This document includes additional figures for selected latitude bins and altitudes in order to support the argument in the main paper.

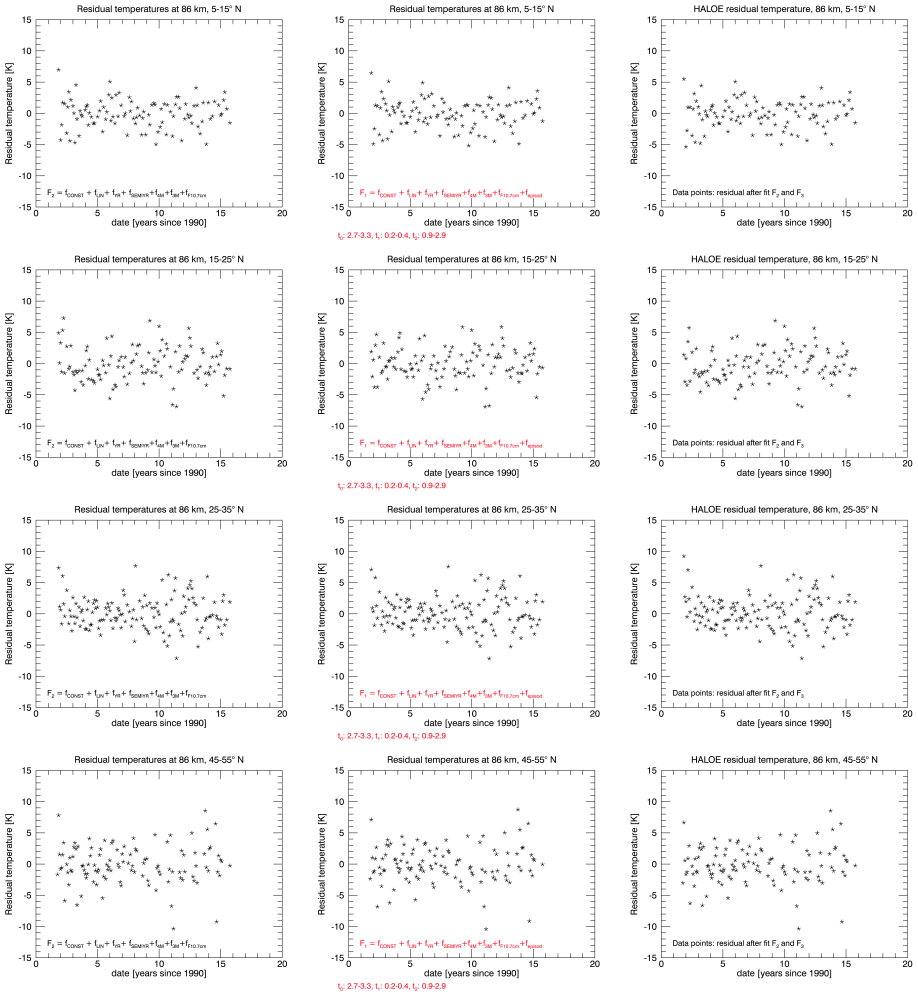

Figure S1. Here are some more examples where high temperatures at the beginning of the HALOE time series are apparent. The left column shows the residual temperatures if only a constant, a linear term, several seasonal terms and a solar term are fitted to the temperatures. The middle column presents the temperature residuals if an additional episodic perturbation term was included. This term is adopted from a previously reported lidar study (She et al., 1998) and the parameters t_0 to t_2 are allowed to vary in a specific range ($2.7 \leq t_0 \leq 3.3$, $0.2 \leq t_1 \leq 0.4$ and $0.9 \leq t_2 \leq 2.9$). The column on the right side shows the residual after an exponential decay function is applied. In a lot of cases, the residual temperature of the data points at the beginning of the time series strongly decrease after the episodic perturbation term is included in the fit. The nature of this episodic perturbation term, however, focuses on the time segment around 1993. Its amplitude often suggests a post-volcanic cooling of the upper mesosphere. Moreover, the high data point at the beginning of the time series are mostly captured by the exponential fit (one exception is for e.g. the time series at 86 km and 30° N). Although they are still visible in the residuals, their residual temperature clearly decreased compared to the residual in the first column that did not include a volcanic term.

References

She, C. Y., Thiel, S. W., and Krueger, D. A.: Observed episodic warming at 86 and 100 km between 1990 and 1997: Effects of Mount Pinatubo Eruption, Geophysical Research Letters, 25, 497–500, https://doi.org/10.1029/98GL00178, 1998.