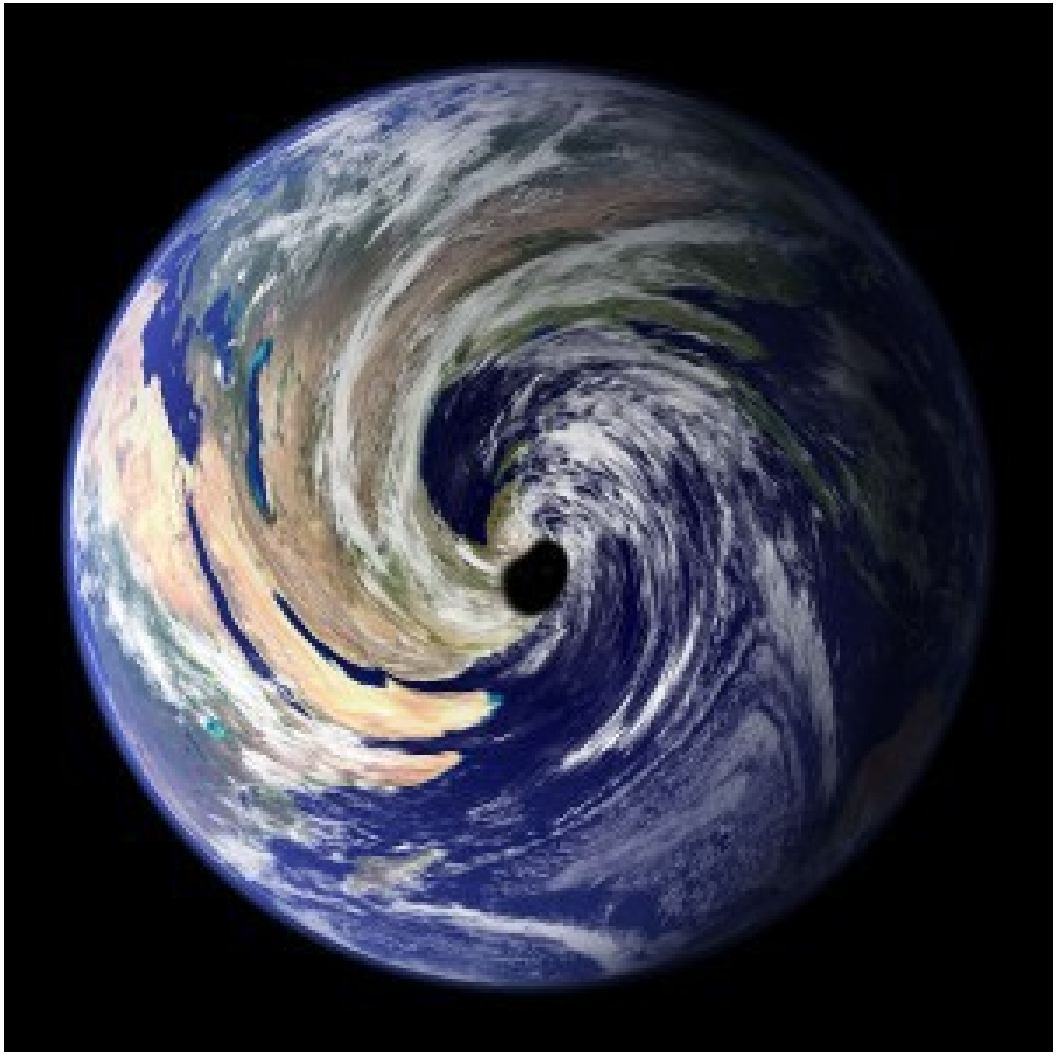
Debunking the 2012 Apocalypse

Alicia Gomez
19 November 2012

Outline

- Blackholes
  - Microscopic
  - Supermassive
- Asteroid Impact
- Planetary Impact
- Geomagnetic Reversal
- Super Volcano
- Solar Flares

CERN Causing Black Holes



The Large Hadron Collider (LHC) [1,2]

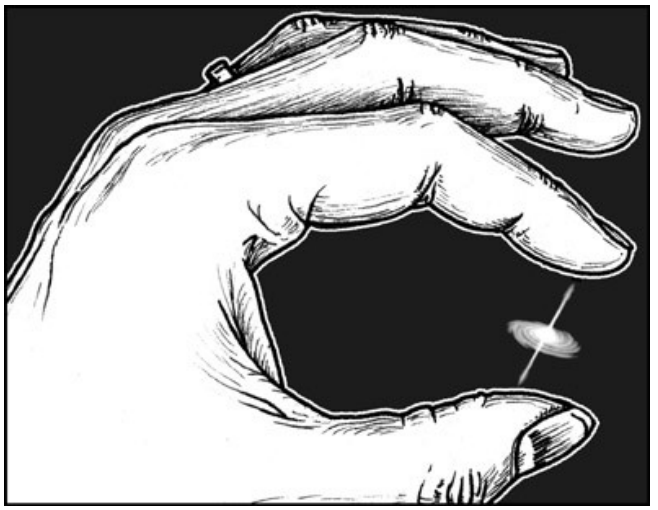
- The LHC is a proton-proton particle collider in Switzerland/France. 7-8 TeV -> 14 TeV.
- If a microscopic black hole were produced, it would have very little mass, and very little gravitational pull.
- Astronomical black holes are much larger than anything produced at the LHC.
  - Collision energy equivalent to that of a mosquito in flight.
  - Cosmic ray muons have more energetic.

Addressed Seriously

- This idea of black hold production was taken seriously by physicists. (http://arxiv.org/pdf/0911.1884v1.pdf)
  - Time evolution: would evaporate almost instantly except when a certain parameter was between 1 and 1.25.
  - In this range, black holes with large initial momentum would cross the Earth in seconds and be flug out into space.
    - This black hole would accrete mass until it reaches 10^-22 kg at which it would evaporate.

No Need to Worry

- Low initial momentum black holes have possibility of staying trapped in the Earth.
  - Most extreme value: mass would accrete to be 10^-14 kg... in about 14 billion years.
- Eyeball estimate – microscopic black holes can absorb at most a human sperm cell in our universe's lifetime.



Earth Sucked into the Black Hole at the Center of the Milky Way

Milky Way Galaxy [3,5]

Milky Way Galaxy over Paranal Observatory

- About 100,000 light years in diameter and has 200-400 billion stars.
- Our solar system is about 2/3 out of the way of the Galactic center.

- Distance from the Sun to the Galactic Center of the Universe is 25,000 light years.
- At the center of the universe there is a super massive black hole of about 4 million solar masses.
- Conspirators say the Earth will be sucked in on Dec 21, 2012.
- If the Earth was traveling at the speed of light, at a straight trajectory... it would take 25,000 years.

Asteroid Impact

Monitors [8,9]

- SENTRY - An Automatic Near-Earth Asteroid Collision Monitoring System. NASA. 2 years.
- NEODyS CLOMON – university of Pisa. 12 years.
- Continually updates the orbits of possible Earth impacting asteroids.
- Uses information from observatories from around the world and cross-checks with each other frequently.

Torino Impact Scale [7]

- 0: No Hazard (white zone) – impact likelihood is zero.
- 1: Normal (green zone) – collision unlikely. No need for public concern.
- 2-4: Meriting Attention by Astronomers (Yellow Zone) – greater than 1% chance of collision. Public officials should be warned if impact is within the decade.
- 5-7: Threatening (Orange Zone) – Critical attention is necessary. Global catastrophe is uncertain.
- 8-10: Certain Collisions (Red Zone) – Global Catastrophe is imminent.

- Worst Zone.... Green. Two objects, both lists to impact from 2040-2060.
- Only two objects listed have 2012 in their range.

- V_{impact} - Velocity at atmospheric entry.
- $V_{infinity}$ - Relative velocity at atmospheric entry neglecting the acceleration caused by the Earth's gravity field, often called the hyperbolic excess velocity. ($V_{infinity}^2 = V_{impact}^2 - V_{escape}^2$, where V_{escape} = ~11.2 km/s is the Earth escape velocity.)
- **H** - Absolute Magnitude, a measure of the intrinsic brightness of the object.
- **Diameter** - This is an estimate based on the absolute magnitude, usually assuming a uniform spherical body with visual albedo $p_V = 0.154$ (in accordance with the Palermo Scale) but sometimes using actual measured values if these are available. Since the albedo is rarely measured, the diameter estimate should be considered only approximate, but in most cases will be accurate to within a factor of two.
- **Mass** - This estimate assumes a uniform spherical body with the computed diameter and a mass density of 2.6 g/cm^3. The mass estimate is somewhat more rough than the diameter estimate, but generally will be accurate to within a factor of three.
- **Energy** - The kinetic energy at impact: 0.5 * Mass * V_{impact}^2. Measured in Megatons of TNT.

2005 TM173

Earth Impact Risk Summary

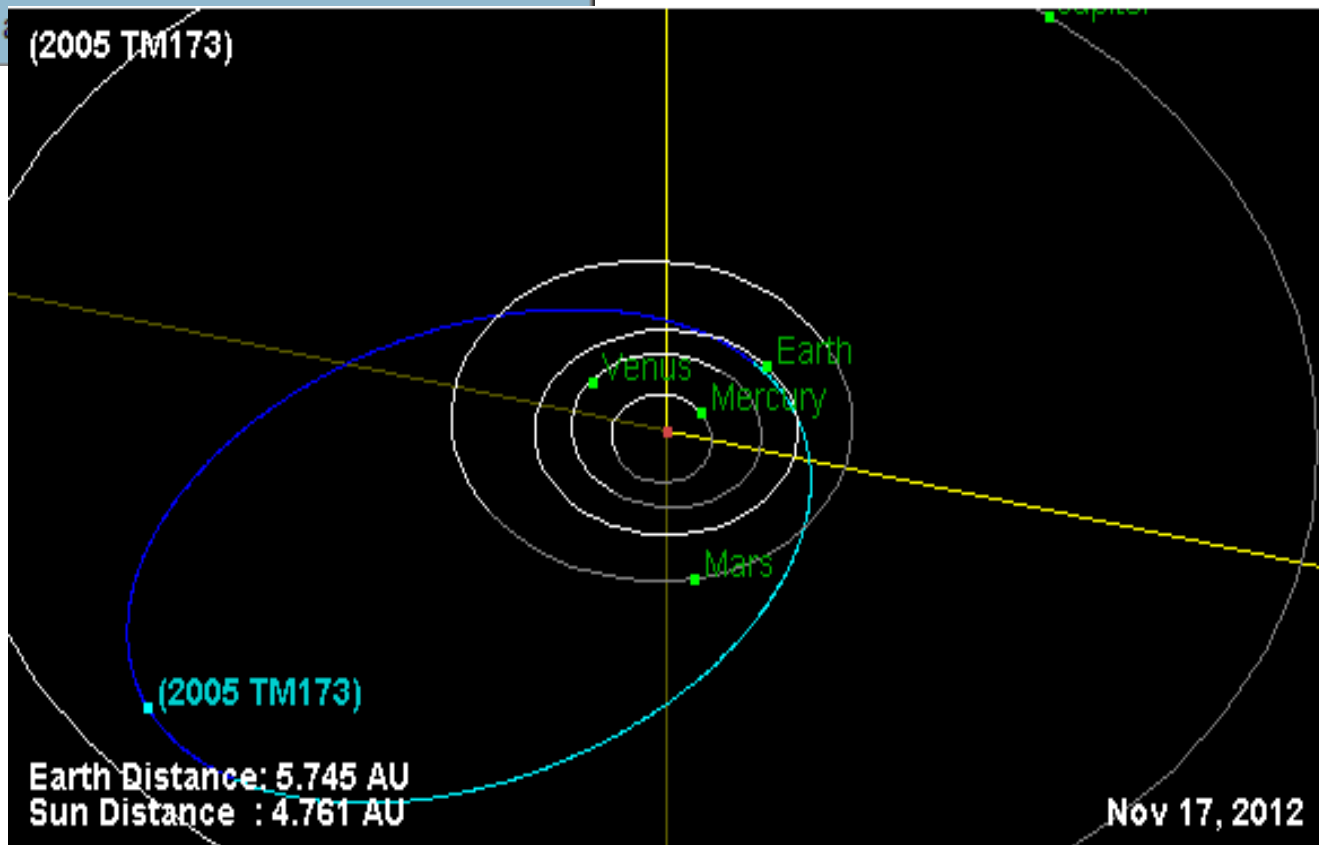
Torino Scale (maximum)	0
Palermo Scale (maximum)	-6.31
Palermo Scale (cumulative)	-5.46
Impact Probability (cumulative)	8.3e-07
Number of Potential Impacts	133

V_{impact}	14.15 km/s
$V_{infinity}$	8.68 km/s
H	24.1
Diameter	0.051 km
Mass	1.8e+08 kg
Energy	4.4e+00 MT

Analysis based on
6 observations spanning 1.9467 days
(2005-Oct-09.20072 to 2005-Oct-11.14743)

all above are mean values
weighted by impact probability

Orbit diagram and elements



2010 WW8

Earth Impact Risk Summary

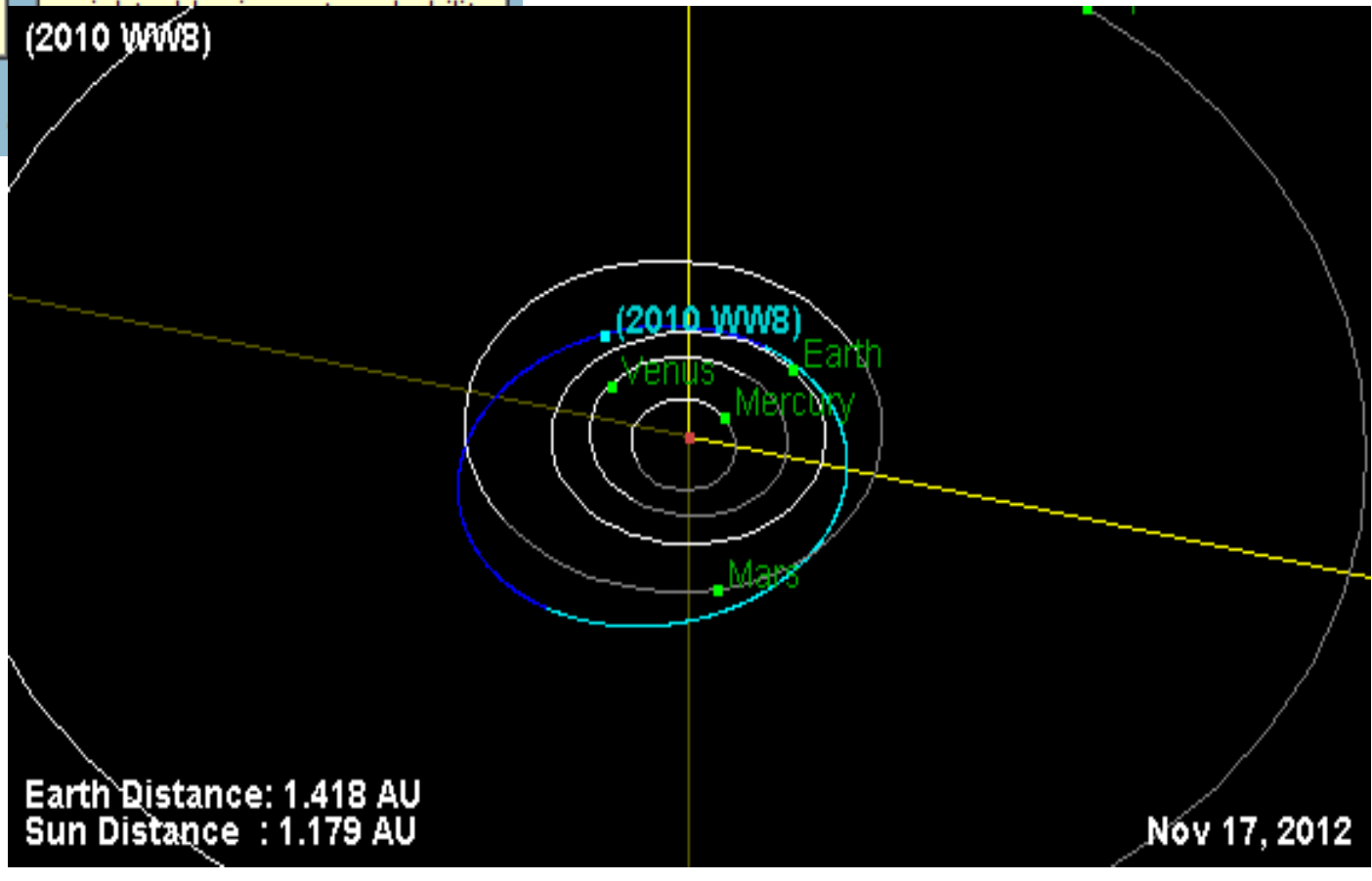
Torino Scale (maximum)	0
Palermo Scale (maximum)	-6.55
Palermo Scale (cumulative)	-6.50
Impact Probability (cumulative)	1.4e-07
Number of Potential Impacts	59

V_{impact}	12.30 km/s
$V_{infinity}$	5.20 km/s
H	26.2
Diameter	0.019 km
Mass	9.7e+06 kg
Energy	1.8e-01 MT

all above are mean values

Analysis based on
11 observations spanning .06622 days
(2010-Nov-30.37333 to 2010-Nov-30.43955)

Orbit diagram and elements



Nibiru (Planet X)

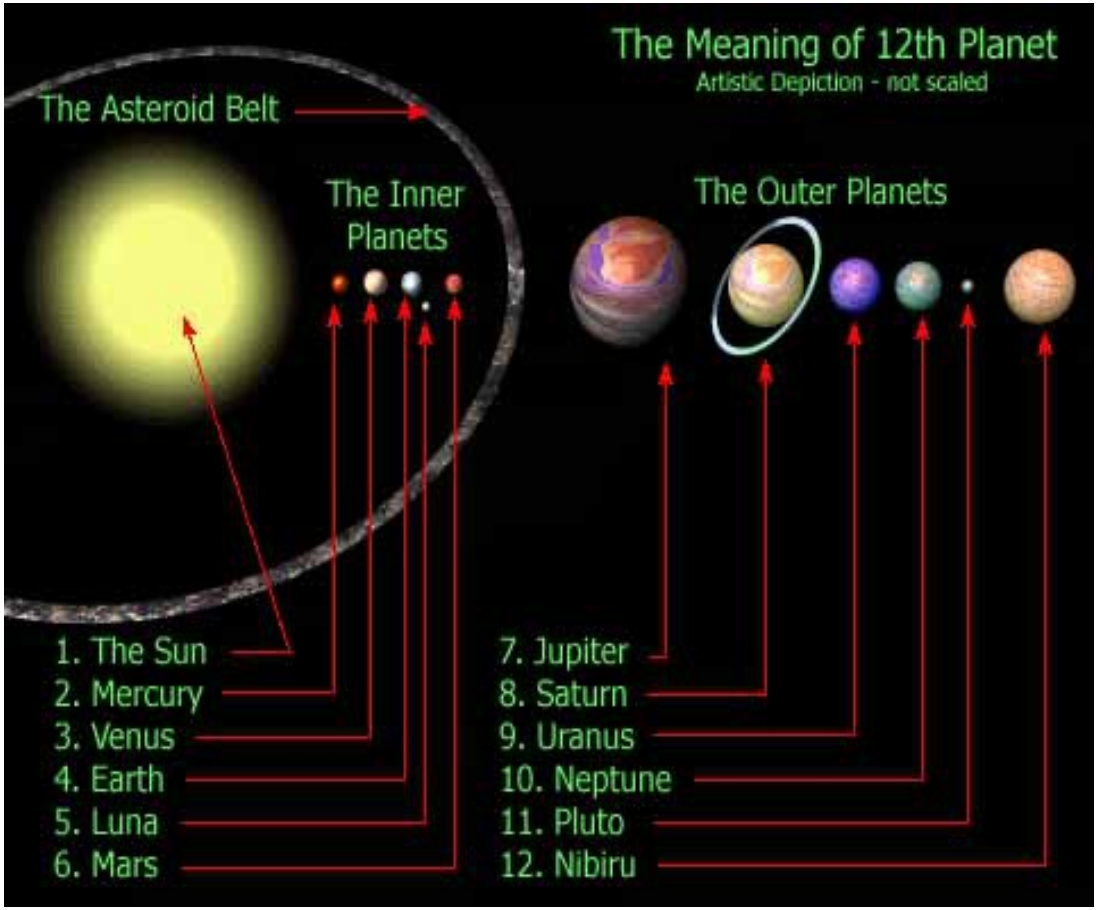
What is Said to Occur.

- Planet will swing so close to the Earth that it will change its magnetic field causing catastrophic damage or will collide with the Earth.

Nibiru [6]

- This myth started in 1995 by Nancy Lieder who was told of our imminent destruction from aliens.

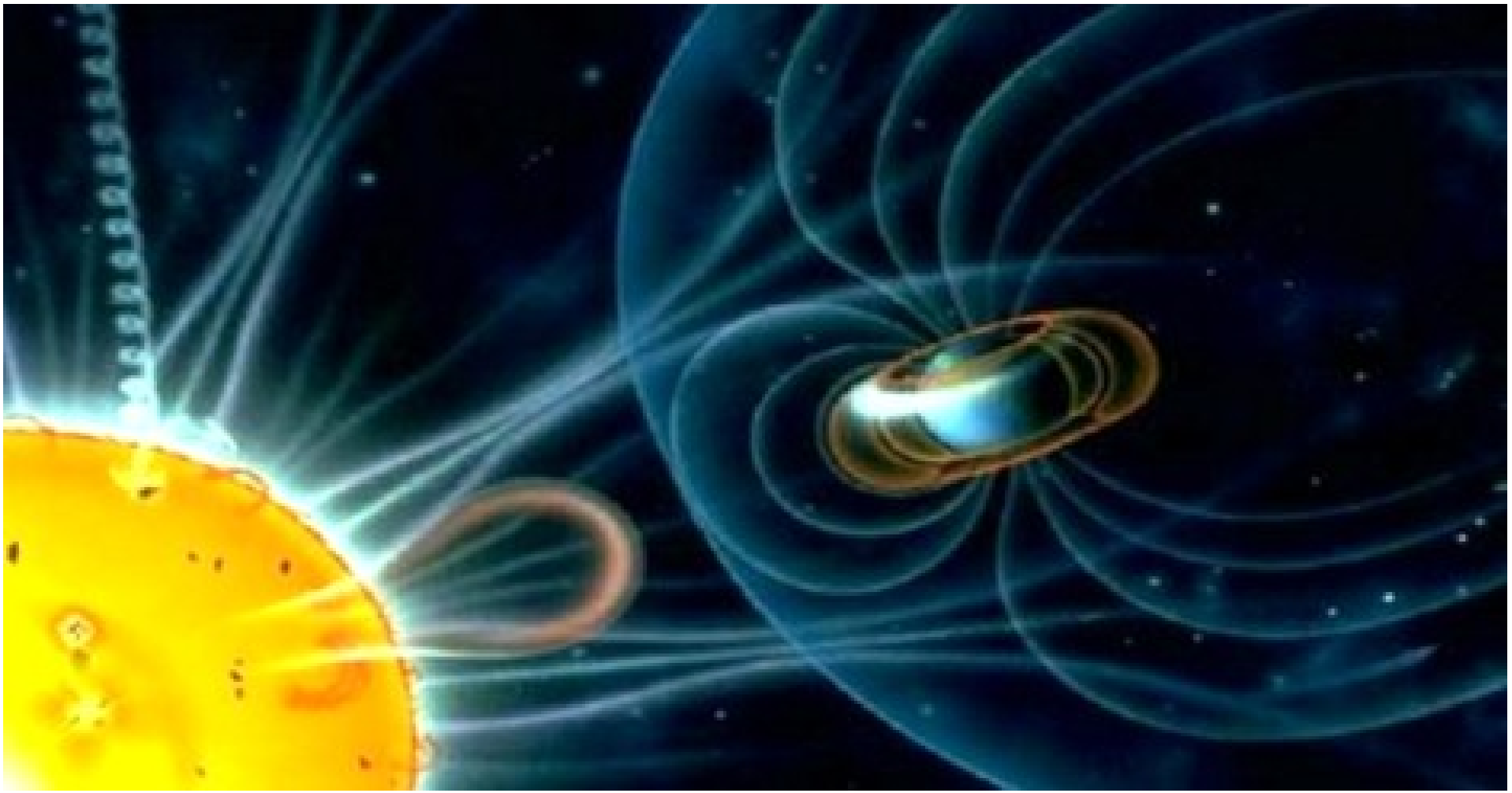
- Nibiru is a planet in Babylonian mythology, the 12th planet in our solar system, with a long skinny orbital period of 3600 years.



Problems

- We should be able to see Nibiru now, as it would be closer than Jupiter, which we can see with the naked eye.
  - Conspirators: it has been hiding behind the sun.
- If it was on its projected Babylonian path, Jupiter would have flug it out of our solar system.

Geomagnetic Reversal

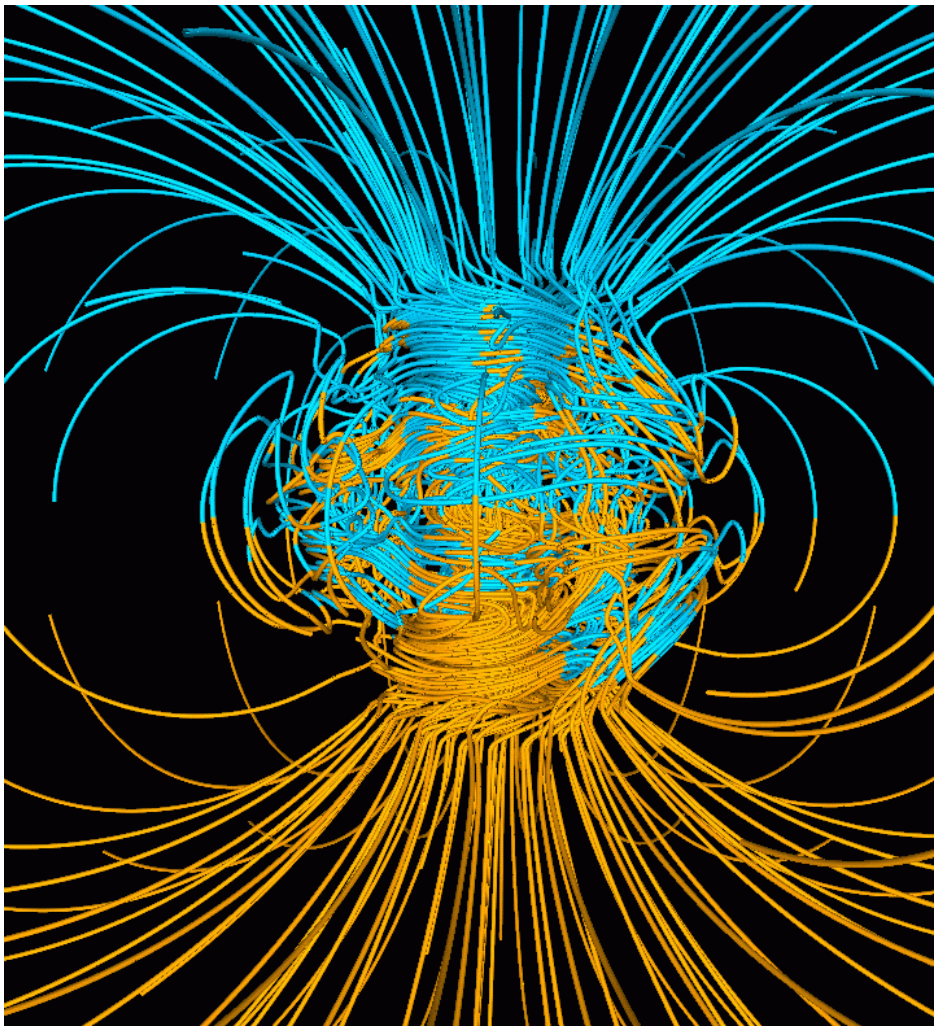


7. Slip-Slop-Slap- BANG!

We all know the Earth is surrounded by a magnetic field that sheilds us from most of the sun's radiation. What you might not know is that the magnetic poles we call north and south have a nasty habit of swapping places every 750,000 years or so – and right now we're about 30,000 years overdue. Scientists have noted that the poles are drifting apart roughly 20-30kms each year, much faster than ever before, which points to a pole-shift being right around the corner. While the pole shift is underway, the magnetic field is disrupted and will eventually disappear, sometimes for up to 100 years. The result is enough UV outdoors to crisp your skin in seconds, killing everything it touches.

Earth's Magnetic Field [12]

- 25-65 microtesla.
- Approximately a magnetic dipole.
- Angled 11 degrees.
- Caused by electric currents in the liquid outer core.
- Deflects solar winds.



Pole Reversal [11]

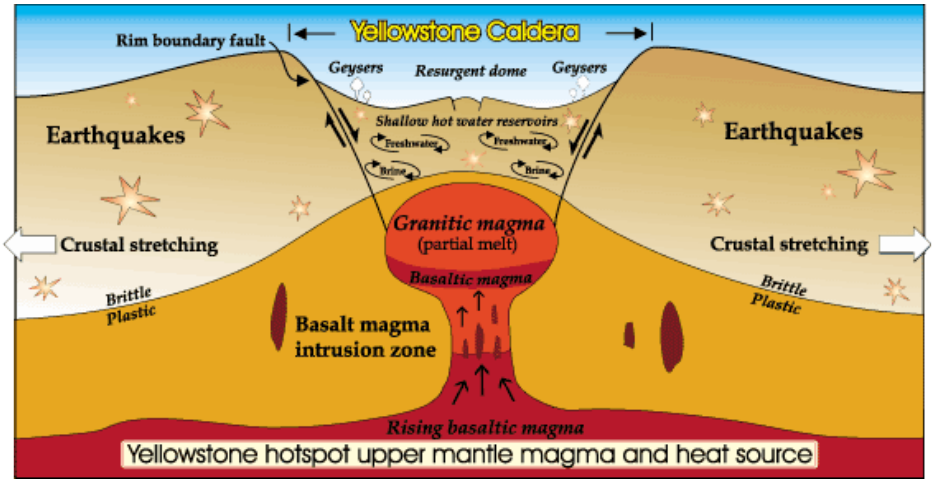
- Chron – time period of either normal polarity, or reverse polarity.
- Chrons usually occur every 100,000 to 1,000,000 years. Average of every 450,000 years.
- Last chron, was 780,000 years ago.
- Transitions take from 1,000 to 10,000 years.
- The magnetic field will not vanish completely.

Vanished Magnetic Field

- Our atmosphere won't vanish instantly.
- Solar wind will cause an induced magnetic field on the earth.
- Mass extinctions are not linked with pole reversals. But, the end of superchrons are associated with more frequent volcanic eruptions.

Supervolcano

Yellowstone Caldera [10]



- Caldera – non-typical form of volcano. Sunken areas from land previously blown out by super-eruption then settled again.

- First Yellowstone supervolcanic eruption 2.1 million years ago. 25,000 times larger than the Mount St. Helens eruption.
- Two other Yellowstone super eruptions 1.3 million and 640,000 years ago.

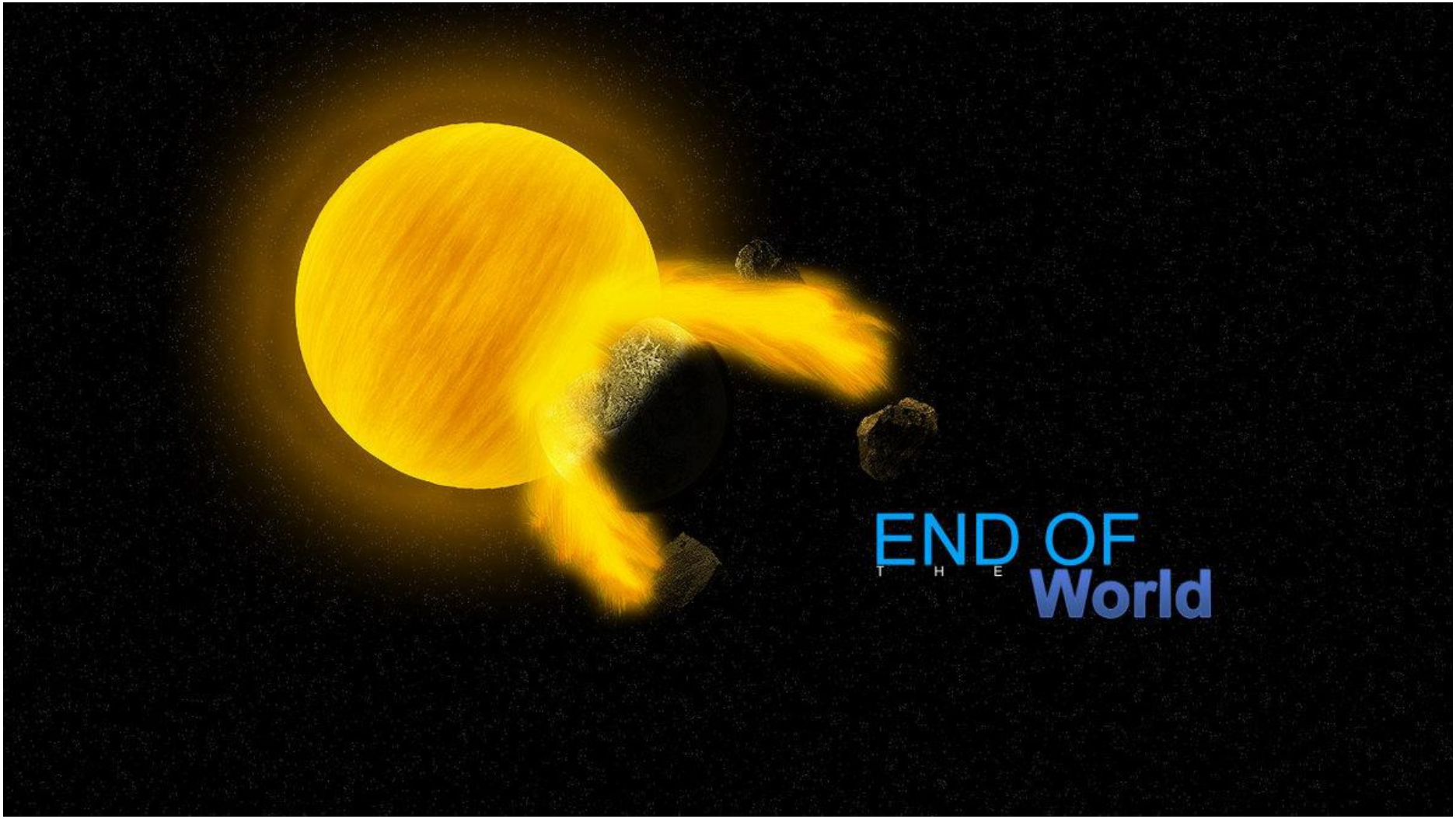
Consequences

- Initial eruption is estimated to kill 87,000 people.
- Clouds of gas and rock would burn everything it touches.
- Temperatures of hundreds of degrees Celcius.
- Ash would cover the western united states.
- Ash will enter the jet stream.
- Food supply threatened.

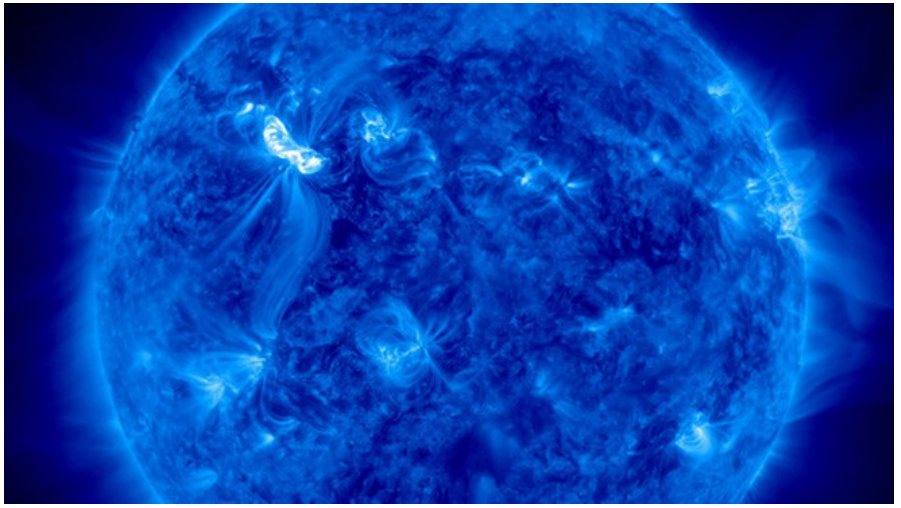
Good(ish) News

- We can not pin-point the exact date of an eruption.
- There will be a recognizable pattern of earthquakes beforehand.
- No need to panic at the moment.

Solar Flares



Solar Flares [13]



- Radiation all over the EM spectrum. Mostly non-visible.

- Large energy release on the surface of the sun.
- The plasma is heated to millions of kelvin.
- Ions are accelerated outward at relativistic speeds.

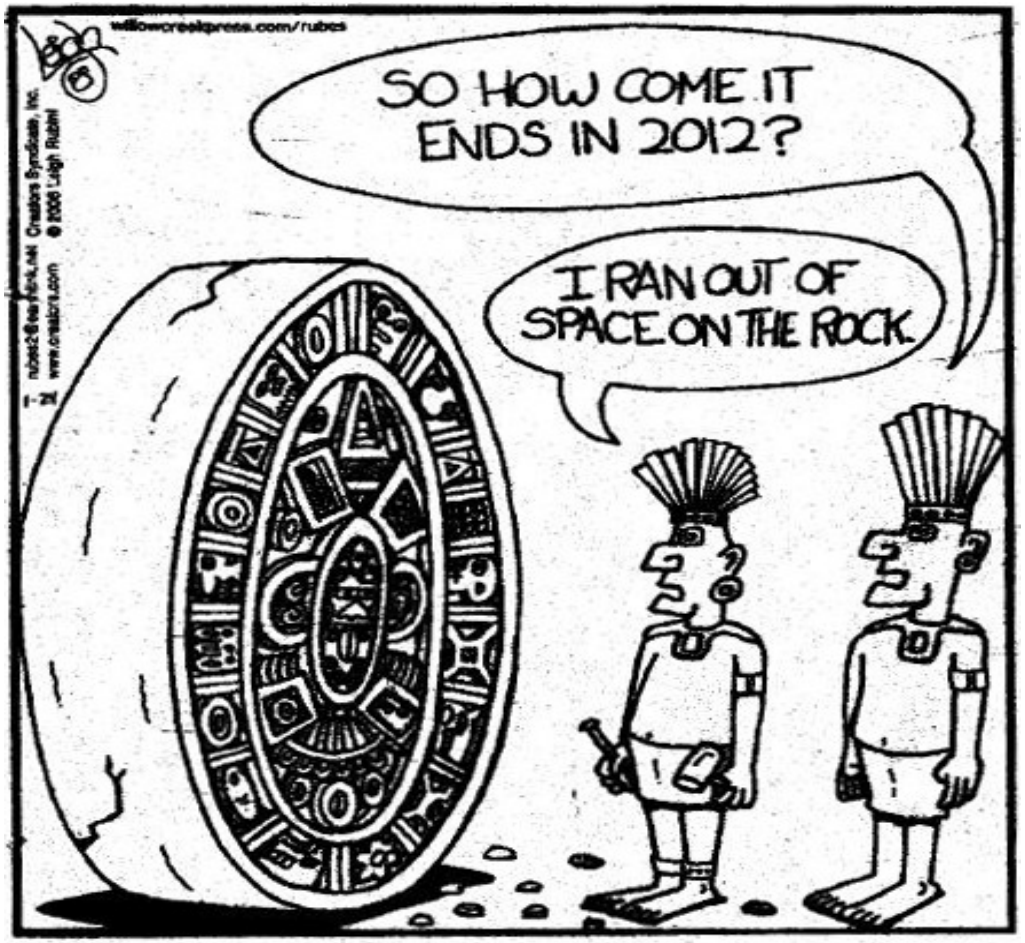
Dangers

- X-rays and UV rays can disrupt long-range radio communications.
- 1989, large geomagnetic storm. Caused blackouts in Canada, radio frequencies to jam and auroras to be seen as far as Texas.
- Earth's magnetic field provides shielding.
- Mostly a danger for astronauts who only have a few minutes time to find shelter.
  - Protons passing through the body. Radiation burns and sickness.

In December?

Conclusion

- The world is not going to end on 21 December 2012. (probably)

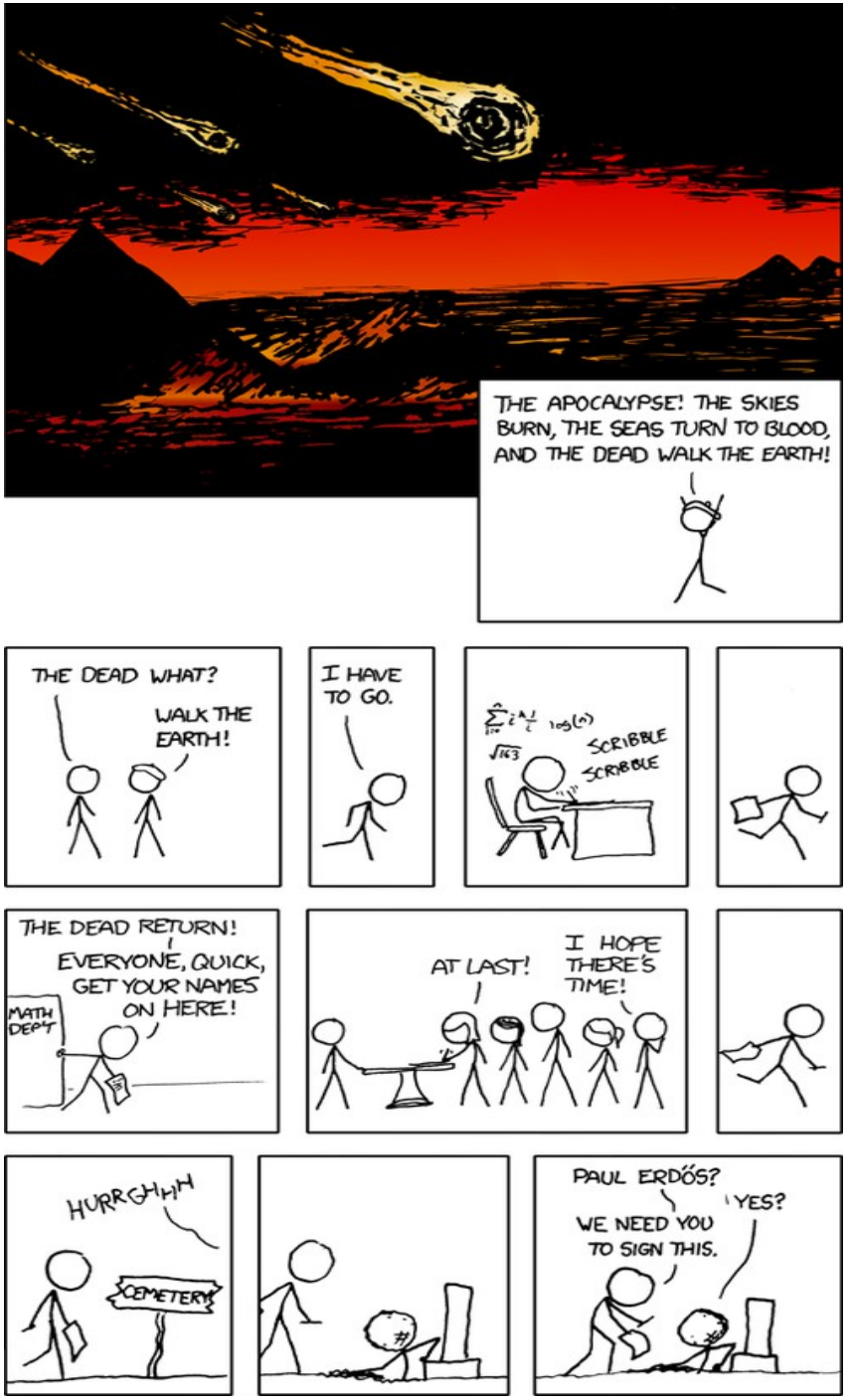


At last, the mystery of the Mayan calendar revealed.

Works Cited

- [1] http://public.web.cern.ch/public/en/lhc/safety-en.html
- [2] http://arxiv.org/pdf/0911.1884v1.pdf
- [3] http://en.wikipedia.org/wiki/Galactic_Center
- [4] http://www.nasa.gov/topics/earth/features/2012-alignment.html
- [5] http://en.wikipedia.org/wiki/Milky_Way
- [6] http://en.wikipedia.org/wiki/Nibiru_cataclysm
- [7] http://neo.jpl.nasa.gov/torino_scale.html
- [8] http://neo.jpl.nasa.gov/news/news126.html
- [9] http://newton.dm.unipi.it/neodys2/
- [10] http://www.cnn.com/2012/08/30/us/wus-supervolcanoes-yellowstone/index.html
- [11] http://en.wikipedia.org/wiki/Geomagnetic_reversal
- [12] http://en.wikipedia.org/wiki/Earth's_magnetic_field
- [13] http://en.wikipedia.org/wiki/March_1989_geomagnetic_storm

Questions?


THE APOCALYPSE! THE SKIES BURN, THE SEAS TURN TO BLOOD, AND THE DEAD WALK THE EARTH!
THE DEAD WHAT?
WALK THE EARTH!
I HAVE TO GO.
SCRIBBLE SCRIBBLE
THE DEAD RETURN!
EVERYONE, QUICK, GET YOUR NAMES ON HERE!
MATH DEPT
AT LAST!
I HOPE THERE'S TIME!
HURRGHHH
CEMETERY
PAUL ERDŐS?
WE NEED YOU TO SIGN THIS.
YES?