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The weekly cycle of ambient concentrations and traffic emissions of coarse (PM10 – PM2.5) atmospheric particles.

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Aim of this study is to investigate the existence of a weekly cycle for particles whose aerodynamic diameter is between 2.5 and 10 μm (PMcoarse), compare the strength of the weekly cycle among various site types and compare the PMcoarse cycle to the PM2.5 cycle. In addition, using information on the weekly cycle of PMcoarse concentrations and traffic emissions, an estimate of the traffic contribution to total PMcoarse in urban areas is provided. The PMcoarse data are the result of parallel PM10 and PM2.5 measurements at 7 sites of the Swiss National Air Pollution Monitoring Network (NABEL). All stations are located in Switzerland and represent five different station types: urban street, urban background, suburban, rural lowland and rural mountain. The data at most of the stations cover a period between 1998 and 2009. The possible existence of a weekly cycle was investigated by examining the smoothed periodograms and the autocorrelation functions for each station. Moreover, the average PMcoarse concentrations were calculated for each day of the week. Thus, a measure of the strength of the weekly cycle could be obtained by calculating the difference between the minimum and maximum average value. It was found that all sites except one of the two rural mountain sites, exhibit weekly cycles. The maximum average weekday concentration was greater than the average Sunday concentration by 57 %, 58 %, 37 %, 27 % and 23 % for each site type respectively. Moreover, it was found that for the urban street, urban background and suburban sites, the PMcoarse weekly cycle in percent was stronger than the PM2.5 cycle by a factor of 1.6 to 4.2 depending on the site type. An analysis of the weekly cycle for each season separately showed that summer has the weakest weekly cycle than all other seasons for all sites except the rural mountain ones. Traffic emissions of PMcoarse were estimated using emission factors for road dust resuspension and break wear for light and heavy duty vehicles. These factors were then multiplied by mileage estimates to find the total emissions. Finally, weekly traffic profiles based on traffic counts were used to obtain emissions for each day of the week. It was found that for urban areas, PMcoarse emissions on weekdays are greater than Sunday emissions by 84%. Ambient concentrations for the urban background and suburban sites are greater by 51% on weekdays than on Sundays. Using this information, it was estimated that traffic-related contribution to the total ambient PMcoarse amounts to 74 % on weekdays and 61 % on Sundays in urban areas. These values are relatively high and they imply that background PMcoarse are much less important compared to traffic-related PMcoarse. This is a plausible finding because dust resuspension, which is the most important component of PMcoarse in landlocked areas, is expected to be rather low due to low wind speed conditions (2 m/s on average) at the considered sites.