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The regional differences of the ozone response to the dynamical forcing over NH high latitudes based on the SBUV merged data for the period 1979-2015

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The Solar Backscattered Ultra Violet (SBUV ver. 8.6) merged ozone data set (total and profile ozone, http://acd-ext.gsfc.nasa.gov/Data_services/merged/) are examined for the period 1979-2015. The column amount of ozone, the ozone content in the troposphere and the lower stratosphere (1000-25.5 hPa), in the middle stratosphere (10.1-2.55 hPa), and in the high stratosphere (1.61 hPa - top of the atmosphere) are calculated for the following NH high latitude regions (φ>64°): East Siberia-Alaska (ES/AL, 165°E-140°W), East Canada-West Greenland (EC/WG, 90°W-49°W), East Greenland –West Europe (EG/WE, 25°W-25°E), Central Russia (CR, 50°E-90°E). The differences between the monthly mean total and profile ozone for all possible combinations of the region pairs are regressed on standard proxies used in the ozone trend modeling (piecewise linear trend, 11-yr solar activity, EP flux, optical depth of the stratospheric aerosols, Southern Oscillation index (SOI), Quasi-Biennial Oscillation (QBO) index, Arctic Oscillations index), and on other proxies rarely used in statistical modeling of ozone including indices of following oscillations: East-Pacific/North Pacific(EP-NP), East Atlantic (EA), Scandinavia (SC), East Atlantic/West Russia (EA-WR). The later proxies are calculated on the monthly basis by NOAA Climate Prediction Center. Using the differences between the monthly regional ozone values enlarges variability of the regressed variables but suppresses the data jumps due to changes in the SBUV instrument type onboard of various satellite platforms operated in the analyzed period (Nimbus 4 and 7, NOAA 9, 11, 14, and 16-19). The regional ozone differences are analyzed separately for spring, summer, and for autumn. The multiple regression of the ozone differences reveals substantial regional and seasonal difference in the ozone response to the dynamical proxies. There are regional differences in the rate of the ozone decline in the period of increasing the stratosphere loading by the ozone depleting substances afterwards the recovery rate is similar in all regions i.e. within large +/- 2 sigma trend error. Surprisingly the ozone differences in the high stratosphere for selected regional pairs are correlated with the dynamical proxies, i.e. SOI proxy for the pairs; ES/AL-CR, EC/WG-EG/WE, and EC/WG-CR, SC proxy for the pair ES/AL-EC/WG; EA-WR proxy for the pairs: ES/AL-CR, EC/WG-CR, and EG/WE-CR, and EP-NP proxy for the pair ES/AL-EG/WE. Such the correlations are hardly seen in the regional ozone data but they appear, mostly in spring, in the ozone differences between the regions. Atmosphere disturbances forced by the selected teleconnection patterns may influence propagation of the planetary and gravity waves both driving the Brewer-Dobson circulation. It seems that in the high stratosphere statistically significant signal due to the dynamical proxies could be related to a modification the Brewer-Dobson circulation influencing the concentration of the ozone depleting substance and air temperature, thus controlling the ozone chemical destruction in the high stratosphere over the Arctic.