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Characterization of anthropogenic CO_2 sources and sinks, from local observations in the Netherlands

C. Sirignano, R.E.M. Neubert, B. Löscher and H.A.J. Meijer

Centre for Isotope Research, Rijksuniversiteit Groningen , The Netherlands

C.Sirignano@rug.nl

Our understanding of the processes that presently involve man made carbon dioxide (CO_2) is the base to predict future changes, caused by the increase of CO_2 in the atmosphere. One of the answers needed is where the CO_2 produced by human activities goes into, as we know from observations that only a fraction of it stays in the atmosphere .....(Keeling and Whorf 2005). On the other hand, characterizing locally the sources of atmospheric CO_2 is another essential piece of information needed. The aim of the work we present is to improve the knowledge about these two key subjects of the carbon budget reconstruction, in particular on the local scale that includes the Netherlands.

Measurements of concurrent changes in the atmospheric CO_2 and O_2 mixing ratios have been proven to be useful for the partitioning of anthropogenic CO_2 into its different sinks, both by direct reconstruction of the global budget, based on decennial trends .....(Keeling, Piper et al. 1996), and by testing process models, simulating CO_2 fluxes and gradients .....(Keeling, Stephens et al. 1998; Stephens, Keeling et al. 1998).

Measurements of atmospheric CO_2 mixing ratio alone are not sufficient also when one wants to evaluate the fraction of the amount of CO_2 derived by fossil fuel combustion. Therefore, complementary information is needed, in this case as well. In the first place, this additional input can be given by radiocarbon (^{14}C) measurements ...(e.g. Levin and Hessaimer 2000). However, mixing ratio measurements of carbon monoxide (CO), emitted together with CO_2 during practically all kinds of combustion processes, could supply similar kind of ancillary data – and even with higher spatial and temporal resolution - if one knew, with the due accuracy, the relation between CO and

CO_2 derived by fossil fuel emission.

With the goal of improving the knowledge on the temporal and local variability of the O_2/ CO_2 signal, we present the results of the analysis on an extended data set from the remote station of Lutjewad (The Netherlands). Furthermore we provide an accurate estimate of the ratio CO/(fossil fuel CO_2) and produce observations on the isotopic signature of the CO_2 emitted by fossil fuel burning, in order to give a characterization of the anthropogenic CO_2 emissions over the Netherlands.

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