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Impact of climate change on photochemical air pollution in Southern California

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Abstract. The effects of future climate and emissions-related perturbations on ozone air quality in Southern California are considered, with an assumed increase to $2\times$ pre-industrial levels for global background levels of carbon dioxide. Effects of emission and climate-related forcings on air quality are superimposed on a summer 2005 high-ozone time period. Perturbations considered here include (a) effect of increased temperature on atmospheric reaction rates, (b) effect of increased temperature on biogenic emissions, (c) effect of increased water vapor concentrations, (d) effect of increased pollutant levels at the inflow (western) boundary, and (e) effect of population growth and technology change on emissions within Southern California. Various combinations of the above perturbations are also considered. The climate-related perturbations (a–c) led to combined peak 1-h ozone increases of up to 11 ppb. The effect on ozone was greatly reduced when the temperature increase was applied mostly during nighttime hours rather than uniformly throughout the day. Increased pollutant levels at the inflow boundary also led to ozone increases up to 5 ppb. These climate and inflow-related changes offset some of the anticipated benefits of emission controls within the air basin.

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