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21st century trends in stratosphere-to-troposphere transport

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One of the key questions in the air quality and climate sciences is how will tropospheric ozone concentrations change in the future. This will depend on two factors: changes in stratosphere-to-troposphere transport (STT) and changes in tropospheric chemistry. Here we aim to identify robust changes in STT using simulations from the Chemistry Climate Model Initiative (CCMI) under a common climate change scenario (RCP6.0). We use two idealized stratospheric tracers implemented in the models to examine changes in transport. We find that the strengthening of the shallow branch of the Brewer-Dobson circulation (BDC) in the lower stratosphere and of the upper part of the Hadley cell in the upper troposphere lead to enhanced STT in the subtropics. The acceleration of the deep branch of the BDC in the NH and changes in eddy transport contribute to increase STT at high latitudes. In the SH, the deep branch does not accelerate due to the dynamical effects of the ozone hole recovery.