# Supplementary Material to

# Climatology and trends in the forcing of the stratospheric zonal-mean flow


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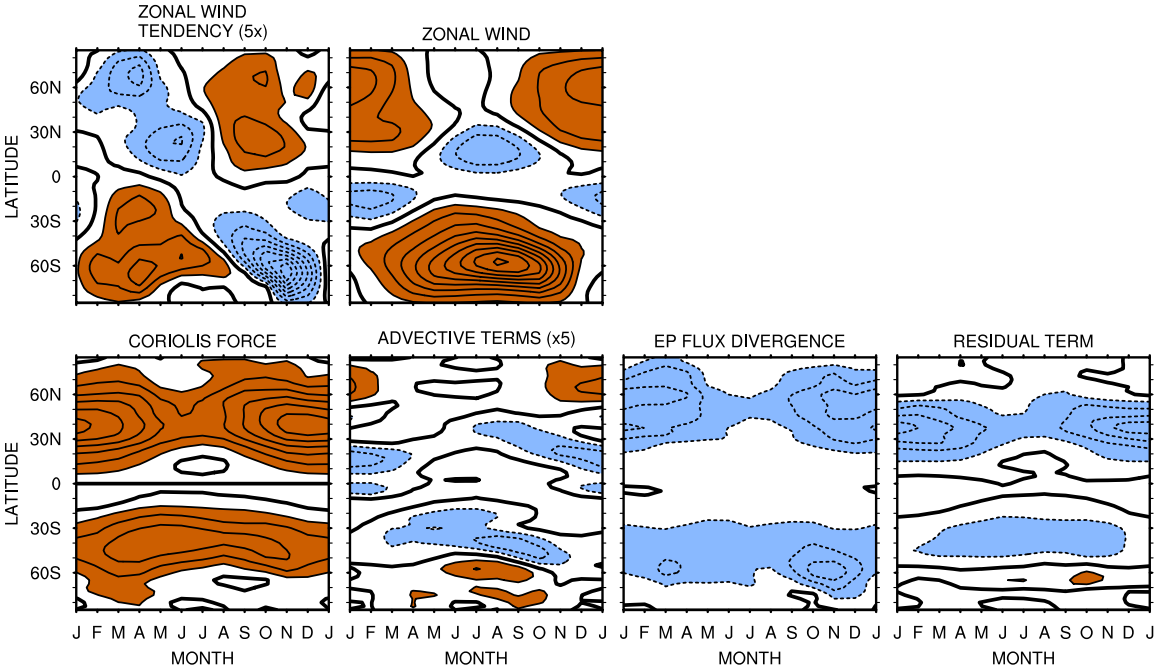


**Fig. S1.** Annual cycle of the R-2 stratospheric zonal-mean zonal wind, zonal wind tendency and each forcing term in the TEM momentum equation averaged between 100 and 20 hPa. Dashed (solid) lines and blue (brown) shadings represent negative (positive) values while the bold solid line represent the zero-line. Contour interval is 6 m $s^{-1}$ for the zonal wind and 0.5 m $s^{-1}$ $day^{-1}$ for the zonal wind tendency and forcing terms. Note that the zonal wind tendency and advective terms are weak compared to the other terms and are therefore multiplied by 5.

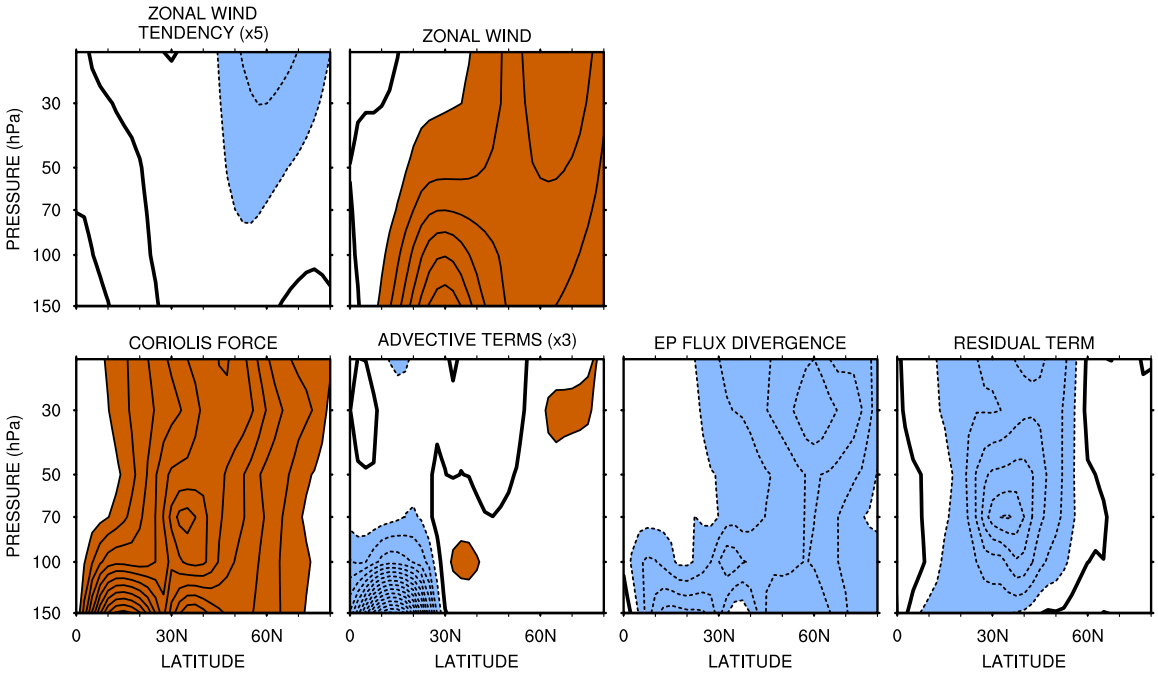


**Fig. S2.** Latitude-height cross-sections of the zonal-mean zonal wind, zonal wind tendency and its forcing terms in the Northern Hemisphere averaged over JFM 1980-2001 for the ERA-40 reanalysis. Dashed (solid) lines and blue (brown) shadings represent negative (positive) values while the bold solid line represent the zero-line. Contour interval is 6 m $s^{-1}$ for the zonal wind and 0.5 m $s^{-1}$ $day^{-1}$ for the zonal wind tendency and forcing terms. Note that the zonal wind tendency and advective terms are weak compared to the other terms and are therefore multiplied by 5 and 3 respectively.

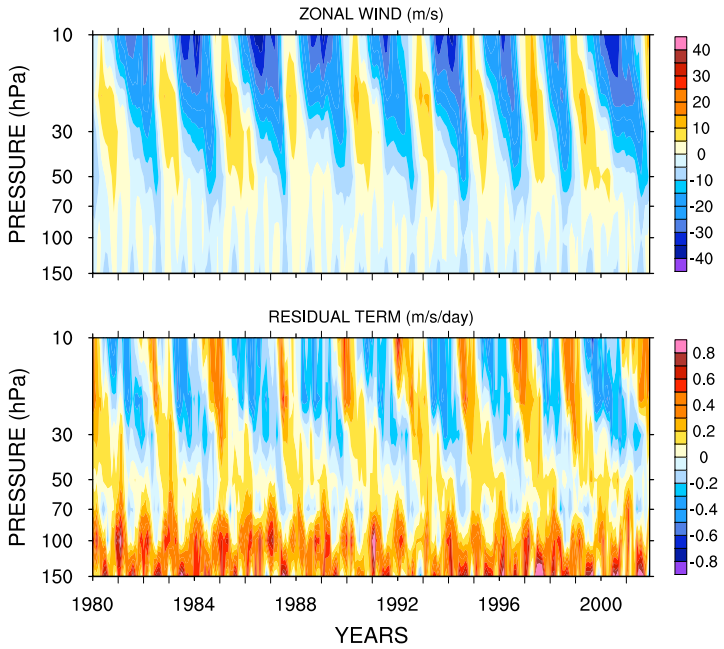


**Fig. S3.** Hovmöller diagram of the equatorial (averaged between 10ºS-10ºN) zonal-mean zonal wind (m $s^{-1}$) and residual term (m $s^{-1}$ $day^{-1}$).

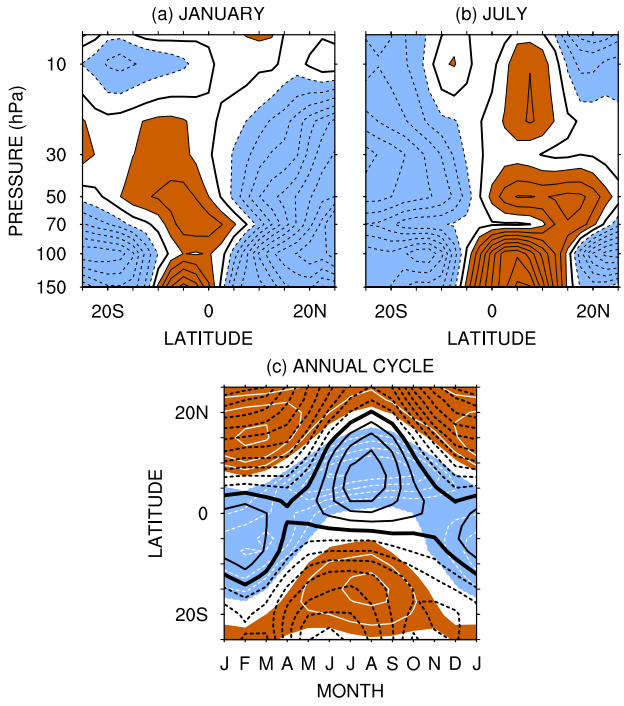


**Fig. S4.** ERA-40 residual term averaged over (a) January and (b) July 1980-2001. (c) Annual cycle of the residual term averaged between 100 and 20 hPa (black contour lines) overlaid on the National Oceanic and Atmospheric Administration (NOAA) interpolated Outgoing Longwave Radiation departures from the annual mean averaged between 25ºS-25ºN and 100 and 20 hPa (color shading with white contour lines). Dashed (solid) lines and blue (brown) colors represent negative (positive) values while the bold solid line represent the zero-line. Contour interval is 0.1 m $s^{-1}$ $day^{-1}$ for the dissipative term and 5 W $m^{-2}$ for the OLR.

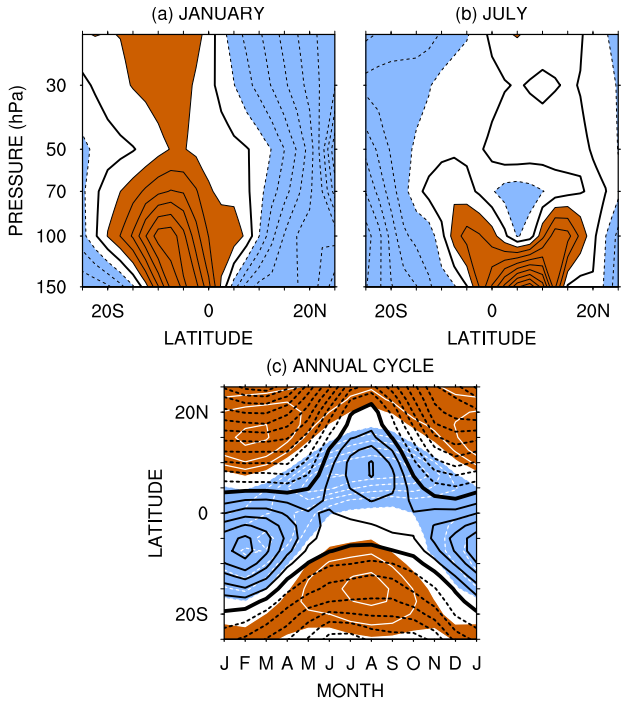


**Fig. S5.** Same as Fig. S4. but the R-2 reanalysis.

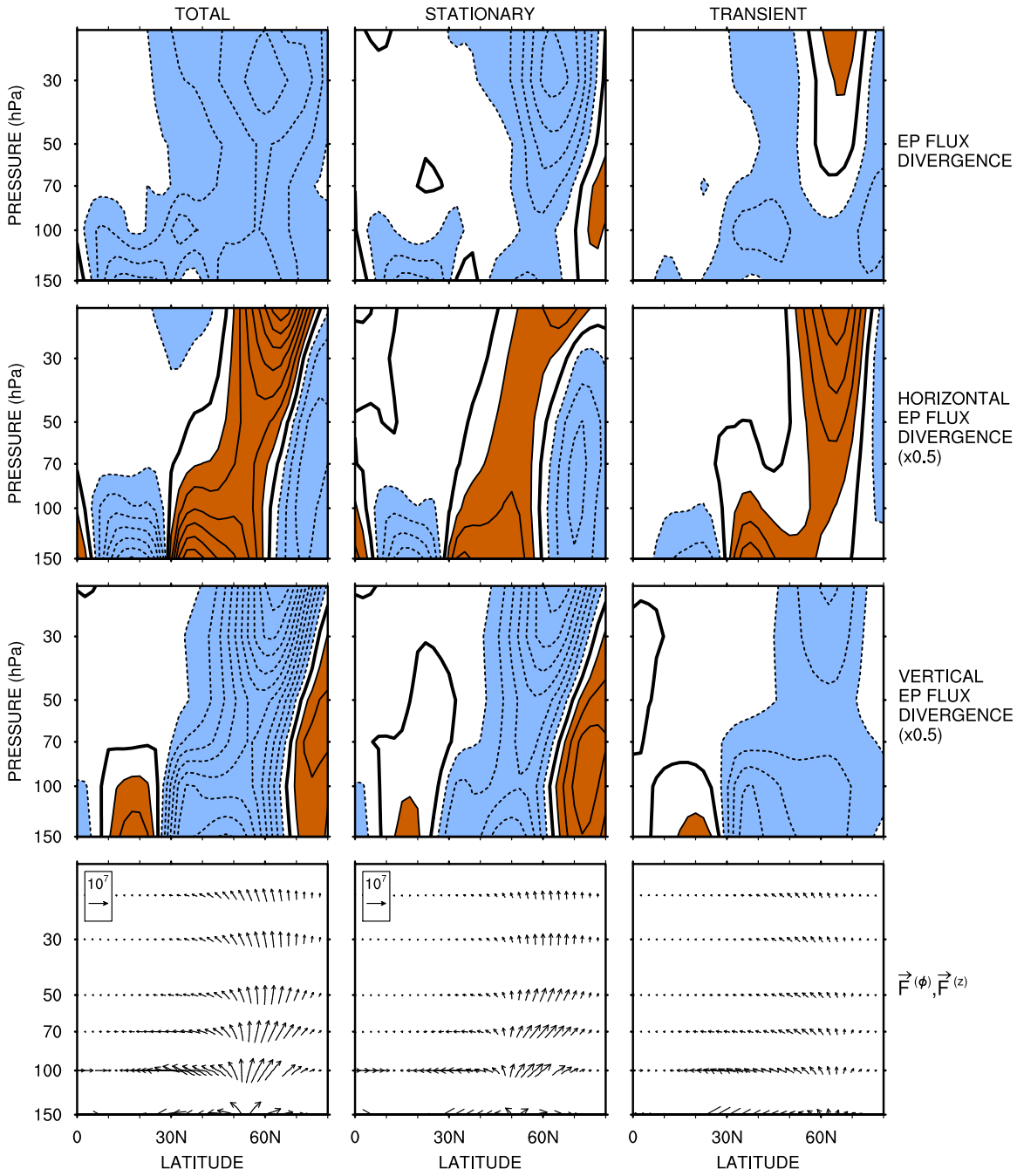


**Fig. S6.** Same as Fig. S2. but for the EP flux divergence, its horizontal and vertical components, and the EP flux vector, including stationary and transient components. Contour interval is 0.5 m $s^{-1}$ $day^{-1}$ for the EP flux divergence and its horizontal and vertical components. The reference vector corresponds to $10^7$ kg $s^{-2}$ and the vertical component is multiplied by 100 for scaling purposes. Note that the horizontal and vertical components of the EP flux divergence are large compared to the EP flux divergence and are therefore multiplied by 0.5.