



Region of influence of 13 remote European measurement sites based on modeled CO mixing ratios

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The regions of influence (ROIs) of 13 rural background and high altitude European measurement sites are quantified based on modeled carbon monoxide (CO) mixing ratios. The mixing ratios have a three hourly time resolution and are obtained by combining regional scale, time-reversed Lagrangian particle dispersion modeling with gridded CO inventory data. The ROIs of individual sites, defined as the area whose surface emissions account for 80% of modeled mixing ratios, typically cover an area of a few 100'000 square km, independent of the altitude of the site. Their geographical shape is influenced by the spatial distribution of surface emissions, by mountain ranges, and by the prevailing westerly winds in Europe. Depending on the site, between 20% and 80% of the variability of the modeled mixing ratios cannot be explained by changing atmospheric transport patterns and must be ascribed to the spatial inhomogeneity of emission sources instead. The use of time dependent CO emissions has an additional 25% effect on modeled mixing ratios. Neither the average modeled mixing ratios nor their variability are indicative of any of these site specific properties. As a rule of thumb, the results suggest that sites intended for regional scale emission monitoring should not be separated by more than 600 km to achieve good geographical coverage.