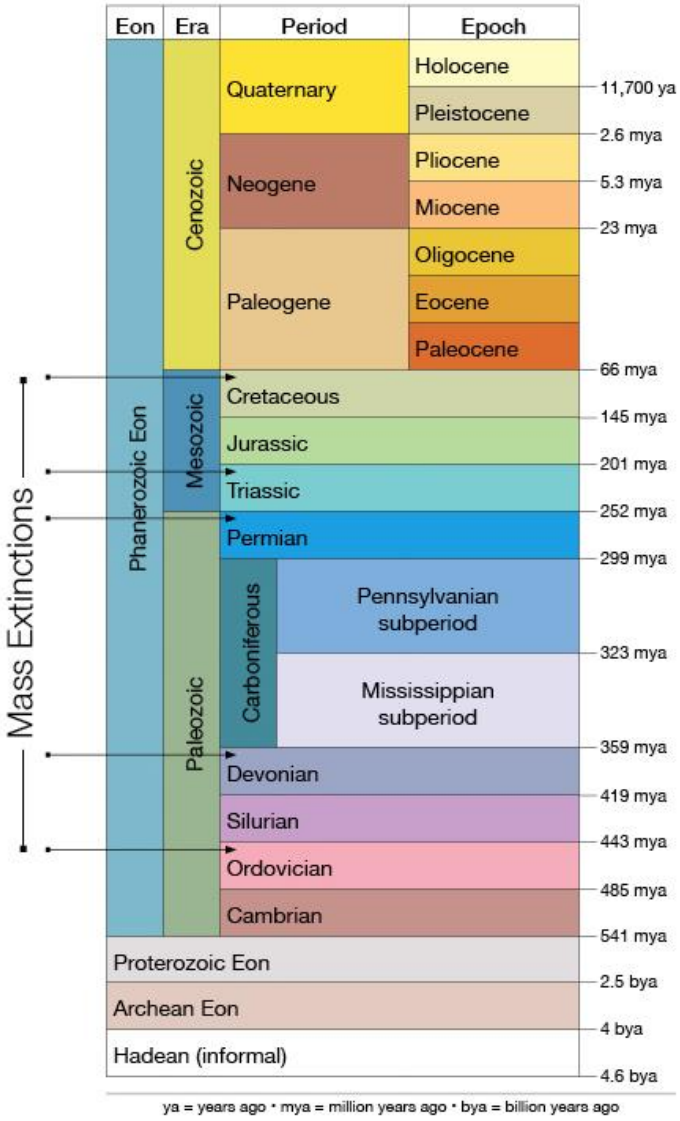
MASS EXTINCTION



Mass extinctions have occurred several times in the history of the Earth. There have been five, the most recent of which (65 million years ago!) is also the most famous because it included the great group of dinosaurs among its victims.

Geological time escapes our conception of time. We are used to measuring hours, days, months or years. When we talk about historical events that took place centuries ago, our imagination is called upon.

The geological time scale is graduated in millions, hundreds of millions and billions of years.

To find their way around, geologists have divided it into eras: Precambrian, Primary, Secondary and Tertiary.

Each era is itself subdivided into different periods:

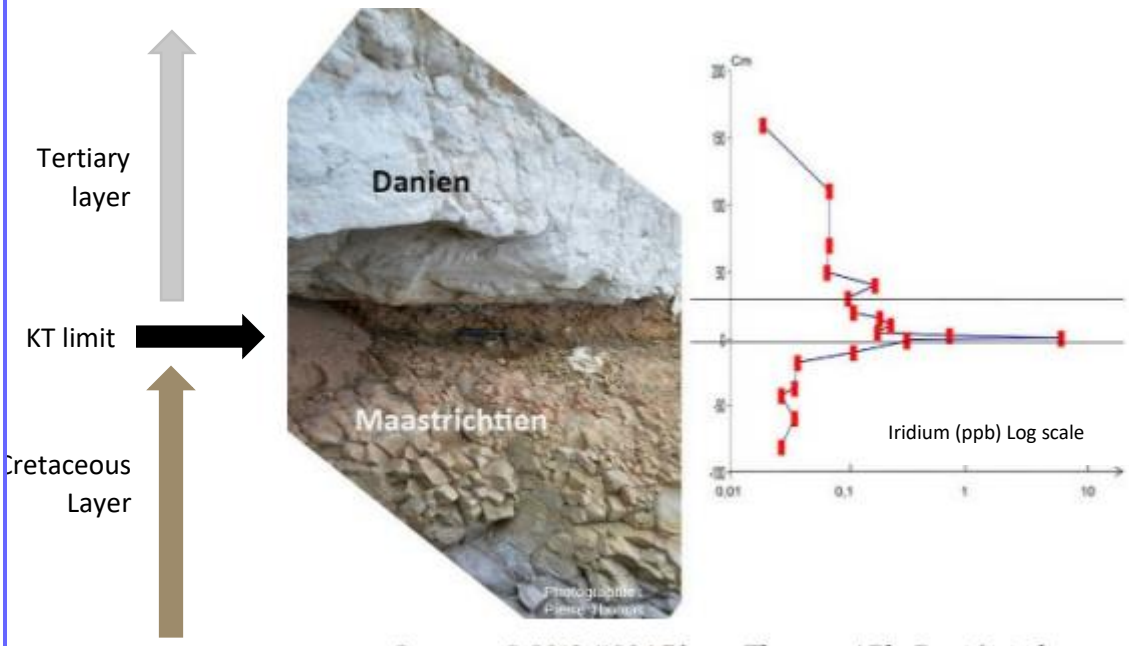
Each period subdivided into different epochs.

<u>The Cretaceous-Tertiary Boundary: - 65 MA</u>

This mass extinction is now well documented and there is no longer any doubt that Alvarez and his team were right: the latest studies from 2020, based on extremely precise stratigraphic analyses, show that this massive destruction of life occurred at the same time as a meteorite impact.

Alvarez and Co have identified several geological sites in Europe that have recorded the traces of this global cataclysm.

The sites of Bidart (France), Gubbio (Italy), Caravaca, Zumaia and Fontlionga (Spain) and Stevns Klint (Denmark) show a thin layer of dark clay (of the order of a few centimetres). Gamma ray analysis of these clays for the level of Iridium (a metal in the platinum family), which is extremely rare on Earth but abundant in asteroids, reveals a peak abundance up to 100 times higher than in the rocks surrounding these layers. (see document)



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While this mass extinction is a fabulous scientific adventure and offers the most cinematic of scenarios, it is of more modest importance despite the elimination of 75% of species. It is also less relevant for comparison with the situation we are currently experiencing. It is another mass extinction that occurred just under 200 million years ago that can shed light on the causes and consequences of these major biodiversity crises.

The Permian – Triassic Boundary: -252 MA

As its name clearly indicates, it marks the boundary between the last era of the Primary Era (the Permian) and the first era of the Secondary Era (the Triassic). According to studies carried out in 2014 by Burgess, it saw the disappearance of more than 90% of marine species in the space of 60 000 years. According to the same author, it took more than 5 million years to observe an increase in biodiversity.

Sedimentary rocks allow us to understand the extent of the collapse of marine fauna at that time. A relevant analogy would be to draw up an inventory of the biodiversity of a magnificent alpine pasture and compare it with that of the lawn of the “Parc des Princes”(football stadium).

The causes of this drastic collapse are still being debated, but a clear pattern is gradually emerging, revealing the interlocking phenomena that took place at the time (see final diagram).

Studies of oxygen isotopes indicate a temperature rise of between 10 and 15°C. In addition, comparable studies on carbon isotopes show that the carbon cycle was completely and permanently disrupted.

This mass extinction is a formidable example of the consequences of a generalized global warming: Appearance of a "dead zone" or anoxic zone between the 2 tropics, gigantic landslides characterized in typical geological formations.

Scientists now estimate that acid rain decimated the earth's vegetation and that extreme weather events caused massive erosion of the continental block.

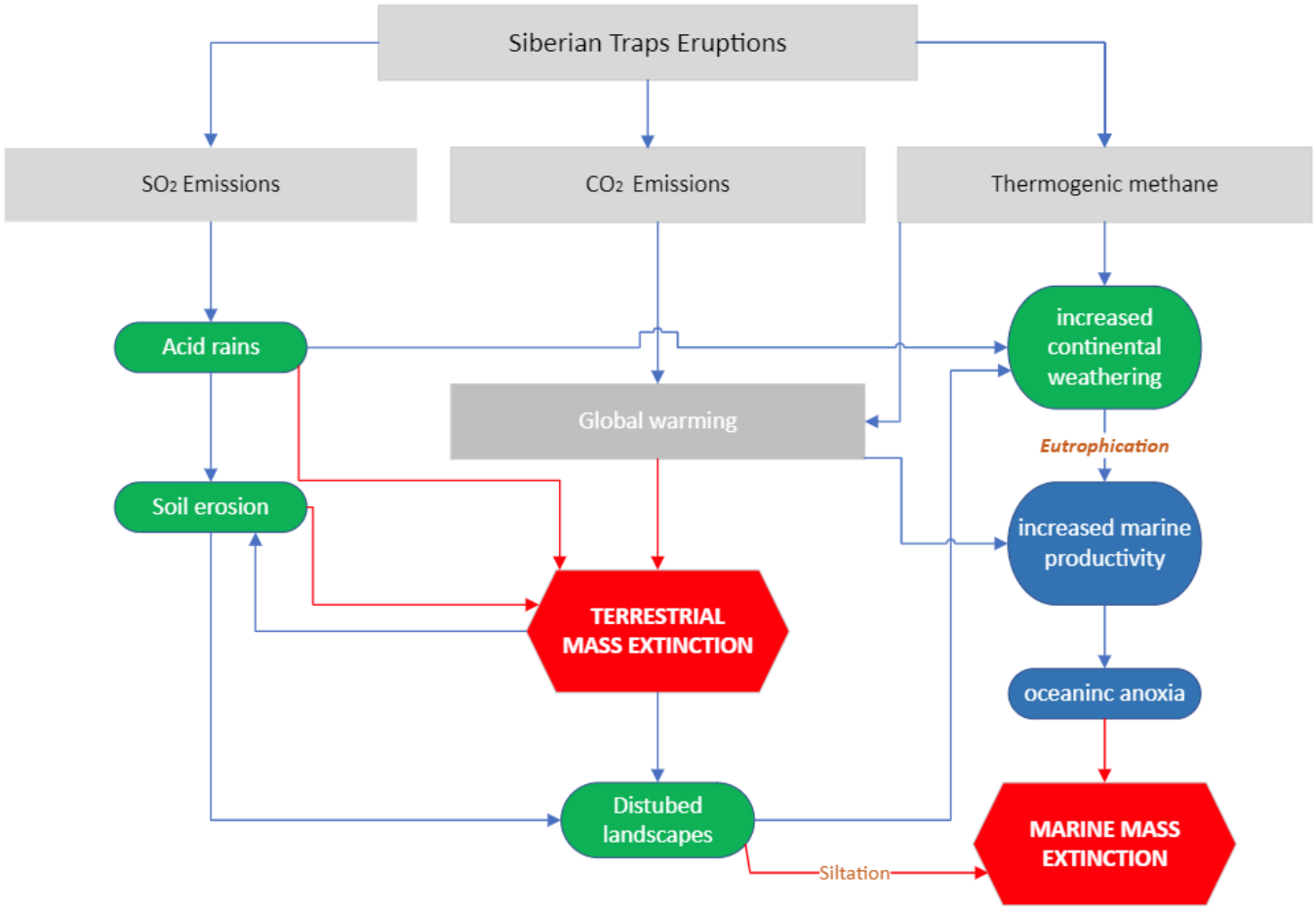
In contrast to the Cretaceous crisis, it is not a meteor ....The Permian-Triassic crisis shows no evidence of extra-terrestrial influence. It is changes in the physical and chemical conditions of the atmosphere that explain the mass extinction of 90% of living species.

What was the cause of these brutal changes in the atmosphere 252 million years ago?

The answer is cruelly topical: CO_2 and a few other well-known gases such as sulphur dioxide (SO_2) and methane (CH_4). Of course, no human industry or means of transport driven by the combustion of fossil fuels, or even the flatulence of any ruminants, can be blamed. Huge volcanic eruptions responsible for the spilling of millions of cubic metres of basalt (known as Siberian traps) accompanied by their trail of more or less toxic gases have been dated to this period.

Rising levels of CO_2 in the atmosphere, acidification and anoxia of the oceans, disruption of the carbon cycle, a general increase in the energy level of climatic phenomena.... and a collapse of biodiversity.

Could it be that any resemblance to existing events is coincidental?



Model explaining the Permian-Triassic mass extinction

Available from: https://www.researchgate.net/figure/Model-of-likely-environmental-consequences-of-the-Siberian-Traps-eruptions-showing-the_fig1_327404675

https://www.researchgate.net/publication/327404675_Hyperthermal-driven_mass_extinctions_Killing_models_during_the_Permian-Triassic_mass_extinction