

Specifications

All the visualizations and information in this document are based on footprints generated by [STILT](#), a lagrangian atmospheric transport model, implemented as [online tool](#) at the ICOS Carbon Portal. Output footprints are presented on a grid with $1/12 \times 1/8$ degrees cells (approximately 10km x 10km) where the cell values represent the cell area's estimated surface influence ("sensitivity") in ppm / ($\mu\text{mol} / (\text{m}^2\text{s})$) on the atmospheric tracer concentration at the station. The footprints for a given station vary in time according to meteorological conditions, in this model represented by hourly operational ECMWF-IFS analysis/forecasts. Modelled concentration can be calculated by combining individual footprints with an anthropogenic emission inventory ([EDGAR](#)) and a biogenic model ([VPRM](#)), which models the exchange of the tracer between the atmosphere and the natural surface vegetation.

For all maps and the land cover polar graph, an average footprint for the specified date range has been used. In the **sensitivity area map** the 192 000 cells have been aggregated depending on their distance to, and direction of, the station. The same aggregation principles were used for the **population sensitivity map** and **point source contribution map**, where the average footprint cells were multiplied by underlying ancillary data layers. The unit of the maps is either percent or the absolute value of the aggregated cells. 100% in terms of the sensitivity map is the value of all aggregated cells summarized. 100% in terms of the population map is the value of all aggregated (total population count * sensitivity) cells summarized. The population data are from [GEOSTAT](#) (2018) and point source emissions data from [E-PRTR](#) (2017). The resulting values in the population map are mainly interesting for intercomparisons between areas, whereas the point source emissions were converted to estimated contribution to the CO₂ mole fraction at the station. The descriptions of the maps include what quartiles the station falls into in terms of absolute ranking among selected ICOS atmospheric stations. The first quartile includes the stations with the lowest total average values.

The **land cover polar graph** is like the maps in that the centre represents the location of the station and the direction bins have been used to aggregate data but do not represent the distance of the land cover type to the station. The area of a land cover type in the figure represents its presence in each direction of the station. The overall dominant land cover type is closest to the centre, with the less significant land cover types displayed in descending order. The **land cover bar graph** is a simpler way to visualize land cover type by direction. Eight 45 degrees bins around the station are represented by stacked bars. The land cover data is from [HILDA](#) (2018). The original land cover types are used except for the aggregation of classes to represent 'broad leaf forest' (HILDA codes 42 + 44), 'coniferous forest' (HILDA codes 41 + 43), 'mixed forest' (HILDA codes 40 + 45) and 'other' (HILDA codes 66 + 77).

The **seasonal variations table** shows the average anthropogenic and biogenic contributions during the different seasons of the year. The biogenic contributions include respiration (CO₂ input to the atmosphere) and Gross Ecosystem Exchange (GEE, CO₂ uptake by the biosphere). Individual footprints with associated estimates of CO₂ concentration components from respiration and GEE, as well as from anthropogenic emissions are displayed on the [STILT result visualization page](#). The values for sensitivity, point source contribution and population are produced by summarizing the cells of maps where these layers have been multiplied by average footprints for the different parts of the year. The seasonal values are shown relative to the yearly averages. A positive relative difference of the seasonal GEE means more uptake of CO₂, which is usually true for the growing seasons.

The same type of values that are presented in the seasonal variations table, but for the average footprint of the selected date range, is used in the **multiple variables graph** to place the selected station relative to reference atmospheric stations in the ICOS network. The value on the y-axis is relative to the minimum and maximum values of these ICOS stations. 0% indicates the station with the lowest variable value, and 100% the highest.

Additional resources

More specifics about the processing of the ancillary data layers can be found in [Storm \(2020\)](#) (section 3.3).

An interactive Jupyter Notebook is available at [ICOS explore data](#) and can be used to output the figures and maps presented in this document, e.g. for a different time-period and/or specific hour(s) of the day. It is also possible to change the bin-sizes and intervals used in the maps and the land cover wind rose. Furthermore, it is possible to generate a characterisation for a hypothetical station. The only requirement is that footprints have been generated using the [STILT on demand calculator](#).