1.163 Lower tropospheric ozone variability and trend over the North China Plain derived from space for 2008-2016.

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Abstract:

China is a highly polluted region. Emission reductions have been applied starting with SO_2 emissions in 2006 and with NOx emissions in 2010. Recent studies show a decrease of NO_2 concentrations or tropospheric columns since 2013 and attribute it to the NOx emissions reduction. The question of the impact of such reduction on ozone is then arising. In this study, we use the capabilities of the IASI satellite instrument to retrieve 2

semi-independent columns of ozone in the lower and the upper troposphere – the lower tropospheric (LT) column having a sensitivity maximum at 3-4 km – to evaluate the variability and trend of LT ozone over the North China Plain (NCP) for 2008-2016. Deseasonalized monthly timeseries show two distinct periods: a first period (2008-2012) with no significant trend (< -0.1 %/yr) and a second period (2013-2016) with a highly significant negative trend of -1.2 %/yr. However, any negative trend has been reported from background surface measurements in this Chinese region. As well, recent work made within the framework of the TOAR (Tropospheric Ozone Assessment Report) initiative reveals discrepancies in the trends of tropospheric ozone derived from satellite instruments. A detailed analysis of the IASI retrieval stability and robustness, done by comparing with surface and ozonesonde measurements and other satellite instruments, does not show any specific issue. We use statistical regression models and simulations from global and regional chemistry transport models to explore the dynamical and chemical factors that could explain this negative trend. Primary results suggest that the negative trend observed from IASI could arise from a reduction of the stratosphere-to-troposphere transport combined with reduction of regional precursor emissions.