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On the predictability of Arctic springtime ozone losses and drivers of stratospheric temperature and ozone trends

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The record ozone loss over the Arctic in the spring of 2011 [e.g., Manney et al., 2011] highlights the importance of a detailed understanding of the connection between cold polar temperatures, polar stratospheric clouds (PSCs) and column ozone. Concerns have been raised during the Arctic winter of 2015/16 that cold temperatures in early and mid-winter could prime conditions leading to a potential record ozone loss in spring when sunlight returns. Fortunately such record ozone loss did not occur as stratospheric temperatures warmed substantially later in the season. Nevertheless important questions remain: (i) how predictable are springtime ozone losses based on temperatures earlier in the season? (ii) What drives Arctic polar stratospheric temperature and ozone trends? Here we address these questions using reanalysis data and chemistry-climate model simulations for the recent past and the 21st century.