We show the dynamical mechanisms responsible for the remarkable strengthening of the Southern Hemisphere circumpolar winds from the lower stratosphere to the surface due to the ozone hole. A state-of-the-art general circulation model forced solely by stratospheric ozone depletion representative of the ozone hole period successfully reproduced these observed changes. The model showed that the ozone hole period induces a marked decrease in planetary wave driving and polar downwelling in the springtime lower stratosphere, which is responsible for the strengthening of the polar vortex and the subsequent delay in its break-up. The reason for this is a reduction in upward propagating planetary waves by the strengthening eastward winds. The anomalous planetary wave driving propagates downwards to the troposphere, resulting in the strengthening and poleward displacement of the mid-latitude tropospheric jet. The tropospheric eddy-driven jet is maintained, subsequently, by increased synoptic waves driving. There is a marked increase in planetary wave driving and polar downwelling in the summertime lower stratosphere, which is responsible for the delayed break-up of the polar vortex. The reason for this is an increase in upward propagating planetary waves due to an upward shift in the zero-wind line. Our results will enable improved prediction of the Southern Hemisphere climate as it changes with the expected ozone recovery in the first half of the 21st century.