Abs Nr. OR-001

Global Carbon Dioxide Consumption by Silicate Weathering

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Carbon dioxide (CO_2) a green house gas, although present in less concentrations by volume in the atmosphere exerts tremendous influence on global climate. The levels of atmospheric CO_2 has varied throughout geologic time and has shown fluctuations leading to global cooling/warming. One of the important consumers of atmospheric CO_2 is by chemical weathering processes of surficial rocks. The weathering of minerals produced by the action of both CO_2 and water are transported along with river water to the oceans, where carbonate depositions occur. The two most abundant rock types on earth's surface – carbonate and silicate rocks weather at different rates, the net effect being over consumption of CO_2 by silicate weathering. In the present article, we present the total amount of CO_2 consumed annually estimated from 332 rivers in the world

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Atmospheric Particulate Matter, its Chemical Composition and the Impacting Meteorological Factors in Coimbatore, India

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Particulate matter (PM), a complex mixture of organic and inorganic substances is a ubiquitous air pollutant, contributed by both natural and anthropogenic sources. Ever since the advent of industrial era, anthropogenic sources of PM have been increasing rapidly. Increasing amounts of such potentially harmful particles being emitted into the atmosphere on a global scale has resulted in damage to the environment, especially soot particles contributing a heating effect to the atmosphere. Such heating effect is believed to have wide implications on various systems of earth including climate.

In India, increasing traffic, unplanned urban and industrial development, higher levels of energy consumption and high influx of population to urban areas are often cited as the reasons for the elevated particulate levels in the urban atmosphere. Coimbatore city, the head quarters of the Coimbatore district is an important industrial cum urban center in India. The city and its urban environs with a population of 0.14 million occupies 15th position in terms of principal urban agglomeration of India. A rapid growth in industries and vehicles are seen since 1980s. A clear picture on airborne particles and its elemental and ionic composition is largely unknown till date. Current study in Coimbatore was undertaken to assess the air borne particulate matter and its chemical constituents with emphasis on impacting micro-meteorological factors. Six stations were selected in and around for the study representing commercial and residential places in urban area, industrial area and sub-urban residential locations.

In the present study the total PM ranged between 136.5 – 206.5 µg/m^3. PM of aerodynamic size below 10 microns (PM10) ranged between 30-149 µg/m^3 with an average of 71.3±22.26 µg/m^3, while PM of size above 10 microns (Non Respirable PM (NRPM) ranged between 24.4 – 460 µg/m^3 averaging 110.8 ± 69.15 µg/m^3. Urban air samples and samples collected near the highway exceeded the permissible limit (60µg/m^3) set by Central Pollution Control Board as annual average. Rise in total PM levels compared to the earlier studies, may be probably attributed to the rapid increase in vehicular population and traffic congestion. Wind speed was negatively correlated with PM10($r = -0.272$, $P<0.01$), while it had a positive correlation with NRPM ($r = 0.275$ $P<0.01$) indicating that higher wind speed has high dilution effect on fine particles especially (PM10), while a strong wind is likely to resuspend the dust particles present in the ground contributing to higher NRSPM concentrations.

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Temperature also had a negative correlation with RSPM values ($r = -0.375$, $P<0.01$).

Among the inorganic constituents estimated (sulphate, chloride, sodium, potassium, phosphate and nitrate), sulphate was observed as dominant compound. Except chloride, all other anions and cations had positive relation with PM10 suggesting that majority of them have similar source. Higher chloride values were obtained in the industrial area.

Heavy metal concentrations in PM10 were in the range Below Detectable Limit (BDL) – 2147 ng/m^3 with abundance varying in the order Zn>Cu>Pb>Ni>Cr>Cd. Significant positive correlation among metals excepting lead and copper suggests that mostly they originate from a common source. Samples of urban and industrial areas showed higher concentrations than residential (urban) and suburban areas.

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Anthropogenic Green house Gases Emission from Indian Domestic Livestock and their Contribution to Global Climate Change

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The concern that enhanced levels of green house gases (GHGs) affect the global climate system significantly has gained momentum over the last few decades. Therefore, the global community has began to identify and monitor GHGs in both industrialized and developing countries because of their importance in "Global warming". The "Global warming" has double effect on agriculture. Agriculture, including livestock contributes to global warming and in turn it is directly affected by the resulting changes in climatic patterns. This livestock environment interaction offers considerable scope for abating adverse effects on the environment. Therefore, accurate quantification of atmospheric green house gases from livestock sector is important for understanding their contribution to "Global climate change" or "Global warming". In the present work an effort has been made to estimate GHGs from agricultural activities related to the animal sector. This has two components. The first component Enteric Fermentation is responsible for emission of methane while the second component Manure management both methane and nitrous oxide are emited. Methane is the dominant GHG from the animal sector (99.999%) while the nitrous oxide is negligible (0.001%). Most of the methane emission from livestock is from enteric fermentation especially from ruminants (cattle, buffalo, sheep and goat)

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Evaluation of Global Warming Using Atmospheric CO_2 Data of NOAA / CMDL Air Sampling Network in the Pacific Ocean

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During the recent past, atmospheric CO_2 data have been collected from various sites by the air sampling network of National Oceanic and Atmospheric Administration, Environmental Research Laboratories, Climate Monitoring and Diagnostic Laboratory (NOAA/CMDL), 325, Broadway, Boulder, Colarado, USA. Such data are systematically documented by Carbon Dioxide Information Analysis Centre, Oak Ridge National Laboratory, U.S. Department of Energy, Tenn. Air sampling for the shipboard NOAA/CMDL program has been carried out since December, 1986 by the merchant vessel *Southland Star,* operated by Blue Star Line Ltd. Air Sampling has also been carried out by the merchant vessel *Wellington Star,* also operated by Blue Star Line Ltd., since May 1990. These ships sail southward from Los Angeles, passing near Christmas Island, American Samoa, and Fiji *en route* to its destination in Auckland, New Zealand. The CO_2 data collected from the network has thrown considerable light on the climate change or expected warming of the Earth.

The analysis of CO_2 data of the air sampling network in the Pacific Ocean sites between the latitudes 30° N to 35° S reveals that there is indeed escalation of CO_2 as the latitude increases northward. The IPCC computer climate model predicts an overall increase of more than 0.3° C during this period. While there is a peak-to-peak fluctuation of interannual temperature by 0.4° C during 1987-1992 based on the satellite MSU data, there is no consistent increase in tropospheric temperature. Therefore, the concept of global warming is not evident *vis-à-vis* the Pacific Ocean sites for the period of study.

It is well known that the concentration of CO_2 in the atmosphere has increased during the past hundred years consequent to fossil fuel based global economy, though, it has been relatively stable before the Industrial Revolution. The increase means that the long-wavelength energy emitted from the Earth cannot escape to space. This is the main reason why many scientists have concluded that an increase in tropospheric carbon dioxide can lead to gradual warming of the Earth.

However, recent investigations by several researchers have established that different factors counteract this warming effect. For example, cloud cover reflects sunlight before it ever reaches the Earth, thus reducing the amount of sunlight

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that reaches the Earth's surface. This reflectance is a function of cloud optical thickness. Studying these complex processes is difficult and highly involved. Some studies have suggested that the amount of carbon that the ecosystem retains depends on the element's availability. As atmospheric CO_2 escalates, CO_2 absorption would also increase. The radiation balance of the atmosphere is essentially determined by the presence of optically active minor constituents such as water vapor, CO_2, ozone, aerosols, etc.

This paper gives new insights into the concept of global warming in the Pacific Ocean sites and analyzes the radiation balance of the atmosphere and the impact of CO_2 on climate and ecosystem. This paper also discusses the water cycle and hydro-meteorological changes in the greenhouse scenario, in the context of the Pacific Ocean experiment.