EGU23-606, updated on 29 Mar 2024
https://doi.org/10.5194/egusphere-egu23-606
EGU General Assembly 2023

The African greenhouse gases budget: flux trends and uncertainties for the 2009-2019 period

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Africa contributes significantly to the global greenhouse gases (GHG) budget through extensive land use change that is driven by rapid population growth and low human development status. As part of the REgional Carbon Cycle Assessment and Processes Phase 2 (RECCAP2) project, we developed a comprehensive GHG budget for the period 2009-2019 for Africa. We considered bottom-up process-based models, data-driven remotely sensed products, and national greenhouse gas inventories in comparison with top-down atmospheric inversions, accounting also for lateral fluxes. We incorporated emission estimates derived from novel methodologies for termites, herbivores, and fire, which are of particular importance in Africa. We further constrained global biomass change products with high-quality local observation data. During the RECCAP2 period, Africa remains a net sink for carbon. Emissions from land cover change represents the largest contribution to the African budget. However, land cover change emissions in the drier savanna regions were largely offset by increased vegetation growth in the wet tropics. Additionally, fire emissions decreased as suggested by strong reductions in burned area. Burning of fuelwood has however increased. As expected, an upward trend in anthropogenic fossil fuel emissions was evident, ascribed to an increasing demand for energy by a growing and developing population. For all the component fluxes, uncertainty and interannual variability is large, which highlights the need for increased efforts to address Africa-specific data gaps. However, for RECCAP2, we have improved our overall understanding of many of the important components of the African GHG budget that will help to inform climate policy and action.

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