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Fire emission estimates for Australian extreme fire season 2019/2020 using FLEXPART

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In Australia, increasing temperatures and prolonged drought periods lead to an intensification of wildfires. In particular, severe fires are expected to occur more frequently in Southeast Australia's eucalyptus forests leading to strongly enhanced CO_2 emissions and preventing the renewed uptake of the released CO_2 by vegetation. However, current fire emission estimates presented by conventional fire emission databases show significant discrepancies in their emission estimates of extreme fire events like the Australian fire season 2019/2020.

Here, we investigate the fire emissions released during the Australian summer 2019/2020 based on total column measurements of CO_2 and CO using the Lagrangian Particle Dispersion Model FLEXPART. We calculate footprints and backward trajectories of trace gases to inversely retrieve carbon emission estimates. In a first case study we focus on TCCON total column measurements of CO and CO_2 taken in Wollongong located close to the hot-spot of eucalyptus fires. As the measurements show a significant enhancement of all mentioned tracers during the fire event, FLEXPART is used to calculate emission estimates for southeast Australia. Furthermore, we retrieve emission factors between the trace gases. Our results are compared to the conventional databases like GFED, GFAS and FINN and emission estimates published by other studies.