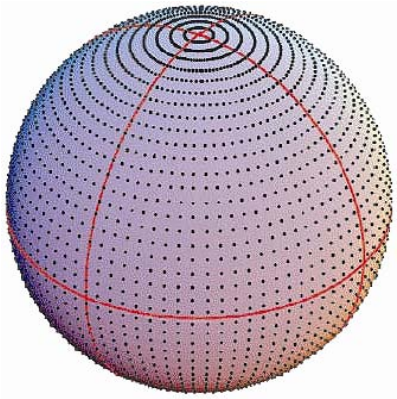
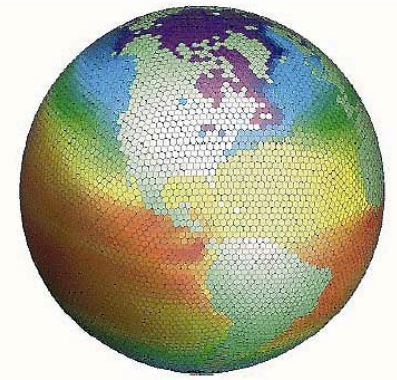
noaaresearch



The lat/lon is a traditional model grid used to make numerical forecasts.



An icosahedral grid, such as the FIM, is the most uniformly distributed geodesic grid suitable for weather and climate models.

Global Systems Division
Dr. Steven Koch, Director
NOAA/DOC
325 Broadway
Boulder, CO 80305
www.esrl.noaa.gov/gsd

Earth System Research Laboratory

Putting Tools in the Hands of Users

ESRL Develops New Climate and Weather Prediction Model- the FIM

A new computational design for a global icosahedral model is currently under development at the Global Systems Division (GSD) of NOAA's Earth System Research Laboratory (ESRL). GSD is collaborating with the Environmental Modeling Center at the National Centers for Environmental Prediction (NCEP) to research and test this "Flow-following"-finite volume Icosahedral Model, known as the FIM.

What is an icosahedron?

FIM is based on the principle of a solid 20-sided geometric figure known as an icosahedron. The FIM coordinate system consists of a large number of hexagonal cells (with 12 embedded pentagons).

Flow-following coordinates reduce nonphysical errors

FIM's name originates from the fact that it is a finite-volume icosahedral model that solves shallow-water flow in combination with a flow-following vertical coordinate whose surfaces move freely according to airflow. These coordinate surfaces aloft are defined by a constant potential temperature, making it flow following. This coordinate system allows for a reduction of nonphysical errors in the model.

Unique grid cell shapes allow conservative finite-volume numerics

This new grid-point model, in a sense, "molds" over the globe providing quasi-uniform coverage with minimal regional variation. The variations can be kept minimal due to the shape of the grid cells. The FIM is particularly suitable for finite-volume numerics whose conservative operators can be easily approximated as line integrals along cell boundaries.

Potentially produces more accurate numerical weather predictions

FIM runs real-time weather forecasts twice daily as part of a verification process proposed by NCEP. These runs and other research have proven that the desirable "conservativeness" of the model can potentially result in better overall numerical predictions.

FIM meets NOAA's Mission Goal

ESRL's efforts to improve local and global weather prediction models enhance our customers' preparedness for responding to hazardous weather- and water-related conditions. These efforts are also applied to improving medium-range weather prediction and responding to climate prediction needs.