CO_2 Measurements at Pallas-Sodankylä GAW-Station, Finland

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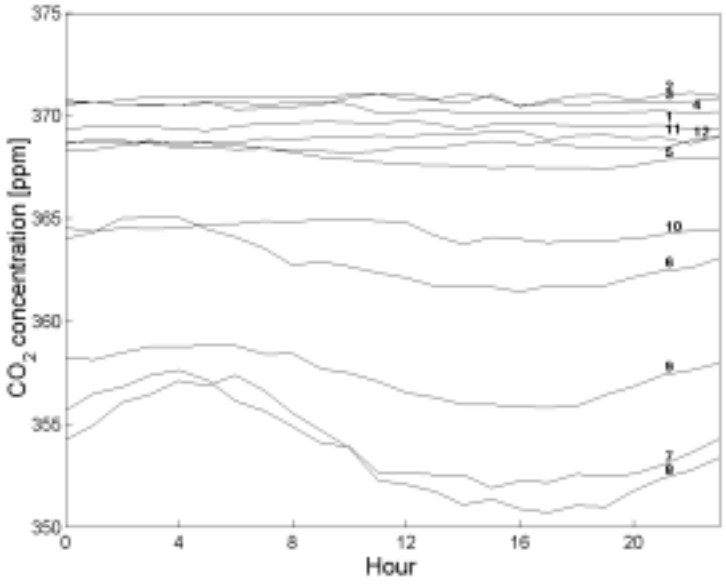
Measurements are made at Pallas-Ounastunturi National Park, locally and regionally characterized with a very limited number of pollution sources. Population density in the scale of hundreds of kilometers is less than two persons/km^2 and the nearest center of population, Muonio, with 2500 inhabitants, is located at 19 km distance from the measuring site. The Pallas region is located near the northern limit of the boreal zone. Mean temperature for the year is –1.6°C. During winter, the temperature can drop below –30°C and during summer rise above +20°C. The ground is covered with snow from October to May. The sun is continuously below the horizon from December 9 to January 3 and above the horizon from May 26 to July 18 (the site lies above the Arctic Circle). Wind direction in Pallas is dominantly southwestern during autumn and winter and eastern during spring and summer. CO_2 is measured at the top of Sammaltunturi (67°58'N, 24°07'E,), which is a fjeld (Arctic hill) about 300 m above surrounding terrain and 560 m above sea level (a.s.l.). The top of the fjeld is treeless and the sparse vegetation consists mainly of mosses and lichens. Treeline is at about 100 m below the station. The forest consists of mixed species, mainly Scots pine (*Pinus sylvestris*), Norway spruce (*Picea abies*), and downy birch (*Betula pubescens*). Wetland areas and lakes can also be found within a few kilometers distance. Sammaltunturi belongs to a chain of fjelds extending from south to north, the highest top reaching 800 m a.s.l. There are measuring stations situated on top of Laukukero (68°04'N, 24°02'E, 765 m a.s.l.), Matorova (68°00'N, 24°14'E, 340 m a.s.l.), and near lake Pallasjärvi (68°01'N, 24°10'E, 303 m a.s.l.) all less than 10 km away from Sammaltunturi. In this study, CO_2 results are presented for a 4-year-long measurement period. The source areas for high CO_2 in winter and summer are discussed together with corresponding analyses for black carbon, aerosols, ozone, and sulphur dioxide. Results are compared to time series from other stations in the Arctic and in European midlatitudes.



Averaged diurnal variation of CO_2 according to hourly medians (UTC + 2 h) measured during 1996-2000 in Sammaltunturi. Scale in y-axis represents the approximate mean of the measuring period. The yearly growth trend was removed by linear fitting to floating monthly means.