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Basic characteristics of atmospheric particles, trace gases and meteorology in a relatively clean Southern African Savannah environment

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Abstract. We have analyzed one year (July 2006–July 2007) of measurement data from a relatively clean background site located in dry savannah in South Africa. The annual-median trace gas concentrations were equal to 0.7 ppb for SO₂, 1.4 ppb for NO_x, 36 ppb for O₃ and 105 ppb for CO. The corresponding PM₁, PM_{2.5} and PM₁₀ concentrations were 9.0, 10.5 and 18.8 μg m⁻³, and the annual median total particle number concentration in the size range 10–840 nm was 2340 cm⁻³. During Easterly winds, influence of industrial sources approximately 150 km away from the measurement site was clearly visible, especially in SO₂ and NO_x concentrations. Of gases, NO_x and CO had a clear annual, and SO₂, NO_x and O₃ clear diurnal cycle. Atmospheric new-particle formation was observed to take place in more than 90% of the analyzed days. The days with no new particle formation were cloudy or rainy days. The formation rate of 10 nm particles varied in the range of 0.1–28 cm⁻³ s⁻¹ (median 1.9 cm⁻³ s⁻¹) and nucleation mode particle growth rates were in the range 3–21 nm h⁻¹ (median 8.5 nm h⁻¹). Due to high formation and growth rates, observed new particle formation gives a significant contribute to the number of cloud condensation nuclei budget, having a potential to affect the regional climate forcing patterns.

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