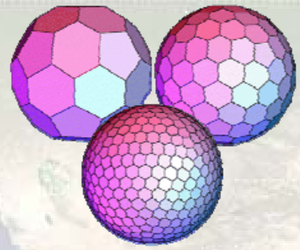
For Teachers

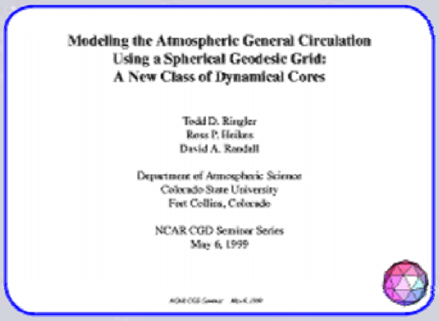
The following material explains how the icosahedron is the basis for new models being developed for global weather prediction.



Spherical Geodesic Grids: A New Approach to Modeling the Climate

Information and Tools to get Started Using Spherical Geodesic Grids




Modeling the Atmospheric General Circulation
Using a Spherical Geodesic Grid:
A New Class of Dynamical Cores

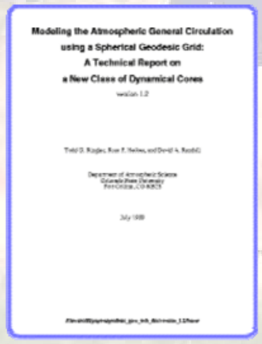
Todd D. Ringler
Ross P. Heikes
David A. Randall

Department of Atmospheric Science
Colorado State University
Fort Collins, Colorado

NCAR CGD Seminar Series
May 6, 1999

An Introduction to Spherical Geodesic Grids

http://kiwi.atmos.colostate.edu/BUGS/geodesic/slideshow/


Modeling the Atmospheric General Circulation
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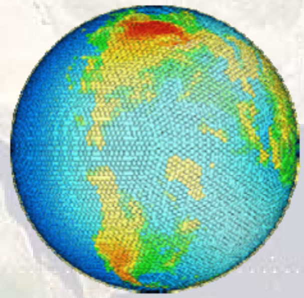
A Technical Report on
a New Class of Dynamical Cores

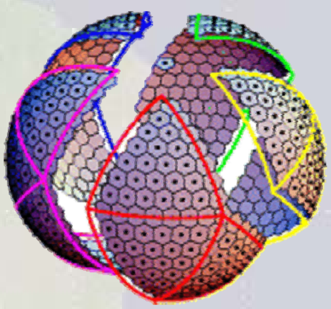
Papers and Technical Reports

http://kiwi.atmos.colostate.edu/BUGS/geodesic/pdfFiles.html



Interpolating To and from Geodesic Grids

http://kiwi.atmos.colostate.edu/BUGS/geodesic/interpolate.html

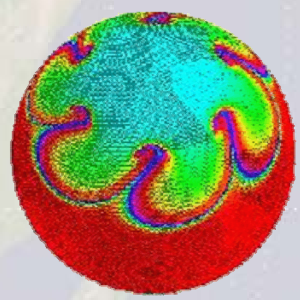


Data Structure

http://kiwi.atmos.colostate.edu/BUGS/geodesic/text.html

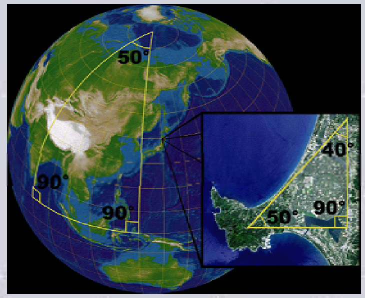
Domain Decomposition Using Massive Parallel Architectures

http://kiwi.atmos.colostate.edu/BUGS/geodesic/domain.html



Geodesic Shallow Water Model

http://kiwi.atmos.colostate.edu/BUGS/geodesic/swim.html



Parallel Architectures

http://kiwi.atmos.colostate.edu/BUGS/geodesic/domain.html

Background globe image courtesy NASA

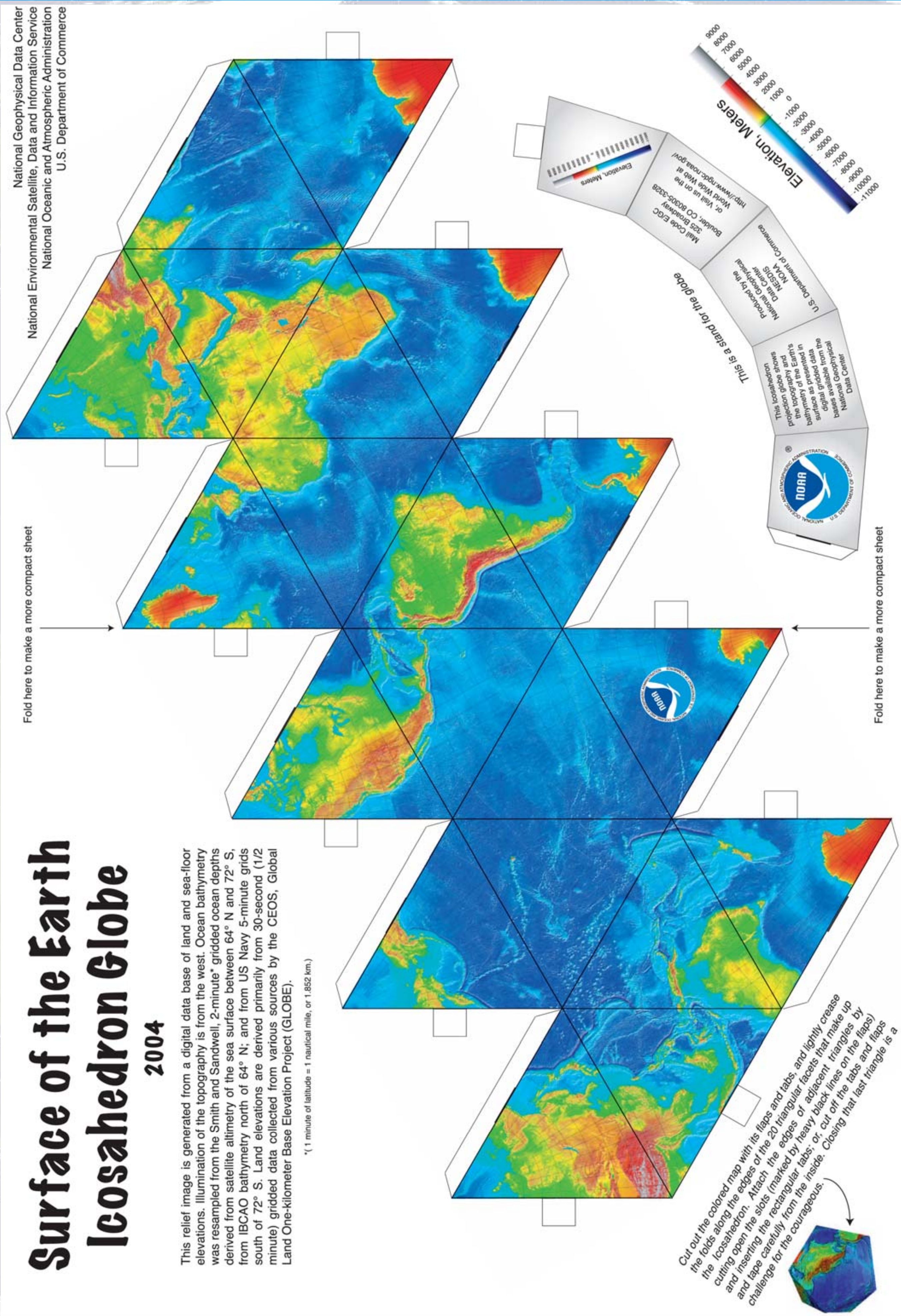


Figure 2-1. Icosahedron Model of the Earth - 1.