Ocean Circulation Trends over the Continents during Noah's Flood

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Biblical Overview

"In the six hundredth year of Noah's life, in the second month, the seventeenth day of the month, on that day all the fountains of the great deep were broken up, and the windows of heaven were opened. And the rain was on the earth forty days and forty nights." Genesis 7:11-12

Biblical Overview

"Now the flood was on the earth forty days. The waters increased and lifted up the ark, and it rose high above the earth. The waters prevailed and greatly increased on the earth, and the ark moved about on the surface of the waters. And the waters prevailed exceedingly on the earth, and all the high hills under the whole heaven were covered." Genesis 7:17-19

Biblical Overview

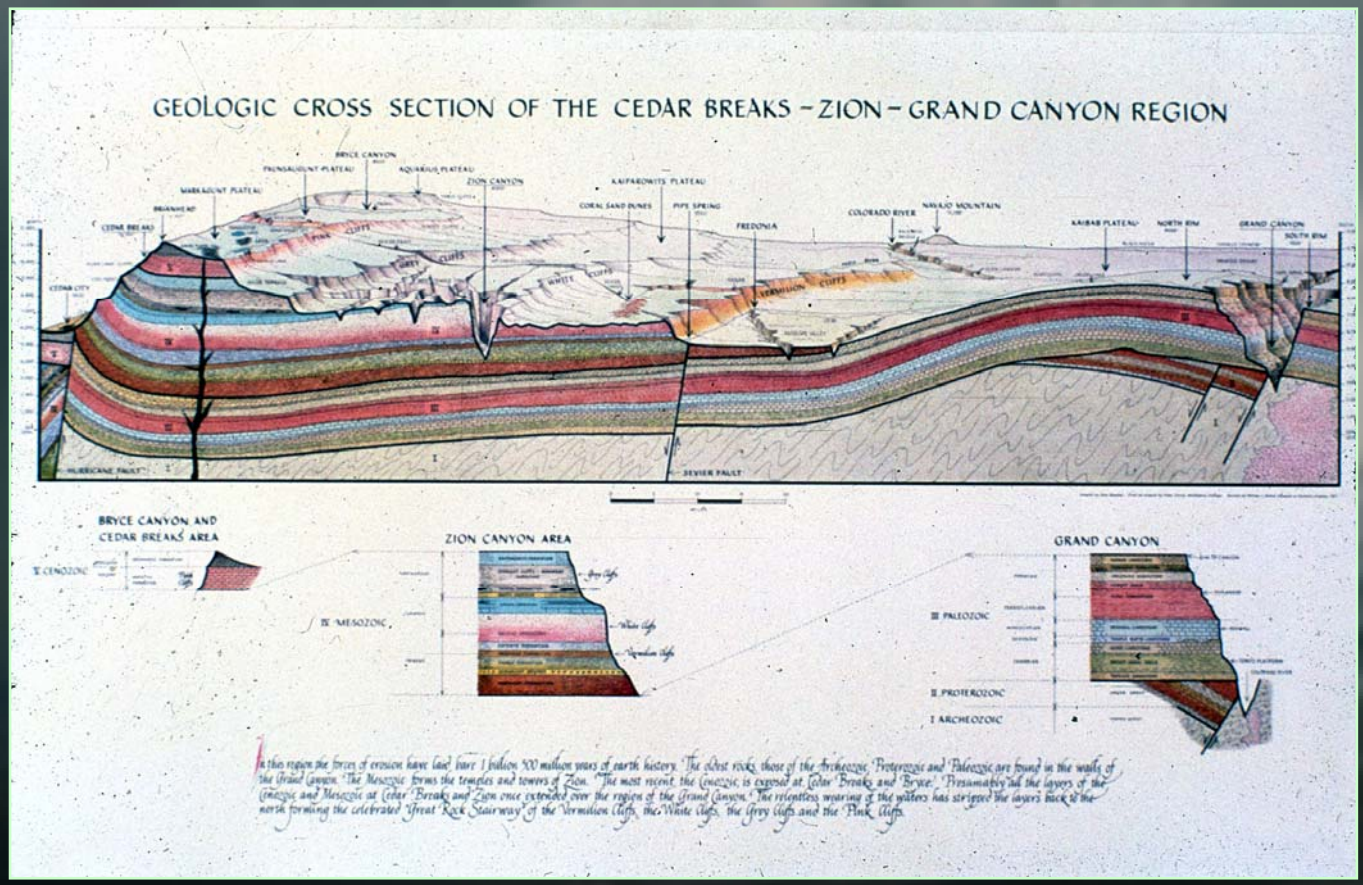
"And all flesh died that moved on the earth: birds and cattle and beasts and every creeping thing that creeps on the earth, and every man."

"So He destroyed all living things which were on the face of the ground: both man and cattle, creeping thing and bird of the air. They were destroyed from the earth. Only Noah and those who were with him in the ark remained alive. And the waters prevailed on the earth one hundred and fifty days." Genesis 7:21, 23-24

Biblical Overview

"that by the word of God the heavens were of old, and the earth standing out of water and in the water, by which the world that then existed perished, being flooded with water." II Peter 3:6

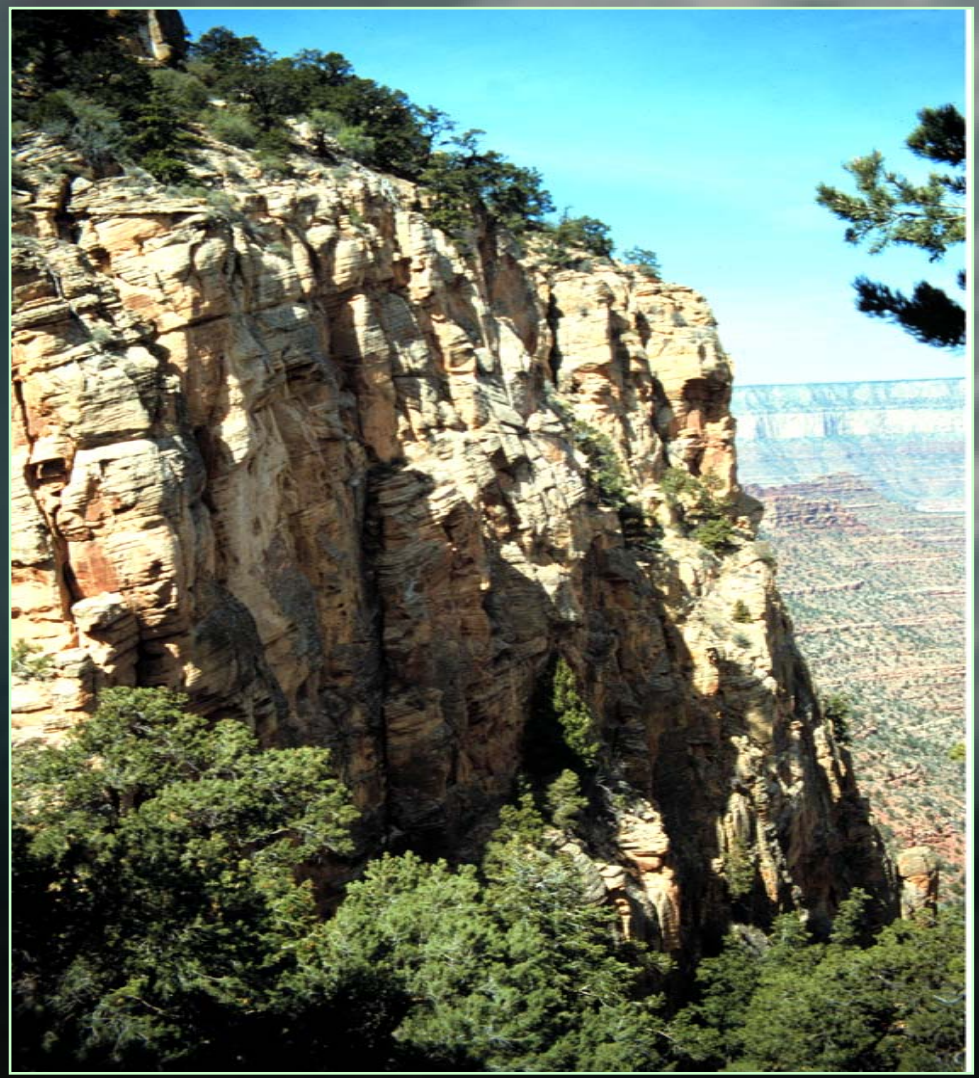
Evidence for Global Catastrophe



There are no modern analogs for most of the fossil-bearing sedimentary record!!

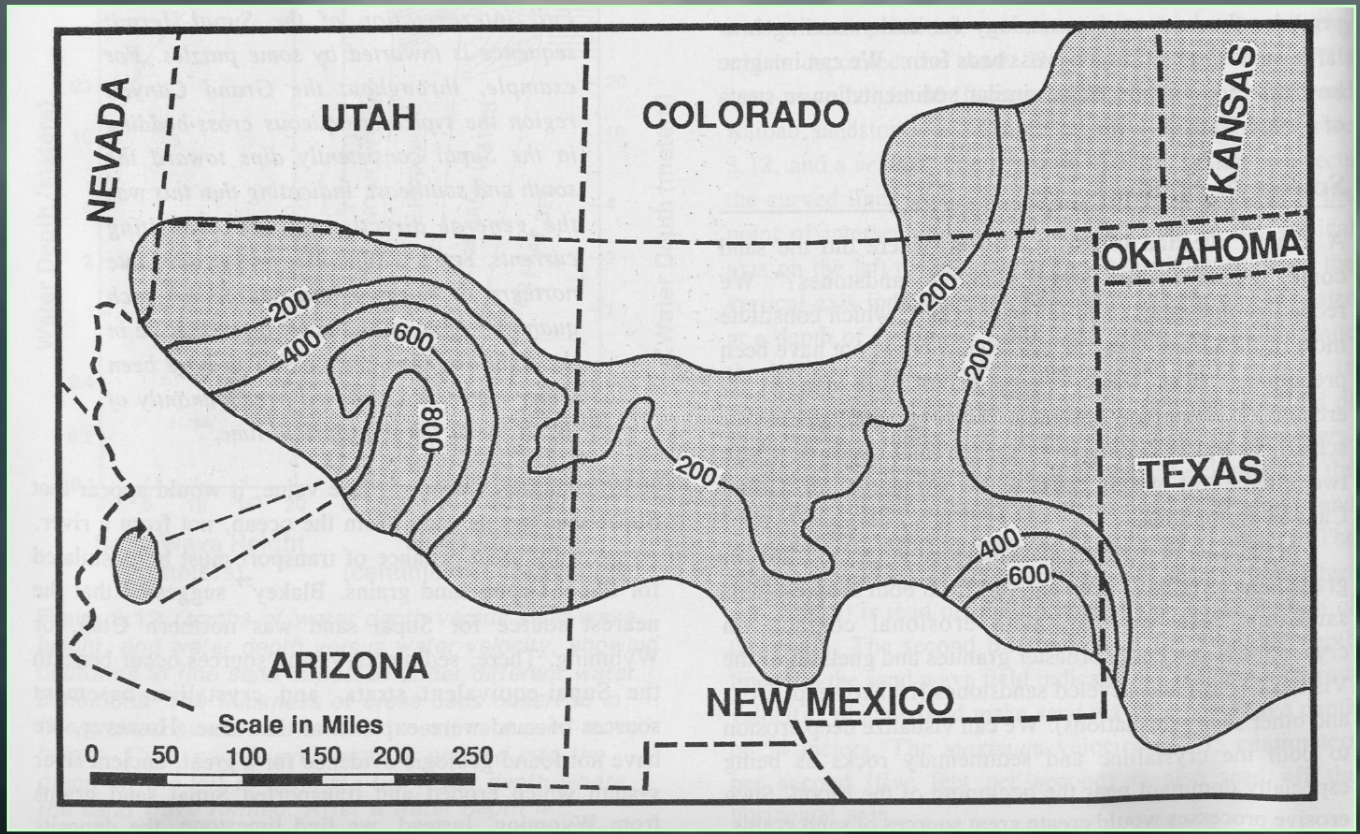
The horizontally extensive layers are continuous in E-W and N-S directions for hundreds of miles, contain fossils, and display internal evidence for high velocity water transport.

Evidence for Global Catastrophe



Coconino Sandstone, Grand Canyon has huge lateral extent!

Evidence for Global Catastrophe



Sandstone-thickness map. The Coconino Sandstone (Arizona) correlates with the Glorieta Sandstone (New Mexico and Texas), Cedar Hills Sandstone (Colorado and Kansas), and the Duncan Sandstone (Oklahoma). The area of sandstone shown is 200,000 square miles and the volume of sand is estimated at 10,000 cubic miles. Contour lines indicate sandstone thickness in feet.

Evidence for Global Catastrophe

Extreme sedimentation rates

Upright fossil tree in limestone, Pike County, Kentucky

Evidence for Global Catastrophe

Extreme sedimentation rates

Vertical fossil tree with base in coal seam, Tennessee

Evidence for Global Catastrophe

Rarity of erosional features at boundaries between major sedimentary units:
Implies sedimentation was rapid and continuous

Contact of the Coconino Sandstone (above) with the Hermit Shale (below) along the Bright Angel Trail, Grand Canyon, Arizona.

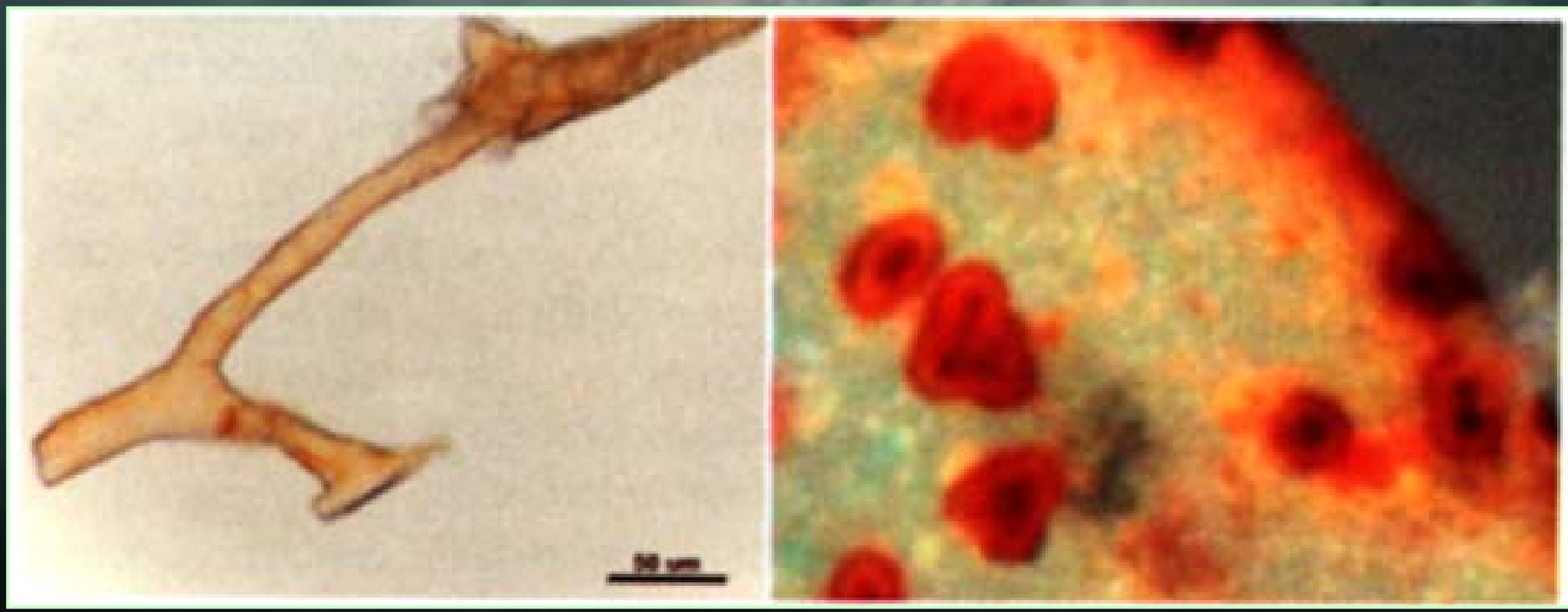
Evidence for Global Catastrophe

Fossil preservation of large animals

Articulated dinosaur bones, Dinosaur National Monument, Vernal, Utah

Evidence for Global Catastrophe

Recent startling discovery: Flexible blood vessels containing red blood cells in bone from T. rex



Science, 307, pp. 1852, 1952-1955, March 25,2005

Background

- Previous numerical experiments were conducted to explore the patterns of ocean circulation using LANL SLSWM
- Used Pangean-like supercontinent configurations
- Found high velocity currents over flooded continents of the order of tens of m/s
- These strong currents explain large-scale sedimentation patterns

Motivation

- Identify the hydraulic mechanism responsible for large-scale mass transport of sediment
- Understand the physics that leads to high velocity currents over flooded continents

Theory

Shallow water equations

$$\frac{d\vec{V}}{dt} = -(2\Omega Sin\varphi)\vec{k} \times \vec{V} - \nabla\Phi$$

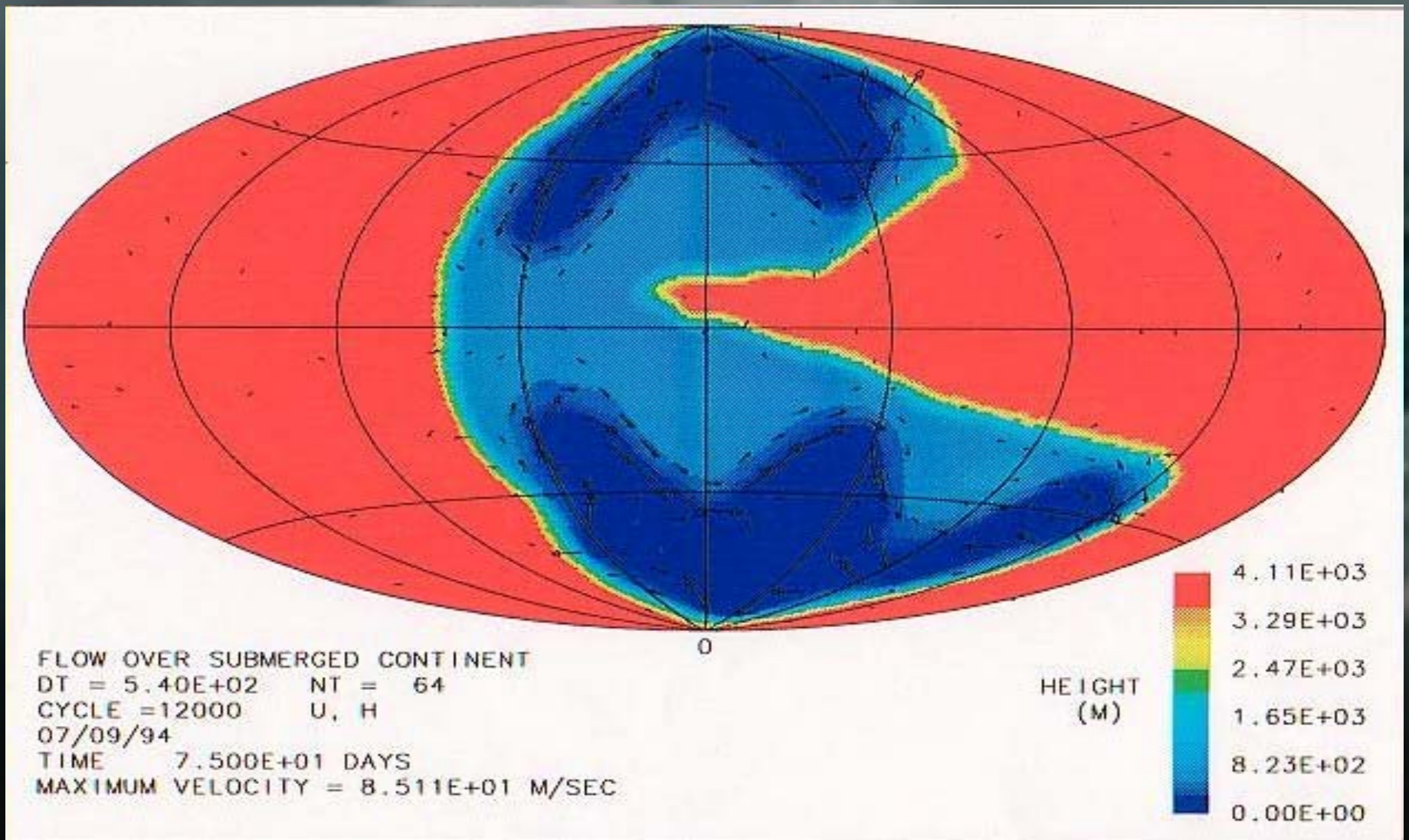
$$\frac{d\Phi}{dt} = -\Phi\nabla \bullet \vec{V}$$

where Φ is the free surface geopotential, Ω the angular velocity of the earth and φ denotes latitude.

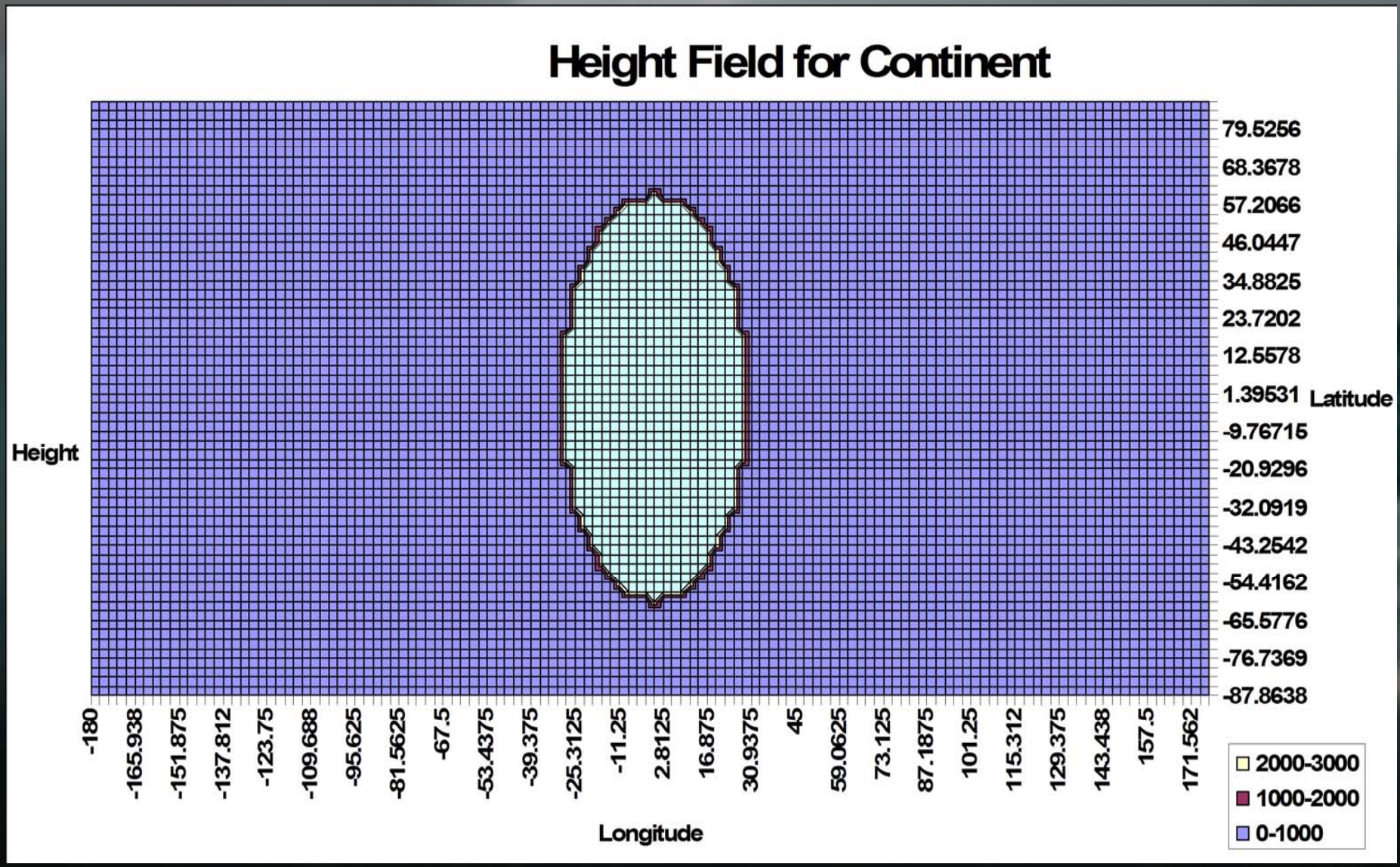
- **2-D code with shallow water approximations**
- **LANL SLSWM code uses semi-Lagrangian method**
- **NCAR STSWM uses spectral transform method**

LANL SLSWM Results

Water circulation over flooded continent



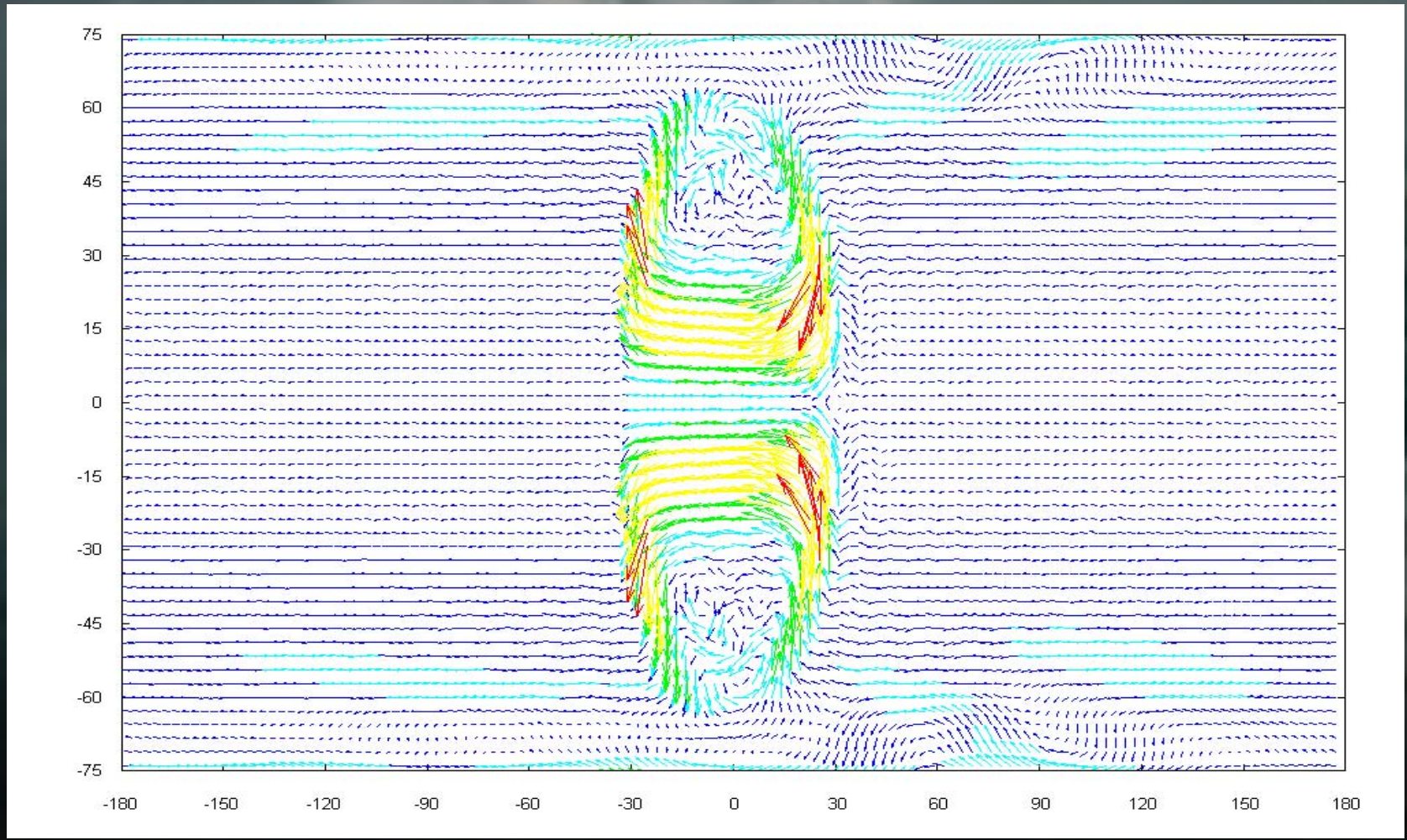
NCAR STSWM Results



NCAR STSWM Results

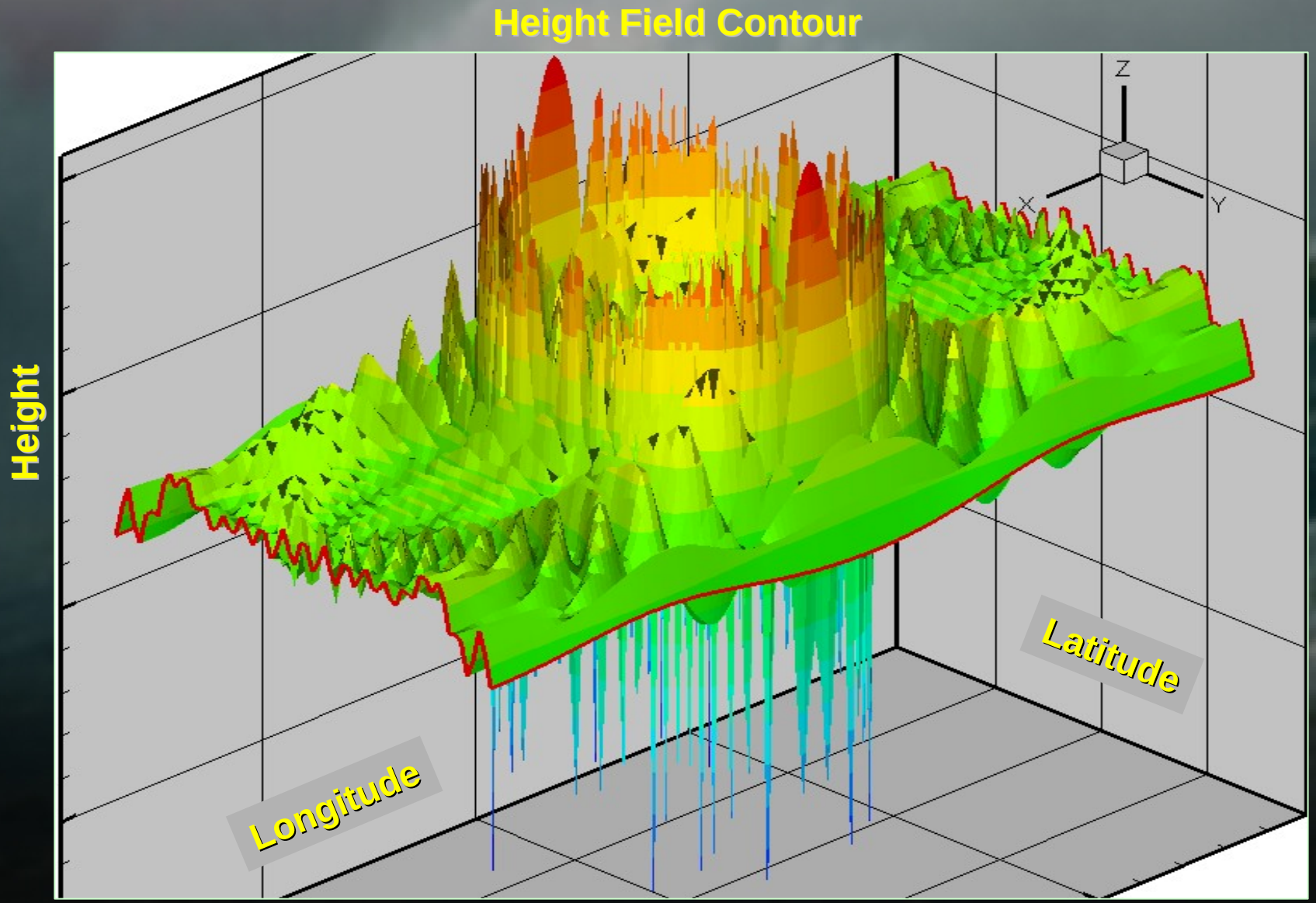
Water circulation over flooded continent

Velocity vector field



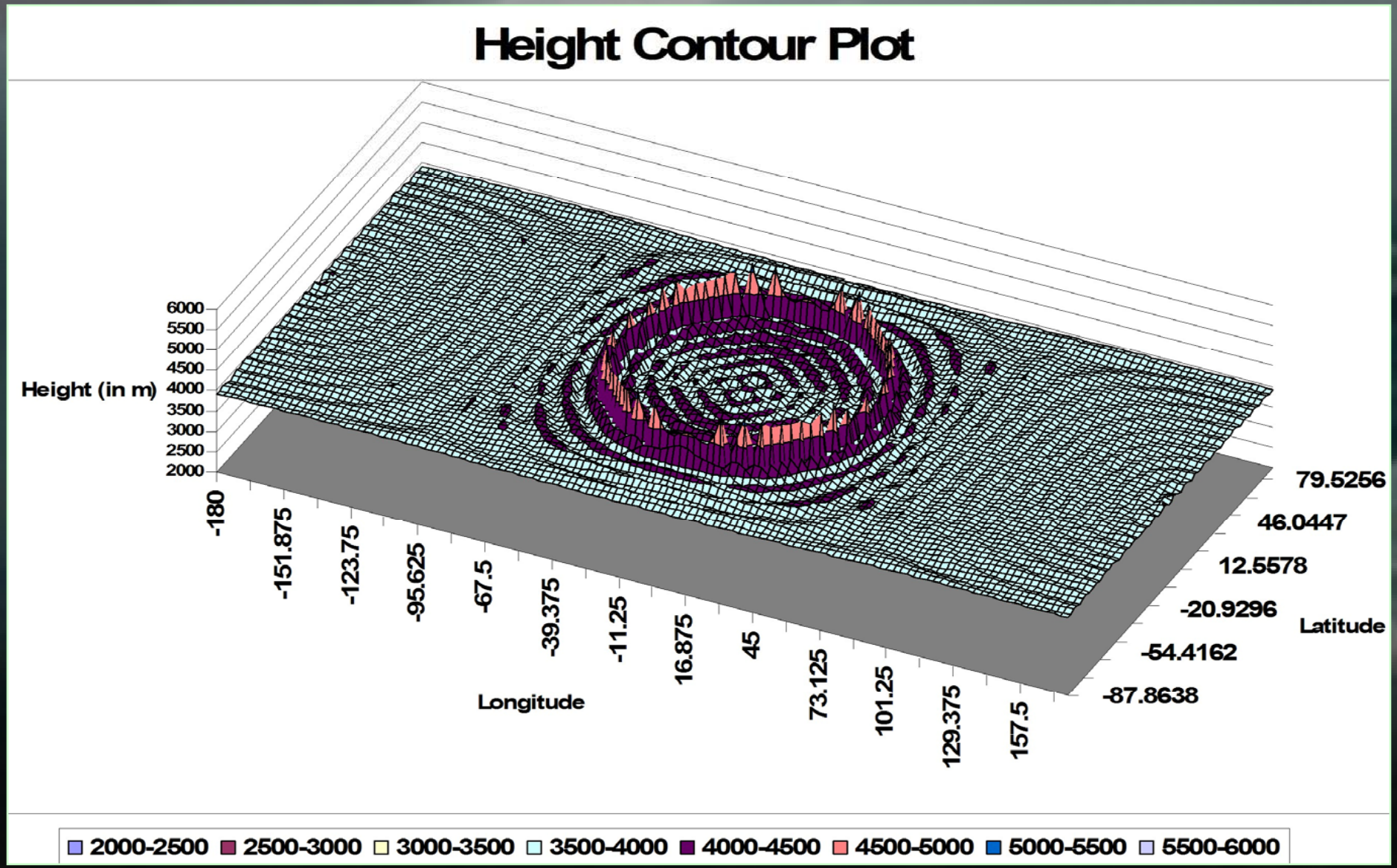
Early difficulty with STSWM code

Spectral ringing



Results

Effect of smoothening of the continent's edge



Results

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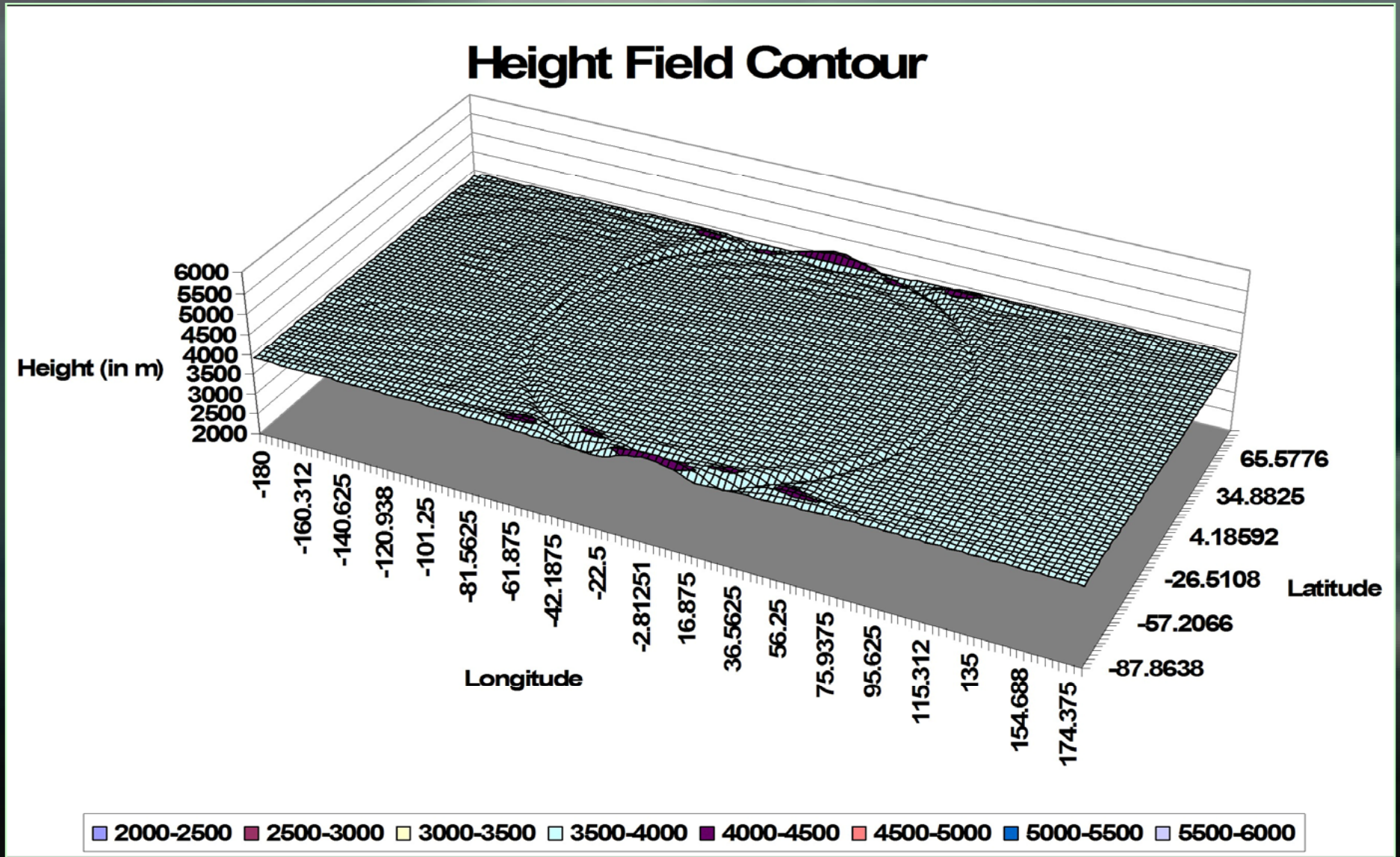
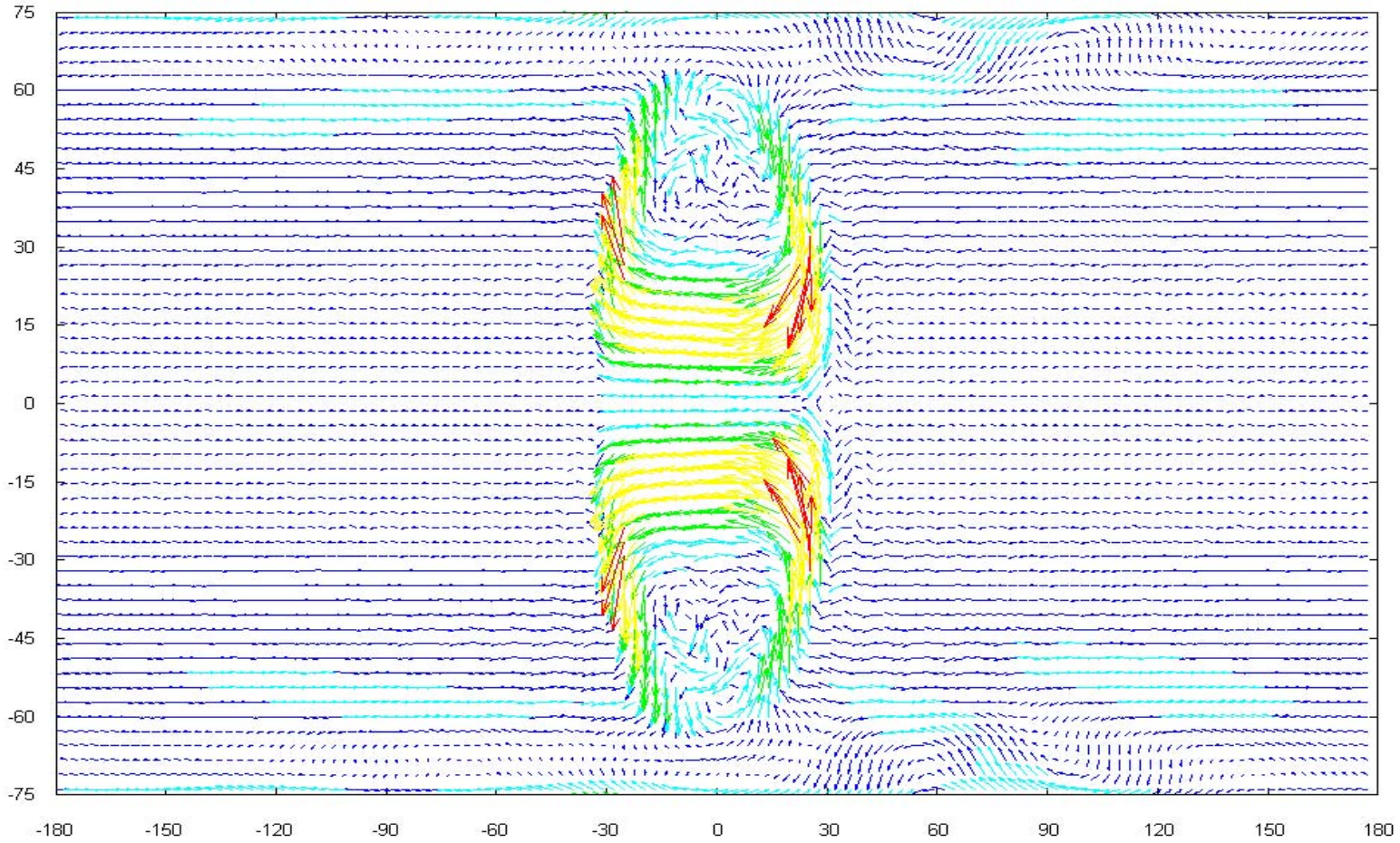


NCAR STSWM Results

Fluid westward movement

Velocity vector field

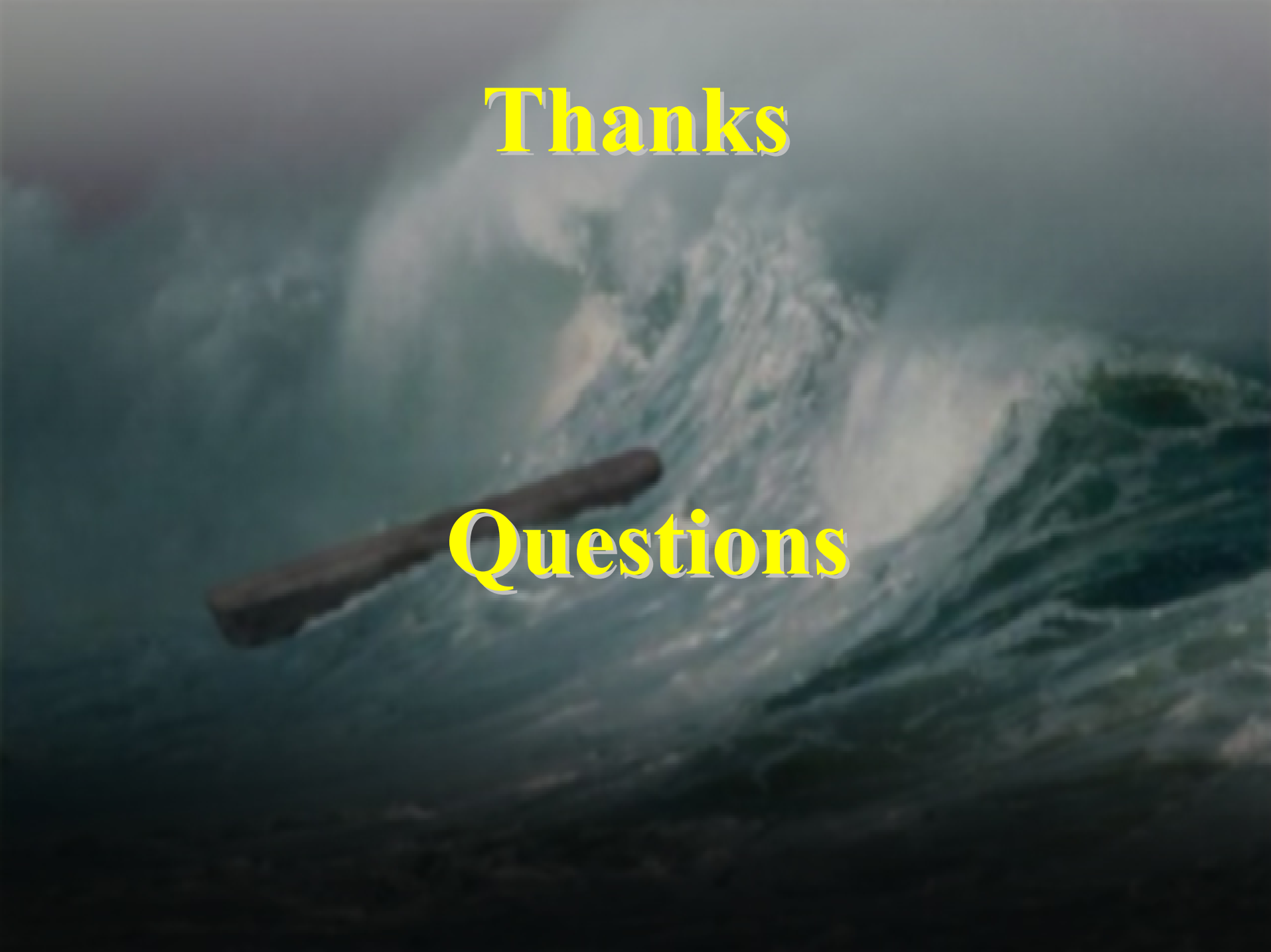


Conclusion

- Numerical calculation yields strong westward current with peak velocity of about 20 m/s over flooded continents

Future Work

- Explore how continent location and distribution affects currents
- Explore how surface topography affects currents
- Understand physics that causes these currents to arise


Thanks
Questions