EMS Annual Meeting Abstracts
Vol. 8, EMS2011-507, 2011
11th EMS / 10th ECAM

Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Effects of greenhouse gas increase and ozone recovery on lower stratospheric circulation and the age of air as revealed by chemistry-climate model simulations up to 2100

K. Shibata and M. Deushi

Meteorological Research Institute, Atmospheric environment and applied meteorology, Tsukuba, Japan
(kshibata@mri-jma.go.jp)

Long-term changes in lower stratospheric wave forcing and the distribution of mean age of air were examined using multidecadal simulations carried out with a chemistry [U+2010] climate model in which changes in ozone concentration and the climate of the middle atmosphere were projected through the twenty-first century. Changes in wave forcing between future (2085–2099) and past (1985–1999) periods show clear seasonal variation in the simulations. In both summer hemispheres, subtropical wave forcing significantly strengthens and extends to the extratropics in the lower stratosphere, with the exception of the Antarctic region where resolved wave forcing is decreased in spring and summer as a result of an earlier breakdown of the polar vortex in the future period. This summer strengthening and extending in wave forcing is likely related to the westerly wind shift of the lower stratospheric easterly wind. In the future period, mean age of air is decreased at all locations and seasons at 50 hPa. However, the decrease is nonuniform in each season and region. A large decrease is simulated over the northern extratropics in summer, in accordance with a strengthened residual circulation. Over the Antarctic, a local maximum decrease appears in December, related to the earlier breakdown of the polar vortex.