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air quality monitoring

Measuring Strategy: Transect

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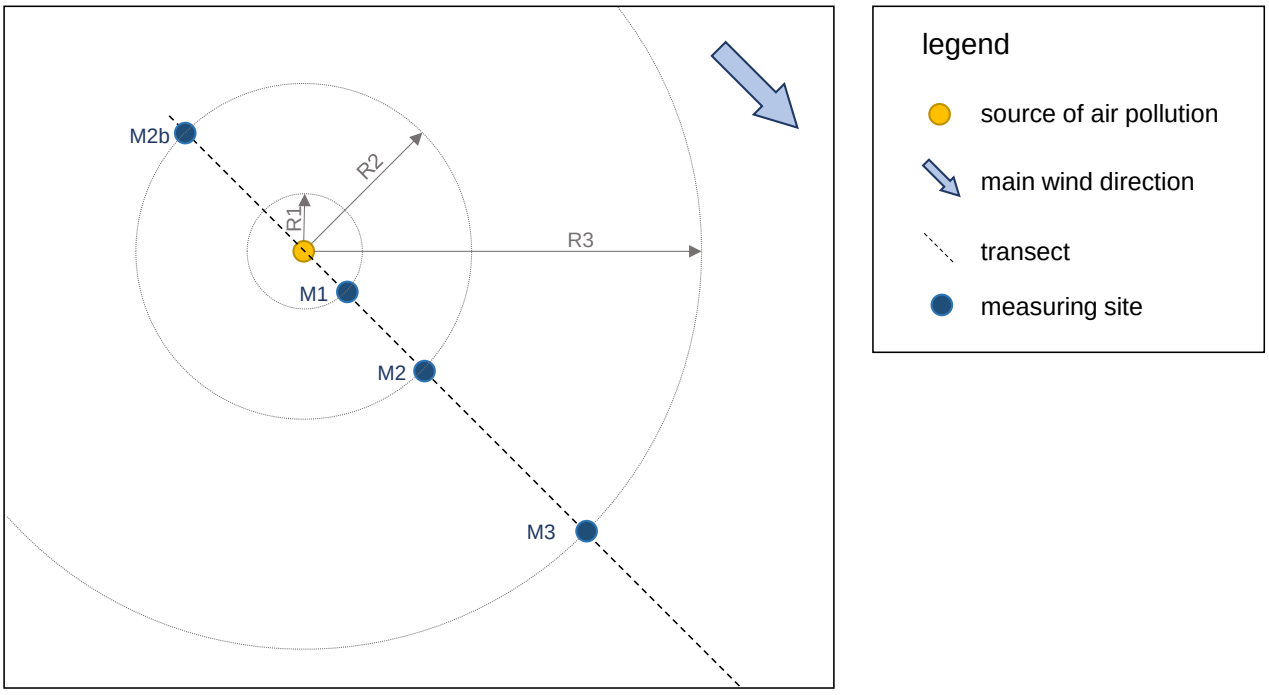
Determination of air pollution sources using a transect

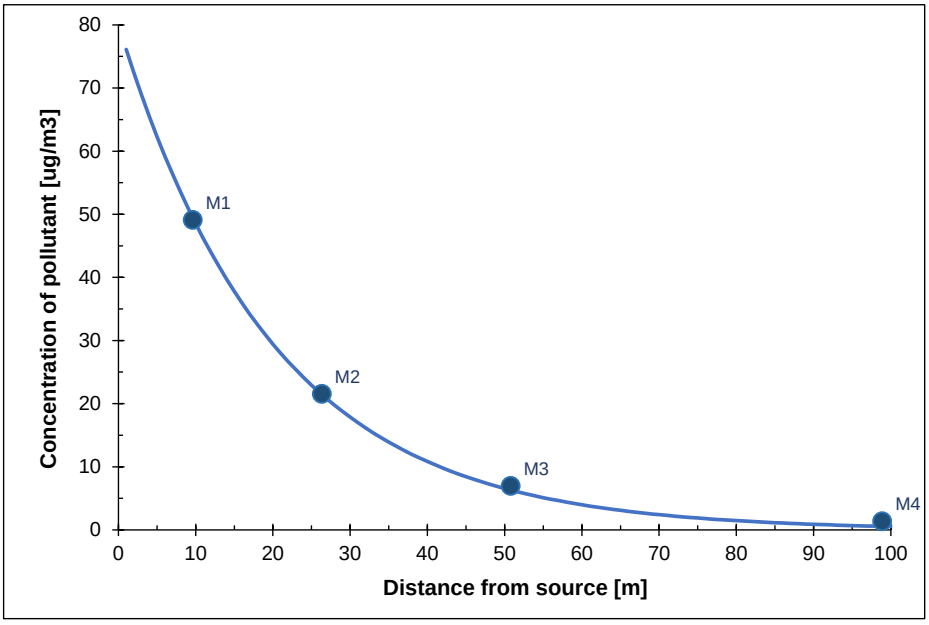
What is a transect?

There are several ways to identify a specific source of air pollution. When using passive sampling, the methodology of a transect is particularly suitable. With this method, several measuring points are recorded on a straight line, which, starting from the presumed pollution source, lies along the main wind direction. Due to the dispersion, the pollutant concentration decreases exponentially with the distance from the source and is mainly transported along the main wind direction. This is illustrated in the scheme below:



What results are to be expected?

Following this approach of experimental design, one would expect to observe an exponential decrease in the measured pollutant concentration indicating the presence of a pollution source. This is schematically shown in the Figure below:



What needs to be considered when planning measurements using a transect?

- The location of the pollution source should be approximately known.
- The main wind direction needs to be know and monitored during the sampling time.
- The area should be as free of barriers as possible so that the wind flow is not strongly influenced.
- Because of the exponential decay of the pollutant concentration, it is important to install the measuring sites not at an equal distance to each other, but rather increase the number of measurement sites close to the pollution source. If the distance between the source and a measuring site, M_i, is the Radius R_i, the following rule of thumb can be applied: $R_{i+1} = 2 \cdot R_i$ meaning that the distance between the source and a measuring site doubles compared to the previous measuring site.
- At least one reference measurement site shall be installed. This could be one or more sites along the transect but in the opposite of the main wind direction. If such a reference is installed at the same distance (see *M2b* in the scheme above) from the source as a measuring site in the main wind direction, it serves as a reference and is expected to report a lower pollutant concentration as its counterpart (see *M2* in the scheme above). Alternatively, a number of measuring sites can be installed along a second transect, which is perpendicular to the original transect and crossing the source.