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## The origin of ozone

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**Abstract.** Highest atmospheric ozone production rates can be found at around 30 km in the tropical stratosphere, leading to ozone mixing ratios of about 10 ppmv. Those stratospheric air masses are then transported to extra-tropical latitudes via the Brewer-Dobson circulation. This is considered the main mechanism to generate mid- and high latitude ozone. By applying the climate-chemistry models E39/C and MAECHAM4/CHEM, this view is investigated in more detail. The origin of ozone in the troposphere and stratosphere is analysed, by incorporating a diagnostics ("marked ozone origin tracers") into the models, which allows to identify the origin of ozone. In most regions the simulated local ozone concentration is dominated by local ozone production, i.e. less than 50% of the ozone at higher latitudes of the stratosphere is produced in the tropics, which conflicts with the idea that the tropics are the global source for stratospheric ozone. Although episodic stratospheric intrusions occur basically everywhere, the main ozone stratosphere-to-troposphere exchange is connected to exchange processes at the sub-tropical jet-stream. The simulated tropospheric influx of ozone amounts to 420 Tg per year, and originates in the Northern Hemisphere from the extra-tropical stratosphere, whereas in the Southern Hemisphere a re-circulation of tropical tropospheric ozone contributes most to the influx of ozone into the troposphere. In the model E39/C, the upper troposphere of both hemispheres is clearly dominated by tropical tropospheric ozone (40%–50%) except for northern summer hemisphere, where the tropospheric contribution (from the tropics as well as from the Northern Hemisphere) does not exceed 20%.

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