

Stratosphere-troposphere exchange and summertime ozone exceedances in Euro-Atlantic region

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Stratosphere-to-troposphere transport (STT) events have been widely studied over the last decades using both observational studies and numerical models. These STT events, sometimes associated with mid-latitude tropopause fold occurrence, are characterized by tongues of anomalously high potential vorticity (PV), high ozone, and low water vapor mixing ratio. These tongues may be stretched out into elongated filaments or roll up to form isolated coherent structures of high PV air (cut-off lows). These systems play a significant role in most exchange processes between stratosphere and troposphere, particularly in the ozone-exchange. On the other hand ozone concentrations observed in a background station located in a rural region in the North of Portugal reveal several episodes of extremely high concentration values, raising the question of whether such extreme episodes result mainly from stratospheric summertime intrusions or from local scale air-pollution transport and photochemical processes. In this study an extensive analysis is performed on the atmospheric circulation over the Euro-Atlantic region in order to identify the physical mechanisms that may account for recorded ozone exceedances during the period 2004-2009. The study relies on thermohydrodynamical fields from the ERA Interim reanalysis dataset provided by the European Centre for Medium-Range Weather Forecasts (ECMWF) and obtained results provide evidence of the contribution from summertime cross-tropopause exchanges to tropospheric ozone budget.