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Analysis of the Tropospheric Ozone Content Variations at Mid-Northern MOZAIC Sites (1994-2002)

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If the exponential evolution of tropospheric ozone since the beginning of the century is unanimously accepted, reasons for the 1980's levelling off and for recent changes are still on discussion because of the complexity of involved processes (photochemical production and destruction, pollutant emission, transport ...), and of the huge space and time distribution variability of tropospheric ozone. This work contributes to document the distribution, the seasonal and inter-annual variability of tropospheric ozone using data from the MOZAIC program (Measurements of Ozone, Water Vapour, Carbon Monoxide, and Nitrogen Oxides by In-service Airbus Aircraft, http://www.aero.obs-mip.fr/mozaic/). Vertical profiles are analysed over the period 1994-2002 at 4 MOZAIC sites: 6338 profiles in Frankfurt, 3308 in Paris, 2631 in New-York, and 1901 over Japan. Tropospheric Ozone Content (TOC), the integrated ozone profile through the depth of the troposphere, is computed for every MOZAIC profile. Stratospheric Intrusion Content (SIC), the integrated ozone profile through tropospheric layers that fulfil stratospheric-origin ozone criteria, is computed using Lagrangian information for air parcel backward trajectories available in the MOZAIC database. Seasonal and inter-annual variability of TOC and SIC at each site are presented. Links between the inter-annual variability of TOC and northern hemispheric large scale patterns of circulations (North Atlantic Oscillation, Northern Annular Mode) are discussed. The potential of MOZAIC data to further document stratosphere-troposphere exchanges processes with the SIC dataset is evaluated.