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O₃ variability in the troposphere from IASI observations in 2008-2015

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In this study, we present geographical patterns of ozone (O₃) variability in the troposphere derived from 8 years of IASI observations (2008-2015). The instrument provides a unique dataset of global vertically-resolved O₃ profiles with a twice daily global coverage and a fairly good vertical resolution in the troposphere allowing us to monitor the year-to-year variability in that layer. The retrievals are performed using the FORLI software, a fast radiative transfer model based on the optimal estimation method, set up for near real time and large scale processing of IASI data.

Multivariate regressions which include important geophysical drivers of O₃ variation (e.g. solar flux - SF, quasi biennial oscillations - QBO, El Niño/Southern Oscillation - ENSO, North Atlantic Oscillation-NAO) and a linear trend term have been performed on time series of spatially averaged O₃ on spatial grids. The performances of the regression models (annual vs seasonal) and the effect of the spatial resolution are first investigated. The resulting covariates and trend spatial structures are then analyzed. Direct effects of NAO and of positive (or negatives) ENSO indexes measured during moderate to intense El Niño (or La Niña) episodes in 2009 and 2015 (or 2010) observed in the ozone columns in the tropics will be discussed. We will also focus on O₃ trends over and downwind anthropogenic polluted areas characterized either by increased (e.g. over Asia) or decreased (e.g. over Europe and the US) O₃ precursor emissions.