Twenty-First Century Trends in Mixing Barriers and Eddy Transport in the Lower Stratosphere

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Future trends in isentropic mixing in the lower stratosphere remain largely unexplored, in contrast with the advective component of the Brewer-Dobson circulation. This study examines trends in effective diffusivity ($\kappa_{\text{eff}}$), a measure of the potential of the flow to produce isentropic mixing, in recent chemistry-climate model simulations. The results highlight substantial reduction of $\kappa_{\text{eff}}$ in the upper flanks of the subtropical jets from fall to spring, which are strengthened in response to greenhouse gas increases. This contrasts with stronger eddy transport, associated with increased wave drag in the region, peaking in summer near the critical lines. The projected ozone recovery leads to enhanced $\kappa_{\text{eff}}$ in polar austral spring and summer, associated with a weaker and shorter-lived austral polar vortex by the end of the 21st century.