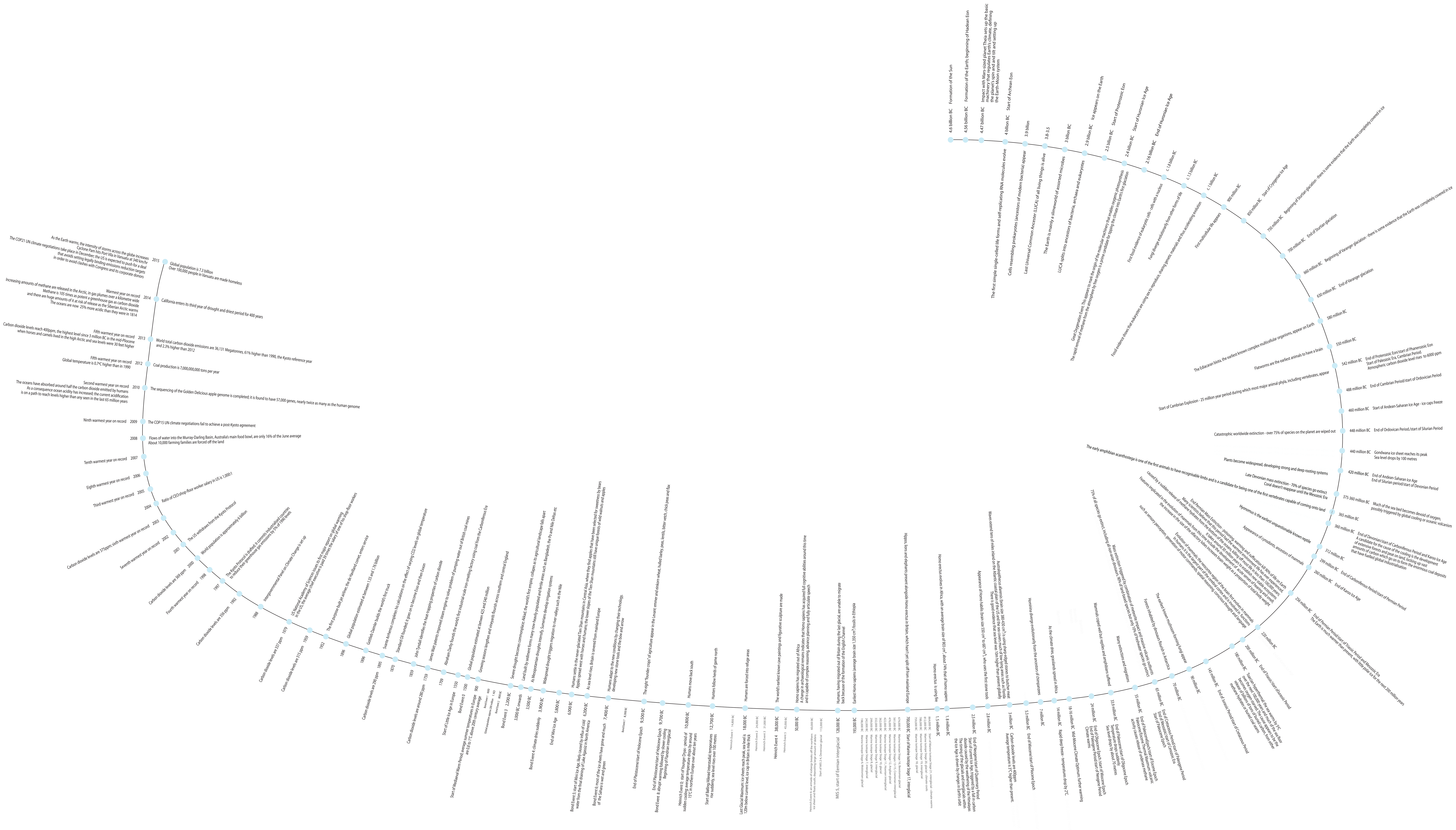
4.6 billion BC Formation of the Sun
4.56 billion BC Formation of the Earth; beginning of Hadean Eon
4.47 billion BC Impact with Mars-sized planet Theia sets up the basic machinery that regulates Earth's climate, defining the planet's spin and and tilt and setting up the Earth-Moon system
4 bllion BC Start of Archean Eon
The first simple single-celled life forms and self-replicating RNA molecules evolve
3.9 billion
Cells resembling prokaryotes (ancestors of modern bacteria) appear
3.8-3.5
Last Universal Common Ancester (LUCA) of all living things is alive
3 billion BC
The Earth is mainly a slimeworld of assorted microbes
2.9 billion BC Ice appears on the Earth
LUCA splits into ancestors of bacteria, archaea and eukaryotes
2.5 billion BC Start of Proterozoic Eon
2.4 billion BC Start of Huronian Ice Age
Great Oxygenation Event. This appears to mark the origin of the molecular machinery that enables oxygenic photosynthesis
The rapid removal of methane from the atmosphere by free oxygen is a prime candidate for tipping the climate into Earth's first glaciation
2.16 billion BC End of Huronian Ice Age
c. 1.8 billion BC
First fossil evidence of eukaryotic cells - cells with a nucleus
c. 1.5 billion BC
Fungi diverge evolutionarily from other forms of life
c. 1 billion BC
Fossil evidence shows that eukaryotes are using sex to reproduce, sharing genetic materials and thus accelerating evolution
900 million BC
First multicellular life appears
850 million BC Start of Cryogenian Ice Age
750 million BC Beginning of Sturtian glaciation - there is some evidence that the Earth was completely covered in ice
700 million BC End of Sturtian glaciation
660 million BC Beginning of Varanger glaciation - there is some evidence that the Earth was completely covered in ice
630 million BC End of Varanger glaciation
580 million BC
The Ediacaran biota, the earliest known complex multicellular organisms, appear on Earth
550 million BC
Flatworms are the earliest animals to have a brain
542 million BC End of Proterozoic Eon/start of Phanerozoic Eon
Start of Paleozoic Era, Cambrian Period.
Atmospheric carbon dioxide level rises to 6000 ppm
Start of Cambrian Explosion - 25 million year period during which most major animal phyla, including vertebrates, appear
488 million BC End of Cambrian Period/start of Ordovician Period
460 million BC Start of Andean-Saharan Ice Age - ice caps freeze
Catastrophic worldwide extinction - over 75% of species on the planet are wiped out
448 million BC End of Ordovican Period./start of Silurian Period
440 million BC Gondwana ice sheet reaches its peak
Sea level drops by 100 metres
Plants become widespread, developing strong and deep rooting systems
420 million BC End of Andean-Saharan Ice Age
End of Silurian period/start of Devonian Period
Late Devonian mass extinction - 70% of species go extinct
Coral doesn't reappear until the Mesozoic Era
375-360 million BC Much of the sea bed becomes devoid of oxygen, possibly triggered by global cooling or oceanic volcanism
The early amphibian acanthostega is one of the first animals to have recognisable limbs and is a candidate for being one of the first vertebrates capable of coming onto land
365 million BC
Hyonomus is the earliest unquestionable known reptile
360 million BC End of Devonian/start of Carboniferous Period and Karoo Ice Age
A candidate for the cause of the cooling is the development of extensive forests and peat on land, locking up vast amounts of carbon which go on to form the enormous coal deposits that have fuelled global industrialisation
Appearance of cynodonts, ancestors of mammals
312 million BC
299 million BC End of Carboniferous Period/start of Permian Period
260 million BC End of Karoo Ice Age
End Permian Mass Extinction - poisoning, warming and suffocation kill 90% of life on Earth
Many scientists believe that this period had the warmest environment life has ever experienced,
caused by a sudden release of methane hydrates from the bottom of the oceans, killing off most life in less than 100,000 years.
It takes around 30 million years to establish new stable ecosystems
Features implicated in the evolution of mammals from this time include the development of acute senses of hearing and smell;
the increase in the size of the olfactory lobes increases brain weight as a proportion of total body weight
256 million BC End of Permian Period/start of Triassic Period and Mesozoic Era
The Earth is much warmer than present, with little polar ice for the next 200 million years
Evolution of mammals: the neocortex region of the brain first evolves in mammals
In humans it is the largest part of the cerebral cortex and is involved in functions
such as sensory perception, generation of motor commands, spatial reasoning, conscious thought and language
220 million BC
200 million BC End of Triassic/start of Jurassic Period
180 million BC Toarcian hyperthermal: the sea warms by 5°C over the next 100,000 years and much of the sea floor becomes oxygen-starved. The cause appears to be the release of billions of tons of buried carbon, from either methane hydrates or buried coal seams
145 million BC End of Jurassic Period/start of Cretaceous Period
The earliest known mushroom-forming fungi appear
90 million BC
Forests inhabited by dinosaurs flourish in Antarctica
70 million BC
75% of all species go extinct, including all non-avian dinosaurs. 90% of land-based species but only 10% of freshwater species go extinct
Mass extinction triggered by combination of meteorite impact and massive volcanic outbursts
65 million BC End of Cretaceous Period/start of Paleogene Period
End of Mesozoic/start of Cenozoic Era
Start of Paleocene Epoch
Many extinctions and migrations
55 million BC End of PaleoceneEpoch/start of Eocene Epoch
Paleocene/Eocene Thermal Maximum: volcanic activity causes release of undersea methane
Mammals coped well but reptiles and amphibians suffered
33.9 million BC End of Paleocene/start of Oligocene Epoch
Temperature drops suddenly
Sea level drops by about 70 metres
24 million BC End of Oligocene Epoch /start of Miocene Epoch
End of Paleogene Period/start of Neogene Period
Climate warms
18-16 million BC Mid-Miocene Climate Optimum: further warming
14 million BC Rapid deep freeze - temperatures drop by 2°C.
As the climate dries, grasslands spread in Africa
7 million BC
Hominina diverge evolutionarily from the ancestors of chimpanzees
5.3 million BC End of Miocene/start of Pliocene Epoch
3 million BC Carbon dioxide levels are 400ppm
Average temperature is 3°C higher than present.
Australopitheus afarensis (brain size 380-430 cm³) is using sharp-edged stones to butcher meat
Waves extend tens of miles inland on the Atlantic coastal plain of the US and the sea covers much of low-lying areas such as Florida
There is good evidence that sea level was 10m higher than present globally
2.8 million BC
Appearance of Homo habilis (brain size 550 cm³ to 687 cm³), who uses the first stone tools
2.5 million BC End of Neogene/start of Quaternary Period
Start of current Ice Age, triggered by a fall in carbon dioxide caused by the weathering of the Himalayas
The timing of the glacials and interglacials within the Ice Age is driven by changes in Earth's orbit
1.8 million BC
Homo erectus evolves in Africa, with an average brain size of 903 cm³, about 74% that of homo sapiens
1.5 million BC
Homo erectus is using fire
864,000 BC Start of Marine Isotope Stage 21, interglacial - climate warms
812,000 BC Marine Isotope Stage 20, glacial - climate cools
788,000 BC Marine Isotope Stage 19, interglacial
759,000 BC Marine Isotope Stage 18, glacial
700,000 BC Start of Marine Isotope Stage 17, interglacial
Hippos, lions and elephants present alongside Homo erectus in Britain, which hasn't yet split off from mainland Europe
674,000 BC Marine Isotope Stage 16, Beestonian glacial
561,000 BC Marine Isotope Stages 13-15, Cromerian interglacial
476,000 BC Marine Isotope Stage 12, Anglian glacial
422,000 BC Marine Isotope Stage 11, Hoxnian interglacial
362,000 BC Marine Isotope Stage 10, glacial
332,000 BC Marine Isotope Stage 9, interglacial
299,000 BC Marine Isotope Stage 8, glacial
242,000 BC Marine Isotope Stage 7, interglacial
198,000 BC Marine Isotope Stage 6, Wolstonian glacial
193,000 BC
Earliest Homo sapiens (average brain size 1,350 cm³) fossils in Ethiopia
128,000 BC MIS 5, start of Eemian interglacial
Humans, having migrated out of Britain during the last glacial, are unable to migrate back because of the formation of the English Channel
113,000 BC Start of MIS 2-4, Devensian glacial
60,000 BC Heinrich Event 6: an armada of icebergs breaks off the northern ice sheet and floats south, depositing large amount of debris
50,000 BC
Homo sapiens has migrated out of Africa
A change in archaeological remains indicates that Homo sapiens has acquired full cognitive abilities around this time and is capable of complex reasoning, advance planning and fully articulate speech
45,000 BC Heinrich Event 5
38,000 BC Heinrich Event 4
The world's earliest known cave paintings and figurative sculpture are made
31,000 BC Heinrich Event 3
24,000 BC Heinrich Event 2
18,000 BC Last Glacial Maximum: ice sheets reach peak, sea level is 120m below current level, ice cap in Britain is mile thick
Humans are forced into refuge areas
14,800 BC Heinrich Event 1
12,700 BC Start of Bolling/Allerod Interstadial; temperatures rise suddenly, sea level rises over 100 metres
Hunters follow herds of game north
10,800 BC Heinrich Event 0; start of Younger Dryas - period of sudden cooling: average temperature drops by around 15°C in northern Europe over about ten years
Humans move back south
9,700 BC End of Pleistocene/start of Holocene Epoch
Bond Event 8: abrupt warming followed by slower cooling
Beginning of Flandrian interglacial
9,500 BC End of Pleistocene/start of Holocene Epoch
The eight "founder crops" of agriculture appear in the Levant: emmer and einkorn wheat, hulled barley, peas, lentils, bitter vetch, chick peas and flax
8,300 BC Bond Event 7
7,400 BC Bond Event 6; most of the ice sheets have gone and much of the Sahara is wet and green
Humans adapt to the new conditions by changing their technology, developing new stone tools and the bow and arrow
6,200 BC Bond Event 5; start of Mini Ice Age, likely caused by influx of cold water from the final draining of Lake Agassiz in North America
As sea level rises, Britain is severed from mainland Europe
Humans settle in the never-glaciated Tien Shan mountains in Central Asia, where they find apples that have been selected for sweetness by bears
Apples spread west with horses and humans; the lower slopes of the Tien Shan mountains still have unique forests of wild walnuts and apples
6,000 BC
5,800 BC End of Mini Ice Age
Widespread drought triggers migration to river valleys such as the Nile
3,900 BC Bond Event 4; climate dries suddenly
As Mesopotamian droughts intensify, Sumerians develop irrigation systems
3,500 BC
Land built by sediment forms many now-heavily-populated and fertile areas such as Bangladesh, the Po and Nile Deltas etc
3,000 BC onwards
Severe drought becomes commonplace; Akkad, the world's first empire, collapes as its agricultural landscape falls apart
2,200 BC Bond Event 3
800 BC Bond Event 2
1 AD Global population approx 200 million
600 Bond Event 1
900 Start of Mediaeval Warm Period; average summer temperatures in Europe are 0.8 to 1°C above 20th century average
Growing seasons lengthen and vineyards flourish across southern and central England
1500 Bond Event 0
Global population estimated at between 425 and 540 million
1550 Start of Little Ice Age in Europe
1709 Abraham Darby founds the world's first industrial-scale iron-smelting factory using coal from the Carboniferous Era
1759 Carbon dioxide levels are around 280 ppm
James Watt patents improved steam engine to solve problem of pumping water out of British coal mines
1859 John Tyndall identifies the heat-trapping properties of carbon dioxide
1870 Standard Oil founded; it goes on to become Esso and then Exxon
1895 Carbon dioxide levels are 290 ppm
Svante Arrhenius completes his calculations on the effect of varying CO2 levels on global temperature
1896 Gottlieb Daimler builds the world's first truck
1896 Global population estimated at between 1.55 and 1.76 billion
1952 The first purpose-built jet airliner, the de Havilland comet, enters service
1959 Carbon dioxide levels are 315 ppm
1979 Carbon dioxide levels are 337 ppm
US National Academy of Sciences issues its first major report on global warming
In the US, the average chief executive is paid 39 times the salary of one of his shop-floor workers
1988 Intergovernmental Panel on Climate Change is set up
1992 Carbon dioxide levels are 356 ppm
1997 The Kyoto Protocol is drafted; it commits industrialised countries to reduce their greenhouse gas emissions by 5% of 1990 levels
1998 Fourth warmest year on record
2000 Carbon dioxide levels are 369 ppm
World population is approximately 6 billion
2001 The US withdraws from the Kyoto Protocol
2002 Seventh warmest year on record
2003 Carbon dioxide levels are 375ppm; sixth warmest year on record
2004 Ratio of CEO:shop-floor worker salary in US is 1,000:1
2005 Third warmest year on record
2006 Eighth warmest year on record
2007 Tenth warmest year on record
2008 Flows of water into the Murray-Darling Basin, Australia's main food bowl, are only 16% of the June average
About 10,000 farming families are forced off the land
2009 Ninth warmest year on record
The COP15 UN climate negotiations fail to achieve a post-Kyoto agreement
2010 Second warmest year on record
The oceans have absorbed around half the carbon dioxide emitted by humans
As a consequence ocean acidity has increased; the current acidification is on a path to reach levels higher than any seen in the last 65 million years
The sequencing of the Golden Delicious apple genome is completed; it is found to have 57,000 genes, nearly twice as many as the human genome
2012 Fifth warmest year on record
Global temperature is 0.7°C higher than in 1990
Coal production is 7,000,000,000 tons per year
2013 Fifth warmest year on record
Carbon dioxide levels reach 400ppm, the highest level since 3 million BC in the mid-Pliocene when horses and camels lived in the high Arctic and sea levels were 30 feet higher
World total carbon dioxide emissions are 36,131 Megatonnes, 61% higher than 1990, the Kyoto reference year and 2.3% higher than 2012
2014 Warmest year on record
Increasing amounts of methane are released in the Arctic, in gas plumes over a kilometre wide
Methane is 105 times as potent a greenhouse gas as carbon dioxide and there are huge amounts of it at risk of release as the Siberian Arctic warms
The oceans are now 25% more acidic than they were in 1814
California enters its third year of drought and driest period for 400 years
2015 As the Earth warms, the intensity of storms across the globe increases
Cyclone Pam hits Port Vila in Vanuatu at 340 km/hr
The COP21 UN climate negotiations take place in December; the US is expected to push for a deal that avoids setting legally binding emissions reduction targets in order to avoid clashes with Congress and its corporate donors
Global population is 7.3 billion
Over 100,000 people in Vanuatu are made homeless