

Determining airborne fraction trend with uncertain land use emission estimatesAndrew Chiodi[†]; Don Harrison[†] JISAO/ University of Washington, USALeading author: andy.chiodi@noaa.gov

One of the most important questions facing global carbon science today is whether the planet's ability to continue to absorb a substantial fraction (currently about half) of the carbon being emitted by anthropogenic activities is diminishing. Recently there have been claims that it is. Because emission levels due to land use changes are not well known, we use Monte Carlo techniques to estimate how large they must have been to yield a statistically significant ($p > 0.9$) increase or decrease in the fraction of emitted carbon that has contributed to the atmospheric growth rate ("airborne fraction") over the past 50 years. Under the range of published assumptions, airborne fraction trends can be either positive or negative, but are not statistically significant at present. The null hypothesis should remain that the sink efficiency has not changed over this period. Improved information about the historical record of land use change emissions is needed to gain a better understanding of the behavior of the planetary sink. Further Monte Carlo results suggest that following the emission scenario based on the most recent (2010) revision of one type of land use emission estimate (based on U.N. Food and Agriculture Organization reports) would produce a statistically significant airborne fraction trend in about two decades, provided we have gained a very accurate knowledge of the historical record of these emissions by that time. It is important that we improve our ability to estimate these types of anthropogenic CO₂ emissions.