

## GLOBAL WARMING: FEVERISH “NIÑOS”?

In a natural way, with an irregular periodicity between two and seven years, a warming of the South Pacific takes place, generating the event of “El Niño Southern Oscillation” (ENSO), usually followed by a cooling that leads to “La Niña”. The events last from a few months to years. Normally, in the South Pacific there is a pressure difference between the east (South America) and the west (Australia) that produces the Walker cell, with an ascending branch in the western sector and a descending one in the eastern part. The superficial trade winds are of great intensity and the ocean remains relatively cold in the eastern region, due to the coastal upwelling, with low evaporation and little rain. Certain years, the pressure difference diminishes, trade winds weaken and, due to the lack of coastal upwelling, the ocean warms up. This leads to more evaporation and rain in the eastern and central parts of the Pacific. Parodying Debussy, a dialogue between sea and wind begins. The action of the sea is responded by the wind. As the sea heats more, the pressure difference is less, and so on until El Niño is produced. Return to “normality” is subject to inertia; oceanic and atmospheric variables are inverted, producing cooling of the ocean, and La Niña.

Instrumental measurements exist since 1950, but evidences of its existence date back to the 14<sup>th</sup> century. The most intense events registered instrumentally took place in 1982-84 and 1997-98. Thanks to satellite observations it is known that the Niño/Niña pair not only affects coastal regions of the South Pacific; it has global “teleconnections”. During the Niño/Niña events, rain patterns are affected all over the world, extreme drought and flooding taking place, with severe consequences. Disease outbreaks also occur; recent studies indicate that the 1918 influenza pandemic, with ~50 million deaths, was associated to a strong ENSO.

During the industrial age temperature has risen ~0.7°C, 2010 being the warmest year since records exist. Undoubtedly, the South Pacific will suffer significant changes as the atmospheric temperature raises, but due to the complexity of climatic processes it is difficult to identify the effects this

will have on ENSO. Among other effects, global warming will weaken South Pacific trade winds, strengthening the growth of El Niño, but the rise in the ocean temperature will increase cloudiness, opposing that growth.

Independently of whether warming affects or not the frequency or intensity of the Niño/Niña events, the crucial question is how are the global effects of the ENSO events affected. According to what has been observed during the last events, it is possible that global warming is potentiating the effects of the Niño/Niña pair. Feverish “Niños”? The models of climate change predict an exacerbation of extreme weather, and that, in general, rainy areas will turn rainier and dry ones drier, favoring a synergy of the two climatic phenomena.

The last Niño (June 2009-April 2010) was moderate, but extreme weather conditions occurred on a global scale: historic drought in the Amazonas, China and Russia, and an intense heat wave (and burnings) in Europe-Russia-Asia, producing ~15000 deaths. In Venezuela, electricity was rationed due to the low levels of dams. Flooding in Pakistan left 1600 deaths and losses of  $15 \times 10^9$  USD. Meanwhile, La Niña that is in progress since August 2010, and which will continue during the northern spring, has produced innumerable deaths from flooding and mudslides in countries as distant as Australia, Brazil, Colombia, South Africa and Sri Lanka. The drought in the African Horn is leading to extreme famine.

International agreements to effectively mitigate climate change have not been reached and a global warming  $>3^\circ\text{C}$  by the end of the century is predicted. Given the progressive rise in temperature, with potentiated “Niños”, the recommendation to the more vulnerable developing countries is that measures be urgently taken to adapt to the climate change (heat waves, intense and frequent drought and flooding, smaller harvests and famine, vector carried diseases, sea-level rise, glacier disappearance and water resource reduction, uncertain hydroelectric generation, terrestrial ecosystems migrations, etc.). The Spanish proverb says “Announced war does not kill soldiers.”

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