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Observations of isoprene and its oxidation products over West Africa

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Measurements of isoprene and its oxidation products (methyl vinyl ketone and methacrolein) were made from the BAe-146 research aircraft during the African Monsoon Multidisciplinary Analysis (AMMA) campaign. Additionally, simultaneous measurements of formaldehyde, organic peroxides, and carbon monoxide were acquired, allowing an examination of the subsequent fate of isoprene emissions. Observations were made on flight tracks over west Africa ranging between 4º N to18º N and 5º W to 5º E, with multiple flights sampling a strong vegetation gradient between 11º and 13º N along the longitude 2.6º E. Excellent agreement was observed between isoprene measurements obtained by in situ proton transfer reaction mass spectrometry (PTR-MS) and from whole air samples collected in flight and subsequently analyzed by gas chromatography with flame ionization detection. Isoprene observations match well with the percentage tree cover in the region obtained from MODIS data. The high frequency of the PTR-MS data ($<$ 15 seconds between measurements), permitted the observation of significantly higher variability in the isoprene data compared to longer-lived biogenic compounds. Substantial levels of both isoprene and first generation oxidation products were observed in the pre-dawn residual layer, indicating that the sources of isoprene outweighed the sinks when the nocturnal boundary layer formed.