

Definitions, statistics used

SOA - secondary organic aerosol, defined as the aerosol mass arising from the oxidation products of gas-phase organic species.

SIA - secondary inorganic aerosols, defined as the sum of sulphate (SO_4^{2-}), nitrate (NO_3^-) and ammonium (NH_4^+). In the EMEP MSC-W model SIA is calculated as the sum:
$$\text{SIA} = \text{SO}_4^{2-} + \text{NO}_3^- (\text{fine}) + \text{NO}_3^- (\text{coarse}) + \text{NH}_4^+$$

SS - sea salt.

MinDust - mineral dust.

PPM - primary particulate matter, originating directly from anthropogenic emissions. One usually distinguishes between fine primary particulate matter, $\text{PPM}_{2.5}$, with aerosol diameters below $2.5 \mu\text{m}$ and coarse primary particulate matter, $\text{PPM}_{\text{coarse}}$ with aerosol diameters between $2.5 \mu\text{m}$ and $10 \mu\text{m}$.

$\text{PM}_{2.5}$ - particulate matter with aerodynamic diameter up to $2.5 \mu\text{m}$. In the EMEP MSC-W model $\text{PM}_{2.5}$ is calculated as $\text{PM}_{2.5} = \text{SO}_4^{2-} + \text{NO}_3^- (\text{fine}) + \text{NH}_4^+ + \text{SS}(\text{fine}) + \text{MinDust}(\text{fine}) + \text{SOA}(\text{fine}) + \text{PPM}_{2.5} + 0.27 \text{NO}_3^- (\text{coarse}) + \text{PM}_{25\text{water}}$. ($\text{PM}_{25\text{water}} = \text{PM}$ associated water).

$\text{PM}_{\text{coarse}}$ - coarse particulate matter with aerodynamic diameter between $2.5 \mu\text{m}$ and $10 \mu\text{m}$. In the EMEP MSC-W model $\text{PM}_{\text{coarse}}$ is calculated as $\text{PM}_{\text{coarse}} = 0.73 \text{NO}_3^- (\text{coarse}) + \text{SS}(\text{coarse}) + \text{MinDust}(\text{coarse}) + \text{PPM}_{\text{coarse}}$.

PM_{10} - particulate matter with aerodynamic diameter up to $10 \mu\text{m}$. In the EMEP MSC-W model PM_{10} is calculated as $\text{PM}_{10} = \text{PM}_{2.5} + \text{PM}_{\text{coarse}}$.

SOx - group of oxidized sulphur components (SO_2 , SO_4^{2-}).

NOx - group of oxidized nitrogen components (NO , NO_2 , NO_3^- , N_2O_5 , HNO_3 , etc.).

redN - group of reduced nitrogen components (NH_3 and NH_4^+).

SOMO35 is the Sum of Ozone Means Over 35 ppb is an indicator for health impact assessment recommended by WHO. It is defined as the yearly sum of the daily maximum of 8-hour running average over 35 ppb. For each day the maximum of the running 8-hours average for O_3 is selected and the values over 35 ppb are summed over the whole year. If we let A_8^d denote the maximum 8-hourly average ozone on day d , during a year with N_y days ($N_y = 365$ or 366), then SOMO35 can be defined as:

$$\text{SOMO35} = \sum_{d=1}^{d=N_y} \max(A_8^d - 35 \text{ ppb}, 0.0)$$

where the max function ensures that only A_8^d values exceeding 35 ppb are included. The corresponding unit is ppb·days (abbreviated also as ppb·d).

AOT40 is the accumulated amount of ozone over the threshold value of 40 ppb, i.e.:

$$\text{AOT40} = \int \max(O_3 - 40 \text{ ppb}, 0.0) dt$$

where the max function ensures that only ozone values exceeding 40 ppb are included. The integral is taken over time, namely the relevant growing season for the

vegetation concerned, and for daytime only. The corresponding unit is ppb-hours (abbreviated to ppb-h).

Although the EMEP model generates a number of AOT-related outputs, in accordance with the recommendations of the UNECE Mapping Manual we will concentrate in this report on two definitions:

AOT40_f^{uc} - AOT40 calculated for forests using estimates of O₃ at forest-top (*uc*: upper-canopy). This AOT40 is that defined for forests by the UNECE Mapping Manual, but using a default growing season of April-September.

AOT40_c^{uc} - AOT40 calculated for agricultural crops using estimates of O₃ at the top of the crop. This AOT40 is close to that defined for agricultural crops by the UNECE Mapping Manual, but using a default growing season of May-July, and a default crop-height of 1 m.

POD_Y - Phyto-toxic ozone dose, is the accumulated stomatal ozone flux over a threshold Y, i.e.:

$$\text{POD}_Y = \int \max(F_{st} - Y, 0) dt$$

where stomatal flux F_{st} , and threshold, Y , are in $\text{nmol m}^{-2} \text{s}^{-1}$, and the \max function evaluates $\max(A - B, 0)$ to $A - B$ for $A > B$, or zero if $A \leq B$. This integral is evaluated over time, from the start of the growing season (SGS), to the end (EGS).

For the generic crop and forest species, the suffix “gen” can be applied, in this report e.g. POD_{Y,gen} (or $AF_{st1.6,gen}$) is used for forests and POD_{3.0,gen-CR} (or $AF_{st3,gen}$) is used for crops.