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Climate Debate HOTS up Even as Global Temperature Cools: a Climate Change Review

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Abstract

Ever since data released earlier this year showed that in the past 15 years, global average temperatures had not risen as fast they had earlier, there has been much hue and cry climate change sceptics naturally seized upon this to declare that they had been proved right. Last month, leaked portions of the forthcoming IPCC report, too, were reported by Western media outlets to contain this perplexing fact. So, had global warming, really paused? Has the apocalypse been averted as a leading London-based weekly put it?

First, the facts it is true that average increase in temperature since 1998 is lower than the previous 20 years or more. But it is also true that the nine warmest years on record have all been in this very 15 year period. The sole exception is 1998 itself, the warmest year on record, itself caused by a historic ElNino event.

But this is not the full story, in this same 15 year period carbon dioxide levels in this same 15 year period carbon dioxide levels in the atmosphere reached 392.6 parts per million (ppm), the highest in 800,000 years; arctic sea ice melted to its lowest ever summer extent-about 18% lower than the previous lowest in 2007; global sea levels reached a record high, continuing the average 3.2mm per year rise; extreme event and more intense water cycles of rain continued. Clearly, all other indicators and more intense water cycles of rain continued. Even global temperatures are rising, but not as rapidly as earlier. The claim here is that reducing greenhouse gases would be a wasted expense if climate change ends up causing only minor problems.

Keywords: IPCC, Debate, Global, ElNino, Development.

1. Introduction

Scientific research has explained this strange event. The four main reasons for a slight slowing down in the warming process are rise in sea heat, ElNino, aerosols, and what is called the 'solar minimum'. These have not been fully included in the IPCC report.

But before going into that here is another fact for context: it is not the first time that there has been such a pause there have been two earlier period when a similar slowdown in warming took place- from 1977 to 1986 and from 1987to1996, both these periods were followed by big jumps in temperatures. Climate change is a complex process and this variability is inherent to it as depicts in the figure below.

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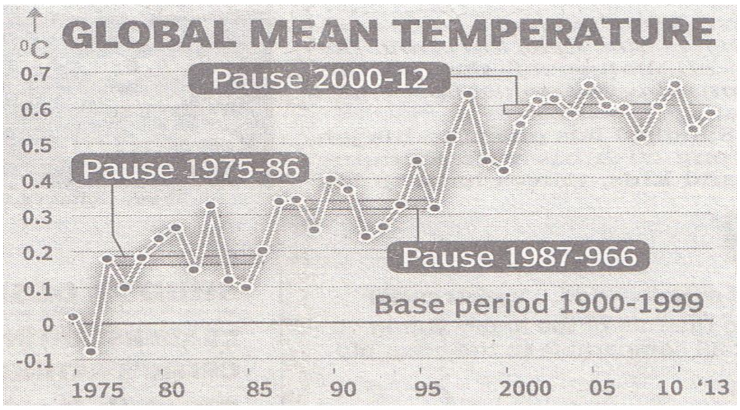
2. Discussion

According to the US National Oceanic and Atmospheric Administration (NOAA), "heat content in the upper 2, 300feet of the ocean remained near record high levels in 2012. Overall increases from 2011 to 2012occurred between depths of 2300 to6600 feet and even in the deep ocean". About 30% of the heat was dumped in to the ocean below the 2300 feet depth as per research by Kevin Trenberth, a scientist at the University Corporation for Atmospheric Research in the US.



Source: US NOAA

Trenberth also found a link between global warming and ElNino event, as heat comes out of the ocean and warms the atmosphere, he writes.

It appears that a series of small volcanic explosions in the past decade and a half have also contributed to the warming slowdown by injecting small particles of dust and ash (called aerosols) in the upper reaches of the atmosphere. This layer acts as a shield preventing more of the sun's rays from coming earthwards.

Besides, during this period of slowed warming the heat coming to Earth from the Sun was less because the sun was passing through its cyclical low, as James Hansen, a leading climate change scientist has pointed out. This solar minimum has lasted from 2005 to 2010 and the sun is now on an upswing. So, the Pause is only a passing phase. As Trenberth writes, "global warming has not gone away".

3. Climate change and Development

Climate change is the single greatest threat to development making the battle to overcome poverty ever harder and more expensive. Finance is urgently needed to assist vulnerable communities adept to a changing climate. Significant financial resources will be needed to help developing countries deal adequately with warming trend, both to reduce greenhouse gas emission and to adapt to the consequences of climate change. At the climate conferences in Copenhagen (2009) and Cancun (2010), the European Union and other developed countries pledged jointly to provide nearly 30 billion USD in fast start finance over the years 2010-2012, and for the longer term, to mobilise USD 100 billion a year by 2020.

A beginning was made towards climate financing through the Copenhagen Accord and there was progress, even if limited. The Accord proposed the establishment of a 'Copenhagen Green Climate Fund and included a loose pledge from rich countries to mobilise the requisite fund. The UN Secretary General convened a High level Advisory Group on Climate Financing

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(AGF) to recommended-ahead of the UN climate meeting in Mexico in December 2010- how the money could be raised. Robert Frank, a well-known climate-economist says, why aren't we demanding more forceful [climate] action? One reason may be the frequent incantation of a motley collection of myths, each one rooted in bad economics:

Last year the World Bank estimated the costs of adaptation in poor countries which were 75-100 billion USD per year if global warming was kept to a reasonably limit. The non-binding pledges from rich countries to cut emission offered since Copenhagen would steer a courses towards a catastrophic rise in temperature. Mitigating climate change is not only about how many rich countries cut their emissions, but also how they help developing countries curb theirs. Emerging economies and poorer countries must now pursue more expensive development paths than the ones rich countries followed. More money will be needed to meet the extra costs of clean development in developing countries. The claim here is that reducing greenhouse gases would be a wasted expense if climate change ends up causing only minor problems. But uncertainty cuts two ways. Things might not be as bad as expected, but they could also be much worse.

Climate finance is about more than compensating developing countries for the costs imposed on them by a problem they did not create. It is an investment between rich and poor countries for a common future. Rich countries cannot only fight climate change at home and win. In the current economic climate the sums required appear daunting, but they are well within the realms of possibility. It is entirely feasible for rich countries to raise hundreds of billions of dollars in public finance each year, through innovative mechanisms i.e. to bring a packaged of climate finance sources on-stream by 2013, worth at least 100 billion USD a year, to help poor people cope with climate change. Although an effective solution will take global coordination, America's inaction has been a major barrier to progress. If the United States and Europe each adopted a steep carbon tax, they could elicit broader cooperation through heavy tariffs on goods produced in countries that failed to do likewise. India and China need access to our markets, giving us enormous leverage.

India being a developing country is categorised as a non-annex 1 in the international climate negotiations which means that presently India is not expected to take up any legally binding commitments for countering climate change. However, India has voluntarily committed itself to reducing its emissions intensity by 20-25 percent of its 2005 levels by 2020.

4. Conclusion

Lack of funding is a large impediment to implementing adaptation plans. The scale and magnitude of the financial support required by the developing countries to enhance their domestic mitigation and adaptation actions are a matter of intense debated in the multilateral negotiations under the United Nations Framework Convention for combating climate change (UNFCC). The convention squarely put the responsibility for the provision of financial support on the developed countries taking into account their contribution to the stock of greenhouse gases (GHGs) in the atmosphere The claim here is that reducing greenhouse gases would be a wasted expense if climate change ends up causing only minor problems. But uncertainty cuts two ways. Things might not be as bad as expected, but they could also be much worse. Reducing CO2 emissions would actually be surprisingly easy. The most effective remedy would be a carbon tax, which would raise the after-tax price of goods in rough proportion to the size of their carbon footprint. Gasoline would become more expensive. If a

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carbon tax were scheduled to be gradually phased in once the economy recovered, its mere announcement would create jobs right away. As with any policy change, there would be winners and losers.

Countries like India that are on the path of development would need access to fiancé and technology if the world is to achieve emission standards in line with stabilisation and sustainable goal. The UNFCCC has estimated a requirement of 200-210 billion USD in additional annual investment in 2030 to return GHG emissions to current levels. India on behalf of the developing countries have been arguing that a global mechanism for generating and accounting for additional resources, mainly from public sources is essential in order to meet the long term finance requirements for adaptation and mitigation. India strongly feels that there should be a multilateral financial mechanism under the convention that should be set up with resources provided is developed countries on the basis of assessed contributions.

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Biodegradation: Its Role in Reducing Toxicity and Exposure to POPs Contaminants in the Environment

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Abstract

Polychlorinatedbiphenyls (PCBs) belong to the broad family of man-made organic chemicals known as chlorinated hydrocarbons. The chemical formula of a PCB is $C_{12}H_{10-x}Cl_x$. There are 209 configurations of PCB with 1 to 10 chlorine atoms, of which only 130 are used commercially. PCBs are aromatic, synthetic chemicals which do not occur naturally in the environment. Due to environmental toxicity PCBs were banned by the Stockholm Convention in 2001. This paper presents the results of the experiment to study the degradation of PCBs in soil under aerobic conditions. The sandy-loam sterilized soil, unsterilized soil and Pseudomonas putida (BP25R) inoculated soil were fortified with PCB 14 at two fortification levels, 10 and 20 µg level in triplicate. The soil samples were maintained at 27° C and the samples were periodically withdrawn on day 0, 1,5,10,15,20,30,45,60,90 and 120. The samples were processed, cleaned and analyzed by GC- ECD. The dissipation kinetics revealed that PCB-14 degraded with a half life of 302.0 and 363.0 days in unsterilized and sterilized 302 to 363 soils indicating that microbes play a significant role in degradation of the persistent pollutants.

Keywords: Biodegradation, Polychlorinated biphenyls (PCBs), Pseudomonas putida, aerobic conditions.

1. Introduction

Polychlorinated biphenyls (PCBs) belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs are aromatic, synthetic chemicals which do not occur naturally in the environment (UNEP, 1999; USEPA, 2013). They consist of the biphenyl structure with two linked benzene rings in which some or all of the hydrogen atoms have been substituted by chlorine atoms. The chemical formula of a PCB is $C_{12}H_{10-x}Cl_x$. There are 209 configurations of PCB with 1 to 10 chlorine atoms, of which only 130 are used commercially. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979(WHO, 2000). The desirable physical and chemical characteristics of PCBs such as excellent dielectric and flame resistance properties, chemical and thermal stability which lead to their extensive industrial use as heat transfer fluids, hydraulic fluids, solvent extenders, plasticizers, flame retardants, organic diluents, and dielectric fluids (Hutzinger, et al.,1974). Extensive application of these chemically and thermally stable compounds has resulted in widespread contamination in the environmental compartments (Buckley, 1982). The high octanol/water partition coefficient (K_{ow}) of some PCB congeners results in their accumulation

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in fatty tissues and their biomagnifications in the food chain (Safe, 1980). Due to their low vapour pressure, PCBs accumulate primarily in the hydrosphere, in the organic fraction of soil, and in organisms. The high chemical stability of PCBs explains their persistence in the environment. Due to polychlorinated biphenyls (PCBs') environmental toxicity and classification as a persistent organic pollutant, PCB production was banned by the Stockholm Convention on Persistent Organic Pollutants in 2001. Toxicological studies of PCBs are complex, because they should take into account numerous different molecules with possible synergic effects, studies suggest toxic and carcinogenic properties, particularly for co-planar congeners (Faroon, et al, 2001). Extensive studies in vivo and in vitro have been conducted on the toxicological effects of PCBs in different mammalian systems. One area that has received less attention is the uptake, translocation and transformation of PCBs in terrestrial plants. Despite the high chemical stability of PCBs, the finding that microorganisms are able to degrade some congeners opened the door to implement bioremediation technologies. Essentially, bacteria can degrade PCBs by two processes aerobic degradation via the biphenyl pathway and anaerobic dechlorination. The former being the most documented.. The first report on the isolation of PCB degrading bacteria dates back to 1973 when Ahmed and Focht found two species of *Achromobacter* capable of degrading PCBs (Ahmed and Focht,1973). Rapidly, other strains were isolated from PCB contaminated sites, some with better degradation efficiencies and broader spectrum of activity (Asturias and Timmis, 1993). Plants also transform organic compounds different way than microorganisms. They remediate organic compounds by the direct uptake of contaminants (Schnoor, et al, 1995). But this paper presents the results of the experiment to study the degradation of PCBs in soil under aerobic conditions. In view of the above a study was carried to determine the behavior and the effect of soil microbes on degradation of PCB14 and the effect of a bacterial strain *Pseudomonas putida*.

2. Materials and methods:

Soil (10g) was taken in 24 conical flasks and sterilized in an autoclave. Sterilized and unsterilized soil was fortified with PCB 14 at 10 and 20 µg levels in triplicate. One set of sterilized soil was inoculated with culture of *Pseudomonas putida* (BP25R) and further fortified with 10 and 20 µg of PCB 14 under aseptic conditions under Laminar flow. The type cultures were obtained from Division of Plant Pathology, Indian Agricultural Research Institute (IARI), New Delhi. These cultures are maintained in nutrient broth media in a BOD at 27 °C. The sterilized, unsterilized and inoculated soil was maintained at 27 ˚C in a BOD. The soil samples were processed periodically on 0.5.10.15.20.30, 45,60, 90 and 120 days. The soil was subjected to extraction by QuCHERS method using PSA. The samples were analyzed by GLC using ECD detector. The Limit of detection was 0.1 µL/mL and the LOQ of the method was 2 ng.

3. Result and Discussion

The results revealed that the half life of the PCB 14 varied from 295-210 in sterilized and unsterilized soil at 10 µg fortification level while in soil inoculated with Bacterial strain Pseudomonas *putida* soil. At higher fortification level PCB dissipated with a half life of 302 to 363 in sterilized and unsterilized soil, respectively while in presence of *Pseudomonas putida* the half life was 128 days. The rate of dissipation was slow and about 24.6-29.8 % dissipation was recorded.

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