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Role of chemistry and climate in lower stratospheric tropical ozone trends

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Published estimates of the observed ozone trend in the tropical lower stratosphere indicate a net decrease of approximately 10% between 1979 and 2005. We present simulations performed with our coupled chemistry-climate atmosphere model (CAM3, with interactive stratospheric and tropospheric chemistry) forced by observed sea-surface temperatures and surface concentrations of long-lived greenhouse gases and ozone-destroying agents. Here we show that the model simulation displays substantial decreases in tropical ozone that compare well both in latitudinal and vertical structure with those observed. Our analysis indicates that the changes in the lower stratospheric (85 hPa-50 hPa) tropical ozone distribution are strongly associated with changes in vertical transport and net chemical production; in addition these simulated ozone changes are associated with changes in stratospheric circulation forced by changes in sea-surface temperatures. Extensions to impacts on tropical and extra-tropical tropopause are also discussed.