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RESEARCH ARTICLE

CARBON CYCLE ANALYSIS AND PROPOSAL OF TECHNIQUES FOR ESTIMATION OF INTER-RELATIONS BETWEEN SOURCES AND SINKS

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ABSTRACT

Carbon (C) is a main building block of all Living organisms. Carbon is present in the atmosphere in the atmosphere in large quantities as well as in Biosphere and geosphere in different compositions. If an organism absorbs more Carbon-di-Oxide (CO_2) than he liberates than this is known as Carbon Sink i.e. Plants and the vice-versa is known as Carbon Source i.e. Human Beings (Dalal, 2010). The balancing of carbon is very essential as the formations of complexes from carbon are huge in number. In Year 1980 ambient Carbon-Di-Oxide in atmosphere is 339 PPM (Parts per Million) which increase to 370 PPM in Year 2000 and increased to 410 PPM in Year 2017 which increases the global temperature by about 33.8 °F impacting the Ecology, Climate, Sociology and Culture of the Earth.

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INTRODUCTION

Despite of decades of debates and thinking it's a nude fact that global warming is increasing due to high rise in Carbon-Di-Oxide concentrations in past decades in the atmosphere. Carbon-di-oxide is a predominant Green house gas (G.H.G.) with its 26% contribution. This acts as a heat blanket on earth surface not letting the heat to pass through it as in fig. 01 (https://www.co2.earth/daily-co2). The core history of measurements depicts that In Year 1980 ambient Carbon-Di-Oxide concentrations in atmosphere is 339 PPM which increased to 410 PPM today. This large increase in Carbon-Di-Oxide concentrations increased the global basic Earth's temperature by about 33.8 °F over the past years. One of the large sources of Carbon-Di-Oxide is burning of fossil fuels (Dalal, 2014). The basic natural sinks of carbon-di-oxide such as plants and biota uptake of oceans utilizes about half of this carbon-di-oxide generated (Dalal, 2015). This leads us to a new debate of the century that *"Can oceans sustain the current carbon-di-oxide uptake configured by the climate change?"* (http://wwf.panda.org/who_we_are/wwf_offices/bolivia/our_work/climate/greenhouse_effect) A large concern is due to rapidly rising Troposphere Carbon-Di-Oxide concentrations and its potential impact on green house effect generating a large climate change (Dalal, 2016). So a large amount of labor and thinking is needed in researches to reduce Carbon-Di-Oxide concentrations as soon as possible so here we are proposing some techniques for analyzing Carbon-Di-Oxide concentrations so that they can be identified at ground level and reduced their only thus reducing environmental problems due to CO_2 to an extent.

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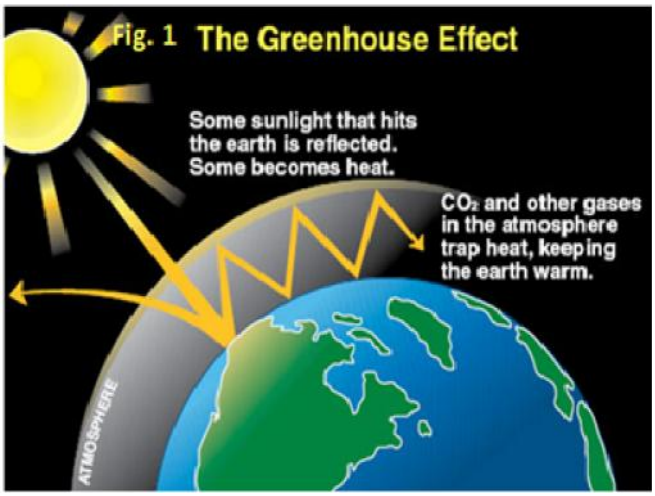
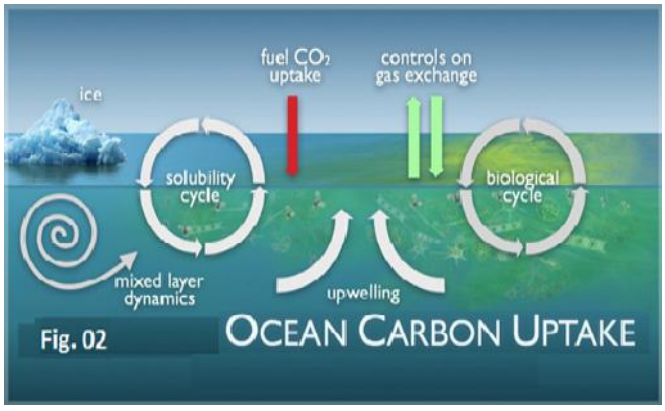
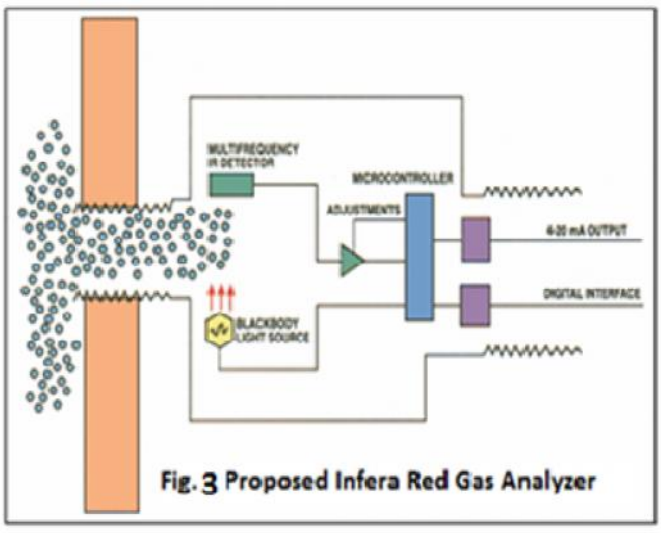
Proposal techniques

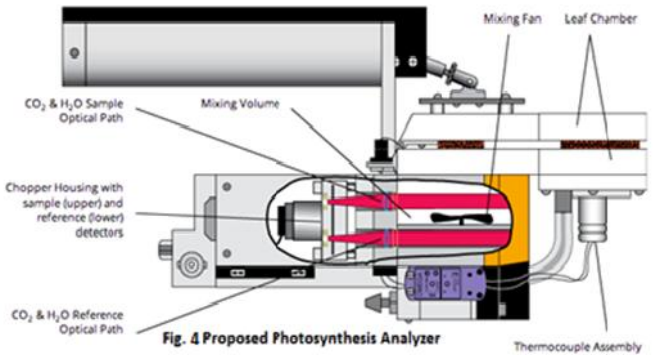
1. I.R.G.A. (Infera Red Gas Analyzer) – This Technique was first proposed in United Kingdom in 1940 were it is been analyzed at laboratory level only. As the technology advances the system become more sophisticated, powerful, and reliable as now we are proposing one which can easily find relation between atmospheric and terrestrial carbon sinks and also 3D vertical carbon-di-oxide fluxes directly on site as in Fig. 3. Typically this analyzer is a closed construction gas pumped structure the tube for carbon-di-oxide flux is long so the lag time will be high. To overcome it we have designed it to analyze the cell directly open to the atmosphere so that it will measure any change in the atmospheric Carbon-Di-Oxide concentrations instantly. Also due to long tube the path length will increase which will result in higher and better 3D resolution.
2. Photosynthesis analyzer – As we all know from years that vegetation is a prime natural sink of carbon absorption as in photosynthesis process the atmospheric

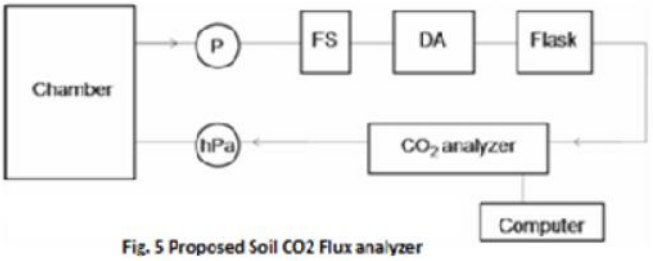
CO_2 is been converted to energy liberating O_2 as bi-product. This bio-chemical reaction helps vegetation providing essential nutrients and energy to all parts of a plant body and also providing the building materials to plant tissues which help in further growth of plants and budding too. Improving our analyzing techniques will let us know more about Carbon-Di-Oxide uptake at different concentrations in photosynthesis is the prime necessity of global community now days. This will need us understand how different crops will respond to various concentrations of carbon-di-oxide at various temperatures and how their photosynthesis rate will alter affecting environmental carbon balancing.

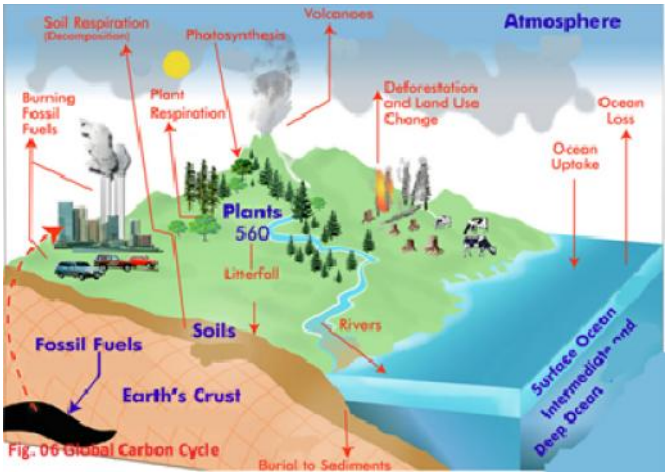












Here we propose a gas exchanger instrument which is been re-designed for analyzing the parameters which are in relation to Carbon-Di-Oxide uptake by a leaf directly. The equipment is light weight, portable hence is battery operated so that it can move and work anywhere at the field so that estimation can be done directly on plant leaf were the variation in temperature, sun light, water vapor and atmospheric gases should not affect the analysis so the leaf chamber is designed as a closed glass chamber were these parameters are controlled automatically. Different leafs have different responses to various rates of carbon-di-oxide uptake so various number of plants of different categories should be taken so that all the variations can be seen and overcome easily without disturbing the leaf ecosystem and without modifying the vegetable – crop interaction with the ecosystem.

3. Soil Carbon-Di-Oxide Flux – This technique is also known as *Soil Respiration* and is one of the big sources of Carbon in environment. The soil respiration plays a major role in global Carbon cycle as in Fig.6 (https://wattsupwiththat.com/2013/08/31). This technique is known as respiration as it consist of carbon-di-oxide liberation done by microbes and fossils during the soil biomass degradation and also the respiration from the plant root tissue and litter fall directly.

The soil flux is been analyzed by two methods the first one is a short term measurement one in which various points in a field are selected of these points in estimation we have to neglect the photosynthesis carbon-di-oxide liberation so have to place I.R.G.A. directly next to soil respiration chamber so this is a little tough method. The Second process is temporal variability were the flux rate changes are monitored daily for a month so is also know as long term unattended soil flux measurement. Here also the I.R.G.A. is placed near the soil chamber but the response time is reduced so that the system become easy, robust and cost efficient. The measurements are done every 90 mins measuring the variation in carbon-di-oxide concentration inside the chamber. The chamber allows the ambient air and sunlight to flow through it so that environmental conditions are been maintained for soil flux.

Conclusion

The fact is that carbon-di-oxide concentrations in atmosphere are increasing which helps the global temperature to rise. In carbon cycle due to lack of sophisticated knowledge there are various gaps which we tried to overcome through these proposals and also endeavor to overcome these environmental changes.

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Web–Links

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