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The direct radiative effect of biomass burning aerosols over southern Africa

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Abstract. A multi-column radiative transfer code is used to assess the direct radiative effect of biomass burning aerosols over the southern African region during September. The horizontal distribution of biomass smoke is estimated from two sources; i) General Circulation Model (GCM) simulations combined with measurements from the Aerosol Robotic Network (AERONET) of Sun photometers; ii) data from the Moderate resolution Imaging Spectrometer (MODIS) satellite. Aircraft and satellite measurements are used to constrain the cloud fields, aerosol optical properties, vertical structure, and land surface albedo included in the model. The net regional direct effect of the biomass smoke is -3.1 to -3.6 Wm^{-2} at the top of atmosphere, and -14.4 to -17.0 Wm^{-2} at the surface for the MODIS and GCM distributions of aerosol. The direct radiative effect is shown to be highly sensitive to the prescribed vertical profiles and aerosol optical properties. The diurnal cycle of clouds and the spectral dependency of surface albedo are also shown to play an important role.

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