Temporal change in averaging kernels as a source of uncertainty in trend estimates of carbon monoxide retrieved from MOPITT

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Satellite remote sensing provides the unique opportunity to monitor global distribution and vertical profile of atmospheric trace gas concentrations. In particular, long-term retrievals from Measurements Of Pollution In The Troposphere (MOPITT) instrument on board the EOS-Terra satellite since 1999 has been used to estimate trends of tropospheric carbon monoxide (CO). Averaging Kernels (AKs) represent the sensitivity of the retrieved state to the true state and thereby is of utmost importance in the MOPITT retrieval diagnostics. This study shows how significant the time varying AKs are as a source of uncertainty in the trend estimates of remote sensed surface CO. If the true mixing ratio is continuously 50% higher or lower than a priori state, the temporal change of surface AKs from 2001 to 2010 causes an artificial trend in retrieved surface CO, ranging from -10.71 to +13.21 ppbv per year (-5.68 to +8.84 % per year) depending on location. Unfortunately, since the true state is unknown, it is impossible to completely remove the AKs uncertainty from the retrieved trend.