What was the Great Flood, detailed in the Bible?

Read book by Bill Ryan and Walter Pitman
Drainage in the early Holocene, Followed by dryer times

Ryan and Pitman (1998)
Sea level was 120 m lower than today during last ice age.

As glaciers melted, sea level rose.....
Migration from Black Sea

Ryan and Pitman (1998)
What does the future hold?

We are carrying out a global experiment......
Antarctic Ice Core
Keeling et al. (1989)
Atmospheric CO2 Concentrations

Last glacial maximum (20 ky ago) 200 ppm
1700 AD (pre-industrial) 280 ppm
2004 AD (today) 375 ppm
Temperature and CO₂ concentration in the atmosphere over the past 400 000 years (from the Vostok ice core)

Global Warming?

Fossil Fuel Use: \[ C + O_2 = CO_2 \]  
(combustion)

About 50% of CO2 released since 1800 has remained in atmosphere. About 25% is in oceans. Rest has probably gone into tree growth or plant debris in sediments.

Effect on temperature? About 0.5°C warming since 1940  
Is this noise or clear signal of more to come?
Millenial Northern Hemisphere temperature reconstruction (blue) and instrumental data (red) from AD 1000 to 1999, adapted from Mann et al. (1999). Smoother version of Northern Hemisphere series (black), linear trend from AD 1000 to 1850 (purple dashed) and two standard error limits (grey shaded) are shown.
Possible effects of global warming

Sea level rise of 60-70 m as icecaps melt.
(during last glacial it was 120 m lower than today)

More hurricanes predicted by global models

Change climate zones and prime agricultural regions

Ice-free Arctic: Huge effect on hydrology and temperature?

Are climate models accurate?????????????
Sea level rise due to global warming

Sea level rise over the last century

- Annual sea level change
- 5-year running mean

Sea level rise scenarios for 2100

- Solid lines represent various scenarios including changes in aerosols beyond 1990. Dashed lines show the scenarios with constant 1990 aerosol.

Source: Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996; Sea level rise over the last century, adapted from Gornitz and Lebedeff, 1987.
Who disappears? Gulf Coast areas at risk

- below 1.5 m
- 1.5-3.5 m

100 miles
What do our leaders think?

Tony Blair states that global warming is a critical problem. Russia has now endorsed the Kyoto Protocol. George Bush will not submit the Kyoto Protocol for senate ratification.
Temperature data

Solid lines are 5 year means for 1400 - 2000 AD. Records from ice cores, tree rings, and direct measurement were compiled by NOAA.
Chaos in Natural Populations
Blowflys in a jar of limited volume
Projections of World population and energy consumption (Pipkin and Trent)
‘The term holistic refers to my conviction that what we are concerned with here is the fundamental interconnectedness of all…….’

-from Dirk Gently’s Holistic Detective Agency by Douglas Adams
The Biblical Version

From Genesis:

_In the beginning God created the heaven and the earth._
(space and matter)

_And God said, Let there be light; and there was light._
(Big Bang)

_Let the waters under the heaven be gathered together__
_until one place and let the dry land appear; and it was so._
(Earth, oceans and continents)

_Let the earth bring forth grass...; and it was so._ (life develops)

....... and God saw that it was good.
A few key events that we discussed...

- Big bang 13 by ago
- H and He form
- Elements >He synthesized in stars
- Solar system forms 4.5 by ago
- Moon forms
- Earth differentiates
- Life evolves before 3.5 by ago
- Plate Tectonics makes the continents go around
- Ice ages come and go
- Mass extinctions occur
- California is assembled
- Humans evolve 150 ky (Homo sapiens)
- You become an Earth Scientist
What do I hope you learned?

Basic Science: Energy is conserved, although it takes many forms.

Time moves forward.

Earth systems evolve as energy and matter are dynamically cycled.
(The Sun, Plate tectonics, Gases of the atmosphere, Climate)

Deterministic behavior provides predictability. But not all events are predictable (chaos). Stuff happens (catastrophes). Evolve or disappear.

Humans are part of a biogeochemical system.
And we are lucky to be here.
The End

or, I hope, the beginning of your pursuit
to understand the Earth