The impact of stratospheric ozone on the Southern Hemisphere (SH) climate is reviewed and updated by examining a set of coupled models participating in the WCRP/CMIP3 and chemistry-climate models participating in the SPARC/CCMVal.2. Consistent with previous studies, stratospheric ozone is found to play a crucial role in driving SH circulation change from the polar regions to the subtropics and from the stratosphere to the surface. For instance, stronger ozone depletion in late spring generally leads to greater poleward displacement and intensification of the tropospheric jet, and greater expansion of the SH Hadley cell in a quasi-linear manner during the austral summer. These changes significantly affect surface climate and hydrology which likely modify stratification and circulation of the Southern Ocean. Model projections further suggest that the anticipated ozone recovery, resulting from the implementation of the Montreal Protocol, will likely decelerate future climate change resulting from increased greenhouse gases, although it might accelerate surface warming over Antarctica.

Possible mechanisms how stratospheric ozone influences the tropospheric circulations are discussed by re-visiting the mechanisms proposed in the literature. Model biases, persistence characteristics and the spread in sensitivity to stratospheric ozone forcing are also discussed.