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Total aerosol effect: radiative forcing or radiative flux perturbation?

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Uncertainties in aerosol radiative forcings, especially those associated with clouds, contribute to a large extent to uncertainties in the total anthropogenic forcing. The interaction of aerosols with clouds and radiation introduces feedbacks which can affect the rate of rain formation. In former assessments of aerosol radiative forcings, these effects have not been quantified. Also, with global aerosol-climate models simulating interactively aerosols and cloud microphysical properties, a quantification of the aerosol forcings in the traditional way is difficult to properly define. Here we argue that fast feedbacks should be included because they act quickly compared with the time scale of global warming. We show that for different forcing agents (aerosols and greenhouse gases) the radiative forcings as traditionally defined agree rather well with estimates from a method, here referred to as radiative flux perturbations (*RFP*), that takes these fast feedbacks and interactions into account. Based on our results, we recommend *RFP* as a valid option to compare different forcing agents, and to compare the effects of particular forcing agents in different models.