MAR13-2012-020415

Abstract for an Invited Paper
for the MAR13 Meeting of
the American Physical Society

The Atmospheric Chemistry of Climate Change

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The chemical composition of the atmosphere regulates the balance between incoming solar short-wave and outgoing terrestrial long-wave radiation, directly *via* absorption and scattering and indirectly *via* modification of clouds. Photo-oxidation reactions remove many chemicals emitted by natural sources, and on geological time scales have prevented runaway growth of infrared-active gases such as methane; however, the same reactions have byproducts (esp. ozone and suspended particles) that affect air quality as well as the radiative forcing of climate. Anthropogenic emissions are now modifying the natural chemical and radiative balances of the atmosphere, but the detailed mechanisms and net effects are still not fully understood. Given the non-linear and coupled nature of the atmospheric chemical system, it is important to realize that future regulations aimed at improving air quality could also influence climate-relevant properties of the atmosphere (and *vice versa*), in ways that may or may not be intended or even beneficial. Careful analyses will be required to distinguish between win-win strategies to address both climate and air quality, and those strategies that penalize one environmental issue to the benefit of the other.