

Atmospheric CO₂ and global warming: A critical review

Summary (auszugsweise):

The projections of man-made climate change through burning of fossil carbon fuels (coal, gas, oil) to CO₂ gas are based mainly on interpretations of measured CO₂ concentrations in the atmosphere and in glacier ice. These measurements and interpretations are subject to serious uncertainties. Dominant factors in the Earth's surface CO₂ cycle are the ocean, in addition to mineral equilibria. Due to their vast buffer capacity, they stabilize the geochemical equilibrium of CO₂ gas between the hydro-, atmo-, litho- and biosphere. Radiocarbon (¹⁴C) studies indicate that the turnover time of dissolved organic carbon in the upper ocean is a few decades. This suggests that CO₂ produced by burning the Earth's whole fossil carbon fuel reservoir would be dissolved in the ocean before reaching the double concentration of its current atmospheric level.

The 19th century measurements of CO₂ in the atmosphere were carried out with an error of up to 100%. A value of 290 ppmv (parts per million, by volume) was chosen as an average for the 19th century atmosphere, by rejecting "not representative" measured values which differed more than 10% from the "general average for the time". This introduced a subjective factor in the estimates of the pre-industrial level of CO₂ in the atmosphere.

The Mauna Loa (Hawaii) observatory has been regarded an ideal site for global CO₂ monitoring. However, it is located near the top of an active volcano, which has, on average, one eruption every three and a half years. There are permanent CO₂ emissions from a rift zone situated only 4 km from the observatory, and the largest active volcanic crater in the world is only 27 km from the

observatory. These special site characteristics have made "editing" of the results an established procedure, which may introduce a subjective bias in the estimates of the "true" values. A similar procedure is used at other CO₂-observatories. There are also problems connected to the instrumental methods for measurements of atmospheric CO₂.

The CO₂ concentrations in air bubbles trapped in glacier ice are often interpreted as previous atmospheric concentrations, assuming that the composition of the air in the bubbles remained unchanged. This was based on another assumption: liquid does not exist in ice below a mean annual temperature of about -24°C, and no changes due to diffusion may be expected. However, it was recently found that liquid can be present in Antarctic ice at temperatures as low as -73°C. Numerous studies indicate that, due to various chemical and physical processes, the CO₂ content in ice can be largely enriched or depleted in comparison with the original atmospheric level. In the air inclusions from pre-industrial ice the CO₂ concentrations were found to range between 135 and 500 ppmv.

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