RECENT CO_2 FLUX VARIABILITY ESTIMATED FROM ATMOSPHERIC MIXING RATIO MEASUREMENTS – AN UPDATE

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ABSTRACT

Regular multi-year measurements of atmospheric CO_2 mixing ratios at a network of sites (Fig. 1) give quantitative spatial and temporal information on surface sources and sinks [e.g., *Conway et al.*, 1994]. Using a global atmospheric tracer transport model in a high-resolution (daily, 4x5 degree pixels) inversion setup, we estimate surface-atmosphere CO_2 fluxes that give the best match between modelled and observed CO_2 concentrations. Building on an earlier study [*Rödenbeck et al.*, 2003], this contribution (1) presents new CO_2 flux estimates using methodological developments, and (2) provides an update on interannual fluxes over the most recent anomalous time period 2002-2003.

(1) The information contained in the atmospheric data is extracted more completely by using individual flask data values or hourly values from continuous analysers, rather than traditional monthly averages or filtered data. Further development is devoted to a-priori flux information, commonly included to compensate for flux features not well-detectable by the atmospheric observation network. As this a-priori information has the potential to considerably impact the results, specification has been sought to be done as transparent, flexible, and process-oriented as possible, for example by separating different flux components and time scales.

(2) The years 2002 and 2003 have seen unusual rises in the atmospheric CO_2 content. With the help of the flux estimates (Fig. 1), the 2002 anomaly can be identified as related to a positive El Niño / Southern Oscillation phase, mainly acting on the tropical carbon cycle. In contrast, the 2003 anomaly turns out to be a northern hemisphere phenomenon. To a substantial extent, it seems to be related to the extreme heat/drought conditions in Europe during that summer. An additional contribution appears to be provided by biomass burning, especially in Siberia.

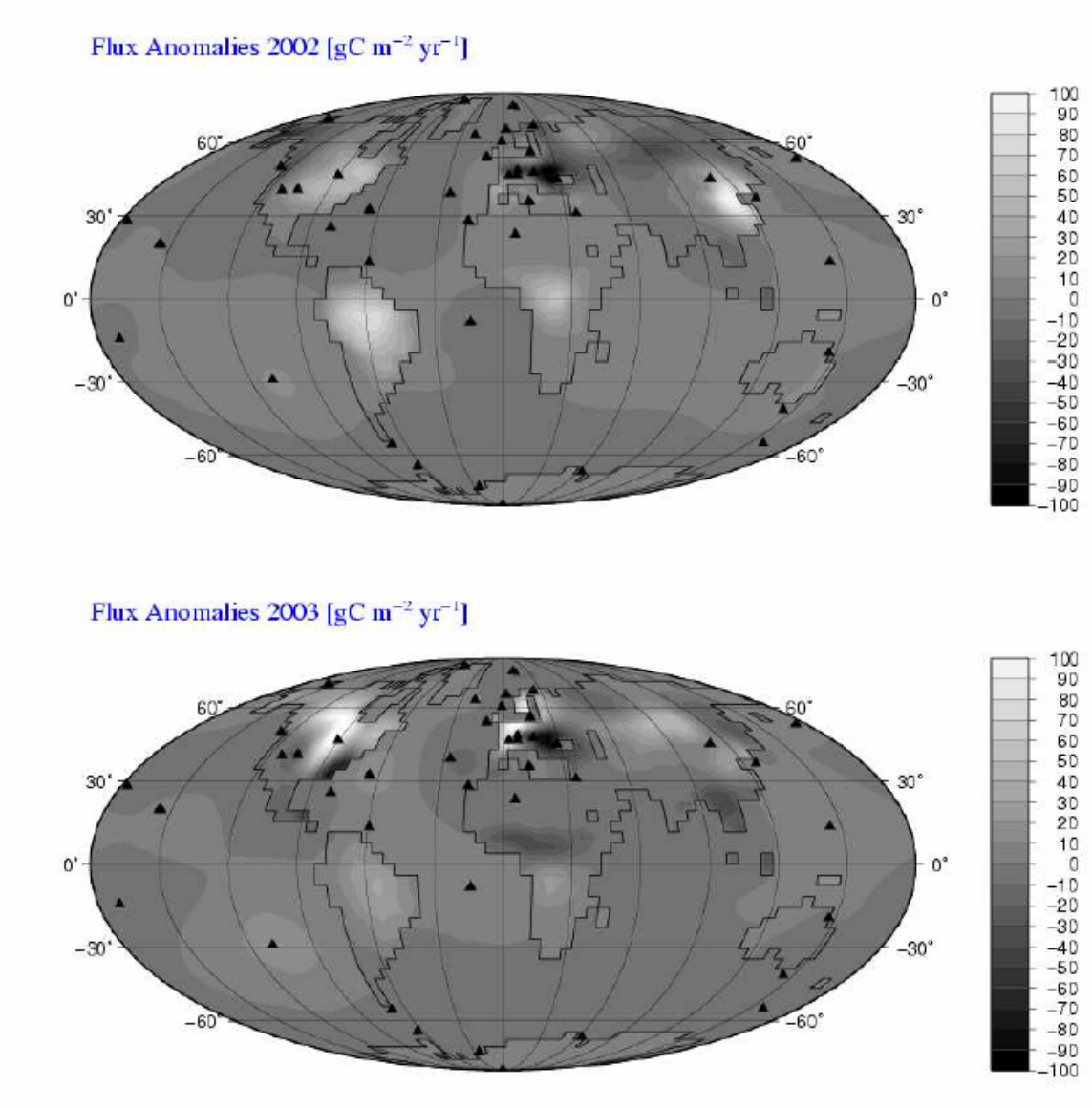

Fig. 1: Estimated carbon flux anomlies in 2002 and 2003. Positive values (light areas) indicate increased CO_2 sources to the atmosphere. Triangles give the locations of the atmospheric measurement sites used in this calculation.

REFERENCES

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