Title: The impact of chemical lateral boundary conditions on regional forecasting of surface ozone during stratospheric intrusions

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Abstract: Surface ozone concentrations can be influenced by stratospheric ozone during stratospheric intrusion events that can either transport stratospheric air directly to the Earth's surface or that can produce streamers of stratospheric air at mid-tropospheric levels. During these events, surface ozone concentrations have been known to increase by as much as 30-40 ppbv due to stratospheric influences. The Environment and Climate Change Canada regional air quality forecast model (GEM-MACH) is used to assess the impact of ozone lateral boundary conditions on surface ozone concentrations during such events. Four different data sets are used to specify ozone concentrations on the model lateral boundaries: a seasonal average of ozone (from MOZART-4); two time-dependent ozone data sets (from the MACC Reanalysis and a global version of GEM-MACH); and a time-dependent data set for which a tropospheric and stratospheric climatology of ozonesonde data are merged according to the dynamical tropopause location diagnosed from the meteorology on the lateral boundary. It is shown that when the vertical distribution of ozone on the lateral boundary adequately reflects the actual tropopause location rather than fixed seasonal values, the agreement with surface observations is improved, particularly over the western U.S. where stratospheric intrusions are known to have the largest impact.