The map of natural global catastrophic risks

Scientifically accepted theories

Universe

False vacuum decay
- Our vacuum could be not real and could transit in another state
- Abrupt transition with light speed
- Nothing can be done
- Wiki

Big Rip
- Dark energy results in accelerating expanding of the universe, which finally tears Earth apart.
- It is similar to false vacuum decay but slower event.
- But accelerated expanding of the universe is confiremed by observations
- It could happen in 22 bln years
- Wiki

Galactic

Gamma-ray bursts
- Destruction of ozon
- Nitric clouds in the atmosphere
- Induced radiation, ionisation of the atmosphere
- Direct burns
- WR104 - dangerous hypernova candidate
- Ordovican extinction may be was caused by GRB
- May affect Earth every 5 mln years. wiki

Magnetars
- The simular effects as from gamma bursts, wiki
- Nearest is 20 000 ly

Nearby supernova
- Gamma-rays, wiki
- Ozon layer damage
- Neutrinos damage DNA (elastic scattering)
- Cloud of radioactive isotops reachs Earth

Interstellar cloud dim Sun light

If Sun pass through sufficiently dence cloid of interstellar matter it could attract it and will partly dim sun light resulting in global cooling

Solar system

Sun
- Superflare, wiki ,results radioctivity, ozon layaer damage, electric equpment failures

Impactors
- Asteroids
- Comets
- Impacts with Moon or other planets resulting in space debris
- Periods of bombardments caused by destabilisation of Oort cloud or by disintegration of a large comet
- Collision of asteroids results in debris shower

Dark comets
- Link
- Large black undetectable bodies which are not NEO most of time
- Centauri as their progenitors
- Tails of decayed comets full of debris resulting in bombardment episodes

Earth

Atmosphere
- Atmospheric composition change (disappearance of oxygen)
- Release of toxic gases (volcanism, methane hydrates, dissolved gases in the ocean)
- *Hypercane* (disturbance of stability of the atmosphere, in case of global warming)
- Ozon depletion resulting in UV radiation

Supervolcano
- Known supervolcanos (20)
- Rift eruption, flood basalt event
- New hot spot (Bolivia)
- Kimberlite pipe explosion
- Explosion of natural toluol in 100 km deep pocket, link
- Explosion of overheated water in deep pocket
- Verneshot – gas explosion from beneath of craton

Consequences:
- Volcanic winter
- Poisonous gases, acidic rains
- Climate affecting gases: CO2, H2S
- Dust in the air is dangerous for breathing
- Effects of explosion: tsunami, sound, debris, piroclastic flows

Climate changes
- Global warming (PETM, Venus)
- New stable state of atmosphere with 55 C medium T.
- Ice age
- Snow ball Earth

Biosphere

Pandemics
- Pandemic (flu, AIDS, fungi)
- Fungi are known to cause extinction of species
- Super pest,
- Dangerous carrier (mosquitoes)
- Natural green goo

Competitors
- Another type of humans (like Homo sapience were for Neanderthals)
- *Another type of intelligent specie*

Organisms
- Dangerous predator
- Food decline

Biodiversity loss
- Ecosystem needs many species for existence
- Ecological collapse
- Food chain collapse (Bee collapse disorder)
- Oxygen production collapse
- Destruction of ecological niche

Species level

"Normal" species extinction
- The confluence of a set of many adverse circumstances
- Changing environment and competitors
- Most species extinct in 3-6 million years

Genetic factors
- Evolution
- Genetic drift and errors accumulation
- Over specialization and than sudden change of the environment
- Dangerous alleles dissemination

Evolving into something else
- Evolutionary pressure change alleles distribution
- New traits appear

Fluctuation of the specie numerosity below critical threshold

Low numerosity and bad luck may result in extinction, if numerosity will fall below threshold

Combined

Impact and new specie

Catastrophe could give advantage to the new ecosystem

Impact and volcanos
- Fires in large coal bed
- Evoking a supervolacinc eruptions
- Asteroid impact results in many volcanic eruptions
- Iron impactor penetrate deep in mantle and it create a channel to molten iron in the earth core. (Like Siberian trapps?)

Past examples

Five great extinctions
- Ordovician-Silurian mass extinction
- Late Devonian mass extinction
- Permian mass extinction
- Triassic-Jurassic mass extinction
- Cretaceous-Tertiary mass extinction

Extinction of similar species
- Neanderthals
- Homo Florentines

Smaller historic extinctions and catastrophic events
- PEMT
- Young Drais
- Toba eruption
- Snowball Earth

Human affected

Climate: global warming

Runaway global warming driven by methane hydrates

Ecology
- Food chains collapse
- Regeneration ability collapse
- Waste management collapse (CO2, arsenic etc)

Artificial supervolcanos
- Deep drilling
- Stevenson probes
- Nuclear explosions

Small impact starts accidental nuclear war

Probability shifts

Anthropic shadow

We could underestimate probabilities of past extinctions because of observational selection effects (Bostrom, Circovich).

Anthropogenic pressure and ability to prevent risks
- Our ability to prevent most natural risks is rising
- But our pressure on nature is also rising

Bostrom's upper limit on the frequency of galactic catastrophes

Less than one in 1 billion years for any galactic catastrophe, Link

Hypothetical, non-proven or very unprobable theories

Universe

Collision with another bran

Collision with another universe in multidimensional space may help to create our universe. And could end it.

Residual dark energy converts into matter

New Big Bang, similar to false vacuum decay

Late cutoff:
- Some process will make the Universe unhabitable after some time threshold
- E.g: evaporation of primordial black holes results in constant explosions inside planets and everywhere

Galactic

Active Galactic nucleus

Sagittarius A is now dormant but was active before, like quasar. May be able to produce jets?

Dark matter
- Clouds of dark matter could accrete on Earth and annihilate into its core, resulting in its heating
- Dark matter could also annihilate inside the Sun
- Other unknowns are possible

Primordial black holes
- Such hole could be inside Earth's core. Its evaporation produces energy equal to collision with 10 km asteroids (1000 tons energy). It would be felt as worldwide earthquake.
- They also could merge inside Earth core resulting in large energy release.

Interstellar asteroids and rogue planets

Passage of nearby star close enough to de-stabilise Oort cloud

Gravitation of the Galaxy plane
- Affects Oort cloud and results in regular comet bombardment then Sun pass through most dense part of galactic plane
- Gravitational waves from very large black holes merge could compress the Earth and create unbearable sound or earthquakes (but it seems that energy is not enough)

Solar system

Holocen bombardment
- Some scientists think that we live in the period of intense bombardment (Clovis comet 13k years ago) and other hypothetical events, resulting from recent destruction of large 100 km size comet, link
- It rises background risks 100

Explosions of other planets
- Primordial back holes merge inside a planet and half energy results in explosion
- Explosions of natural nuclear reactors inside planets

Sun

Hypothetical and remote events:
- Sungazing comets: 100 km comet impact on the Sun may increase its luminosity 100 times for several seconds only because of the energy of explosion (speed of impact will be 600 km sec)
- Comets may also interact with sun magnetic field resulting in large flares.
- Event of convection: change of buoyancy inside the sun, fresh hydrogen goes to the core (Idea of Shklovsky, 1984, now abandoned as the solar neutrino paradox is solved)
- Changes of luminosity: older Sun may be less stable. Even 10 per cent change of luminosity will be lethal for Earth.
- Long term rising luminosity trend
- CME during low Earth magnetic field could have much stronger effects

Earth

Worldwide earthquake
- Ocean rift zone crack
- Large vertical movement of a continent because of change of byonancy
- Unknown processes in the Earth core

Oceans
- Degasation - SH4, CO2, CH4 (Ryskin 2003), like on Nios lake, resulting on firestroms, global cooling or heating.
- Anxious event
- Poisonous microorganisms
- Large worldwide tsunami

Earth's core
- Degasation of H2, CO2, O2, H20 from earh core based on different hypothesis of its composition, and change of atmospheric composition
- Large eruption of molten iron from upper core
- Black tide - eruption of abiogenic oil.
- Heating by WIMPs
- Natural reactor inside and its explosion
- Phase transition of Fe crystal in the inner core, collapse of it.
- As central core grow, gases concentration is growing in outer core, which rise their particular pressure and chance that they

Earth's core and magnetic field
- Magnetic field reversal - it happens more and more often
- But it is not dangerous if not completely vanish or coincide with superflare
- Periods of changing magnetic field precedes trap volcanism (and we live in such period) - Krasilov, ruslink

Plate tectonics results in Ice age
- New configuration of continents affect climate
- If volcanos will stop in the future, no CO2 will be in atmosphere

Biosphere

Ecosystem evolves to extinction
- Anti-Gaya theory
- Oxygen catastrophe in the past
- CO2 depletion in the future

Toxic bacteria
- *Red tide - toxic marine bacteria, horizontal gene transfer play role here.*
- *Halogen producing bacteria may destroyed ozon layer in the past, during Great extinction (russian link)*

Species level

Change of habitat

Lost of genetic diversity within specie and resulting fragility

Human being are very similar genetically because of bottle neck 70 000 ago and rapid population growth

Overpopulation resulting in resources exhaustion and population collapse

Human affected

Artificial provoking of natural catastrophes
- Asteroid deflection to Earth
- Stevenson probe to the Earth core
- Artificial global warming by nuclear explosions in methane hydrates deposits
- Artificial nuclear winter
- Explosion of nukes in supervolcanos
- Arifical verneshort as result of very deep drilling into cavity with overpressured gas beneath craton.
- Large open mines for dymonds in Kymberlit provinces could weaken lythosphera and result in vernshort (like in Mirny)

Humans help to evolve new viruses
- In farms, by mixing many animals
- By introducing new animals in remote habitats.

Human observations speed dark energy break

Reverse Zenon effect may speed up dark energy decay, because human observations return it to the starting point, link, ruslink

Probability shifts

End of stability period

Humans were more likely to appear during improbably stable periods in Earth history, and so we could be in the end of such period.

Underestimating fragility of our environment

We could underestimate fragility of environment because of anthropic shadow

Volatile period was needed for formation of human universal intelligence

Intelligence as universal adaptation is more effective and quickly evolve in changing environments, and current ice age is such environment.

Description of the map

Created by Alexey Turchin, alexeiturchin@gmail.com,
2016, CC3.0

Red - most probable risks
Green - my crazy ideas, most probably false