Errors in ozone risk assessment using standard conditions for the conversion of ozone concentrations from passive samplers in mountain regions

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Passive samplers are often employed to assess ozone risk for vegetation in remote areas such as mountain forests. After their chemical analysis, the ozone concentration values are usually used to estimate AOT40 exceedances, after disaggregation of the weekly concentration means with an imposed ozone daily course (e.g. Gerosa et al 2007).
Typically ozone concentrations from chemical lab sheets are returned in mass unit per cubic meter (e.g. $\mu g/m^3$) and these values are then converted to ppb since this unit let to appreciate the relative abundance of the pollutant molecules with respect to the other molecules in ambient air. Moreover the AOT40 index to assess the vegetation exposure to ozone is based on this unit.
In most cases the mass units are quickly converted to ppb by applying a *standard* coefficient of 1.96, referred to SATP conditions (Standard Ambient Temperature and Pressure = 25°C and 100 kPa). But this coefficient can greatly vary with the elevation and the average temperatures of the measuring periods at each site. Moreover the temperature at a certain elevation site depends on the temperature gradient which is not ever known.
Forgetting theses facts will lead to significant error in ozone concentrations and effects estimations, particularly in mountain regions. Examples from two mapping exercises are presented, with regards to the ozone concentrations and the AOT40 estimation errors in the Italian Alps. Lacking information on the elevation T gradient, adiabatic lapse rates for temperature and pressure were applied to derive P and T at each given elevated station, starting from the T and P values recorded at some station located in the valley bottom. The error magnitude of concentration estimations ranged from 0 to 12% within the forest vertical distribution gradient, but much greater errors were recorded for AOT40 estimation during daylight hours.