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Climatic Change and Humanity: A Permanent Conflict?

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Abstract. Climate change has occurred, whether due to human activity or not, throughout the history of the Earth to a greater or lesser traumatic degree. We must use our great technological capacity to prevent its effects so as not to allow the change to lead to a catastrophe.

The real problem derives from a social and consumeristic model which, given the current energy resources, can not be made sustainable for the world population. Demographic control, hand in hand with research into and the use of new energy models are absolutely necessary if we are to avoid a final catastrophe.

Keywords: Climate change, demography, energetic resources

That human activity has influenced and continues to influence the climate today? I have no doubt about this at all. The evidence seems to be irrefutable. That human activity is able to modify climatic tendencies and oscillations in a "natural" way, without a significant human presence, and has been doing so throughout geological history? As a geologist, I will focus on this observation so as to analyse recent climatic changes such

as the present one, framing them within the context of the earth's history and the mutual influences resulting from human activity.

In fact, until recently, climatic determinism was consubstantial with human activity. As a result, until very recently, human activity had to adapt to the climatic conditions present in their geographical location. If adaptation was not possible then there would have to be a migration to another location or, on occasions, total extinction.

The first example of the above would appear to be the origin of our species in East Africa. Monkeys which lived somewhere in the jungle, like contemporary gorillas or orangutangs, found themselves confronted by progressive desertification which converted the jungle into savannah. Accustomed to having an abundance of fruit at hand, they had to adapt to the scarcity of food and found out how to use their hands to obtain fruit by breaking open the protective outer covering … and so they survived.

In other places, such as Vallès (Catalonia, Spain) it seems that the Dryopithecus, apes which existed six million years ago[1], were unable to adapt and there is no evidence of a continuing evolutionary line, thus we assume they simple ceased to exist. Climatic changes, similar to those which occurred in the two places already mentioned, were traumatic: on the one hand provoking extinction and on the other an evolution towards a more viable form of life.

In the main, such climatic changes were caused when, during the continental shift, the Antarctic moved to occupy the South Pole. Over 3.000 meters of ice accumulated, and is still extant today, sea levels dropped around the planet and the circumpolar oceanic currents began to move. The climate in Europe changed from the subtropical, with palm trees and coral reefs reaching as far Paris, London and Vienna, to that we have today. Six million years ago we still had coral reefs in what today is Penedès (Sant Pau d'Ordal, Catalonia, Spain), with sharks in Vallès (Campins).

[1] In Pau, studied by S. Moya and others at the Paleontological Museum in Sabadell

This is the great geological cooling of the Earth. To believe that human activity can change it, melting ice in the Antarctic, is something of a contradiction, just like the belief that we are able to shift a continent to one side or the other.

However, the Earth does receive external and internal influences that can cause an oscillation in the geologic climate, provoking minor reactions which are, nonetheless, important regarding the activity and health of all living things.

Over the last two million years, there have been periods when the earth has warmed up and cooled down. These periods increasingly more intense and shorter, are known as glacial and interglacial periods caused by movements of the Earth's axis, solar radiation variances, and exceptional volcanic activity or also by the impact of meteorites.

These oscillations, which have lasted for tens of thousands of years (two of inferior magnitude), have resulted in ice covering, for example, Scandinavia to Northern Germany, Poland to the Netherlands, practically all Canada to as far south as New York and the Great Lakes at the peak of the glacial period. This was when the Pyrenean glaciers occupied the valleys with tongues that reached as far as Puigcerdà, the river Querol valley, down to Rialb in Noguera Pallaresa and close to Pont de Suert in Noguera Ribagorçana. These oscillations brought about a lowering of the sea level, by one hundred of metres, at the peak of the cold period and a warmer climate than the present during the peak of the warm period, with only a few glaciers extant outside the Antarctic. It could be said that the huge Antarctic icecap was left almost untouched by these oscillations.

The changes forced the fauna, including our ancestors, to migrate in search of better conditions in which to accommodate their habits and diet, in the course of which many species became extinct. It was during a period of lesser climatic change that, for example, in the throes of the last ice age, large tracts of North and East Asia became climatically suitable for human occupation and, from there, taking advantage of the drop in sea level, Japan was colonised and America via the Bering Straits and Yukon region which, at that time, was free of ice.

Today, more than ten thousand years afterwards, we are clearly living in an interglacial period (one which is comparatively mild compared to that of 400.000 years ago), and in our period climatic oscillations of a minor

order are also being experienced. However, they affect the modern human species, *Homo sapiens sapiens*, the Neanderthals being extinct, and have conditioned a large part of the prehistoric period and all history from the end of the Upper Palaeolithic to contemporary times. I do not say up to "our times" because it would seem that during the last decades it is we who have wrought effects on the climate and at this moment in time I do not want to affirm or contradict anything until I have neared my conclusion.

Let me proceed, then, to analyse the effects of the current climate change from the geologist's point of view in an attempt to discover what is specifically pertinent to the present change in comparison with those that have occurred over the last ten thousand years which are not the result of human activity, given that, even though there were humans, they were few in number and with little technology with which to modify the climate and were thus not responsible for any climatic catastrophe.

A) The Glaciers Melt

Over the last ten thousand years the Alpine glaciers have reduced ten times in size in comparison with those of today. Tree trunks found in existing moraines reveal that the tree line was four hundred metres above the present level. The route that Hannibal and his elephants took to Rome across the Alps would be impracticable today. In the Pyrenees, the present day glaciers are the result of a Little Ice Age between the XVI-XVIII centuries. This cooling down period caused a severe socioeconomic crisis, hunger and misery in a large part of Europe.

From the point of view of a geologist who specialises in glaciers in the past, the present heating up of the planet and the consequent withdrawal of glaciers is by no means abnormal and, furthermore, in the past it has proved to be beneficial for human beings who de pended on climate more than we do today.

B/ Desertification

It has not yet been proved that the warming up of the planet has brought about more arid zones than those already extant or in comparison with those in the past. What actually happens is that they move location.

North Africa itself, defined two thousand years ago as the grain basket of Rome, became arid later in time, but there can be no doubt that the heating up of the planet will cause more rain. The relocation of arid and wet zones is by no means a phenomenon of our times.

C/ The Rise in Sea Level

During the most recent and longer warm climatic period (Climatic optimum), sea levels rose by approximately a metre. Known as Flandrian transgression, this is the maximum postglacial marine transgression ever known and took place 6.000 to 3.000 years before our era. While disregarding the catastrophic and rather doubtful predictions made by Al Gore with regard to rising sea levels, could the current climate change bring about a similar rise of up to one metre like that which affected the Egyptian and Mesopotamian civilisations? Without a doubt. We should be prepared in the long term for such a phenomenon just as we are, in the short term, for the rise in river levels.

The fundamental and most serious difference between ancient times and the present is that both marine and freshwater flood plains are inhabited by millions of sedentary people, while politico-administrative frontiers do not allow for human migration and relocation which will occur as a result.

We could continue to analyse different climatic parameters and would arrive at the conclusion that, in geological terms, the climate has changed time and again, even recently, and our species has adapted itself with greater or lesser ease. So we could ask ourselves; maybe the problem of an imminent catastrophe is not the result of climate change?

In 1810, 1.000 million people inhabited the planet. One hundred and fifteen years later, in 1925, there were twice that number. In the space of some forty years the figure had reached three to six thousand-million. In 1989 the UN gave a rather optimistic figure of ten thousand-million inhabitants by 2050 but, at the present population growth rate it is more than likely that that figure will be reached well before then.

In order to use the energy that each one thousand-million people require in the "first world", an Egyptian needed to have 120 slaves in his service. These one thousand-million people consider it both ethically reasonable (and

economically interesting!) that the remaining five thousand-million should reach our degree of comfort and, as a result, our energy consumption!

Should the species known as *Homo sapiens sapiens* which has developed technology so as to live in the desert, the Antarctic or in space in the most inhospitable conditions be afraid of climate change?

Is climate change not just a myth or a devil that we have constructed in order to hide our heads in the sand so as not to see the real problems that will face the planet in the future? Overpopulation and the lack of energy resources to supply a social model that technological advances have made possible blind us to the real problems confronting us and which, I would like to believe, science will solve because if they remain unsolved then wars fought over space and energy resources will most certainly reduce the population or even extinguish the species regardless of whether it is cold or hot. Other species on the planet, if we leave any alive, would doubtless benefit and, if they could, rejoice!

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