Atmospheric nitrous oxide observations at Mount Waliguan station in China, from 1995 to 2014

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N_2O data obtained from discrete flask air sampling during 1995-2014 at Waliguan (WLG) station (36°17N, 100°54E, 3816 m asl) is presented for the first time, with a description of data quality. WLG station is the only global background station of WMO/GAW in central Eurasia. Characteristics of the mole fractions, growth rates, seasonal cycles, as well as influence of long-distance transport were investigated from selected background data. Observed time series suggests that atmospheric background N_2O possess long-term trends of increase and a statistically significant seasonal cycle. N_2O annual means vary from 313.5±0.1 ppb to 327.2±0.2 ppb, With an mean annual growth rate of 0.8±0.1ppb yr^{-1}, which is close to the global mean annual growth rate.

Averaged seasonal cycle shows minimum value of -0.24 ppb in July and two peaks with maximum value of 0.1 ppb in March and smaller value of 0.09 ppb in September. The amplitude of the seasonal cycle is 0.34 ppb, which is in consist with results of previous researches about other monitoring stations located in the Northern Hemisphere. The negative values in summer are mainly the result of maximum stratospheric-troposphere exchange (STE). The positive values in winter and early spring are possibly due to thawing of the frozen soil under the cold plateau climate which induce the increase in N_2O emission.

Evaluation of the influence of transport on N_2O variability has been carried out using backward air-mass trajectory analysis and highlights the effect of the regional distribution of sources. The widely use of fertilizer in agricultural practices in northeastern China strongly contribute to the continuous increase in N_2O mole fractions at WLG station. The results from this study can provide atmospheric N_2O characteristics in Asian inland regions, and be used in other studies to improve the understanding of N_2O source and sink distributions.