

# Emissions of trace gases from Australian temperate forest fires: emission factors and dependence on modified combustion efficiency

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**Abstract.** We characterised trace gas emissions from Australian temperate forest fires through a mixture of in situ open-path FTIR measurements spectroscopy and selective ion flow tube mass spectrometry (SIFT-MS) and White cell FTIR spectroscopy of grab samples. We report emission factors for a total of 25 trace gas species measured in smoke from nine prescribed fires. We find significant dependence on modified combustion efficiency (MCE) for some species, although regional differences indicate that the use of MCE as a proxy may be limited. We also find that the fire-integrated MCE values derived from our in situ on-the-ground open-path measurements are not significantly different from those reported for airborne measurements of smoke from fires in the same ecosystem. We then compare our average emission factors to those measured for temperate forest fires elsewhere (North America) and for fires in another dominant Australian ecosystem (savanna) and find significant differences in both cases. Indeed, we find that although the emission factors of some species agree within 20%, including those of hydrogen cyanide, ethene, methanol, formaldehyde and 1,3-butadiene; others, such as acetic acid, ethanol, monoterpenes, ammonia, acetonitrile and pyrrole, differ by a factor of two or more. This indicates that the use of ecosystem-specific emission factors is warranted for applications involving emissions from Australian forest fires.