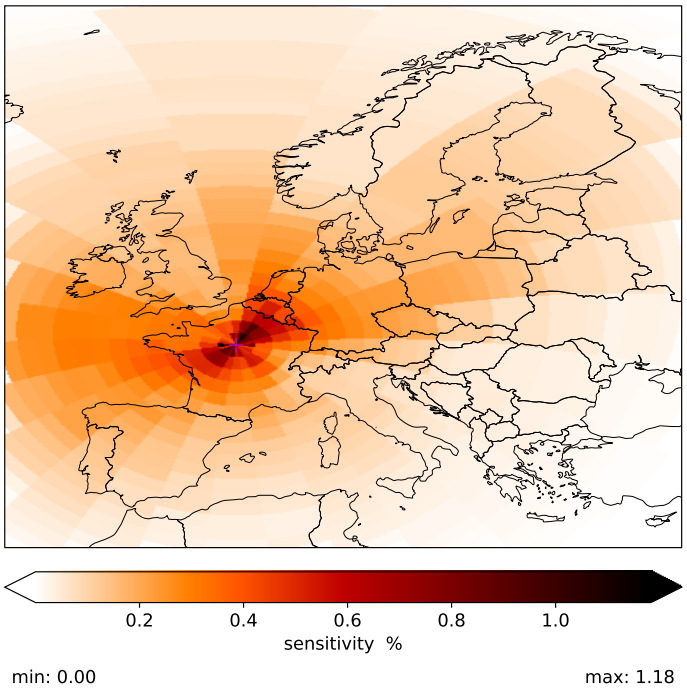
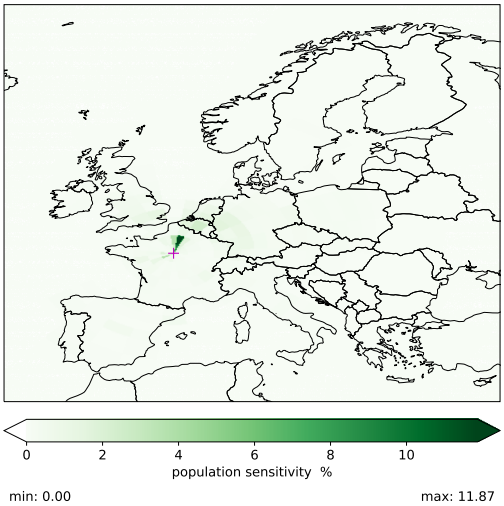
Trainou station characterization

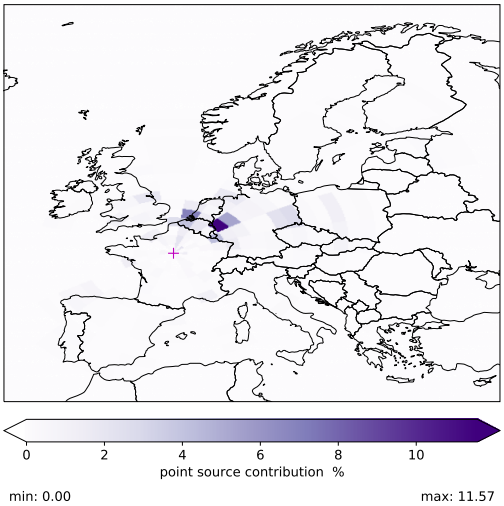
Station characterization based on STILT model footprints for 2018, an anthropogenic emissions database, a biogenic flux model and ancillary datalayers. More details are found at the end of this document. Trainou is a class 2 ICOS atmospheric station of the type tall tower located in France (latitude: 47.96°N, longitude: 2.11°E).



The **sensitivity area map** shows the average footprint/sensitivity area for 2018. The darker the colour the more important the area was as a potential source to the measured concentrations. The total sensitivity for the surface varies between stations and Trainou is in the third quartile of the ICOS certified atmospheric stations.



The **population sensitivity map** is the result of the average sensitivity map multiplied by the number of people living within each footprint cell. Relative to other ICOS certified atmospheric stations, Trainou is in the third quartile when it comes to sensitivity to population.



The **point source contribution map** is the result of the average sensitivity map multiplied by the CO_2 emissions from point sources, like power plants and industrial facilities, within each footprint cell translated into expected influence on the CO_2 concentration at the station. Relative to other ICOS certified atmospheric stations, Trainou is in the second quartile when it comes to point source contribution.

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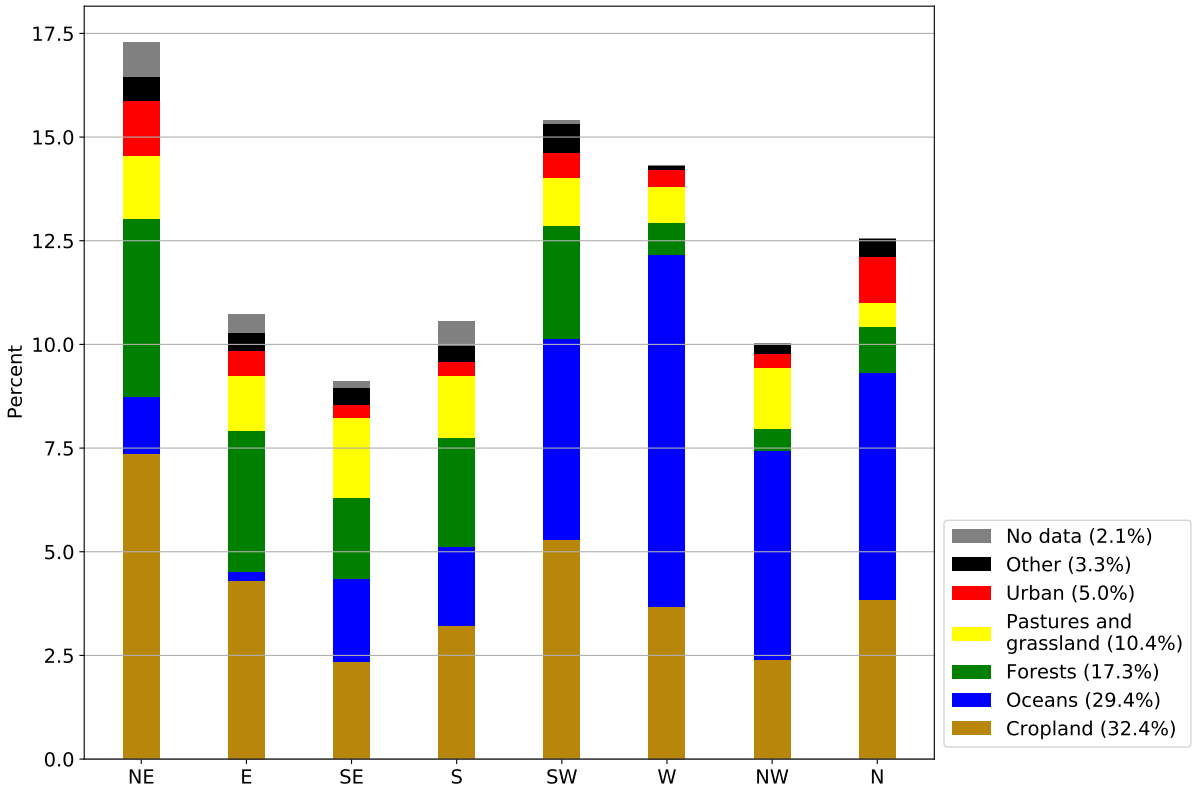
Variable	2018	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Unit
Sensitivity	4.30	-6.22	4.87	-13.49	14.75	ppm / (μmol / m^{2}s)
Population	42404	-10.06	-3.88	9.85	3.83	pop*(ppm / (μmol / m^{2}s))
Point source	0.80	-11.17	6.84	-5.77	9.93	ppm
GEE	5.34	-90.15	147.22	13.58	-71.00	ppm (uptake)
Respiration	4.02	-50.72	25.85	25.56	-1.51	ppm
Anthropogenic	2.74	6.67	-7.63	-13.38	14.39	ppm

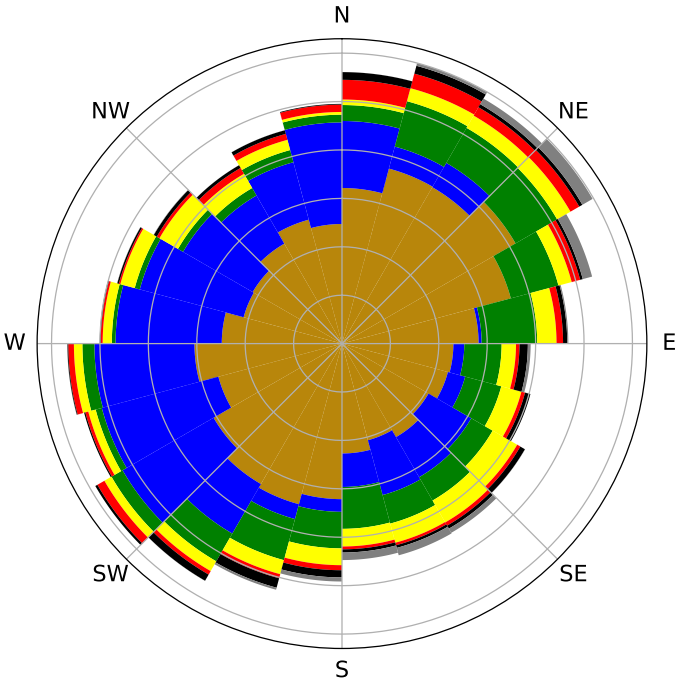
The first three variables in the **seasonal variations table** are the results of summarizing the maps. These values are found in the 2018 column. Average footprints for the different parts of the year have in turn been computed, multiplied by the ancillary datalayers, and calculate relative (%) to the average for the whole year. The remaining three variables – gross ecosystem exchange (GEE), respiration and anthropogenic contribution – are the modelled averages.



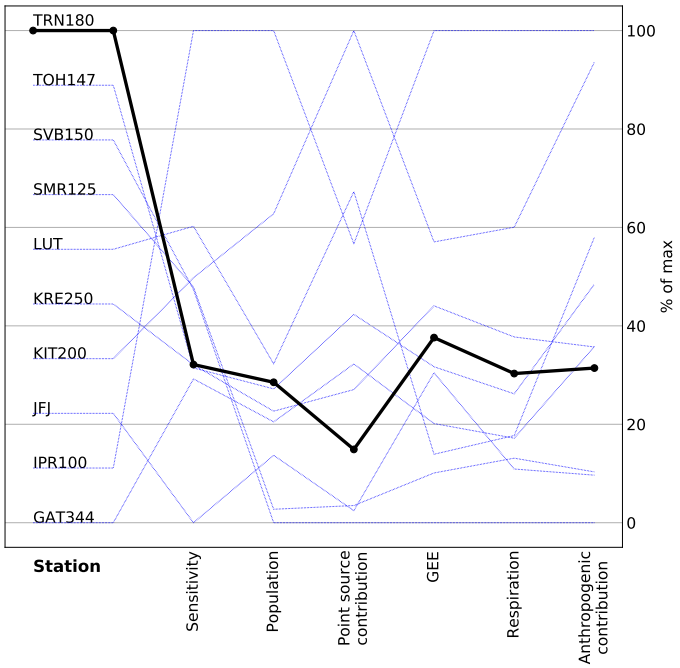
The land cover breakdown within Trainou's 2018 average footprint is shown in the **land cover bar graph**. The total for each land cover type is found in the legend and their relative occurence in the different directions of the stations (north-east, east, south-east etc.) are indicated by the graph.

Advanced figures

We advice careful reading of the explanations before attempting to understand the following figures. For further infromation and understanding, please read the specifications at the end of this documnet.



The **land cover polar graph** shows the distribution of land cover types around the station located in the center. It indicates the directions (15 degrees bins) in which the land cover types are found within the average footprint. The area of a type in the graph corresponds its relative contribution with the highest contributing type located closest to the center.



Representative ICOS certified atmospheric stations are compared in this **multiple variable graph**. Trainou's values are shown with the black line and the points' placements on the y-axis are determined relative to the minimum (0%) and maximum (100%) values given all ICOS certified atmospheric stations. The variables are the same as those in the seasonal variations table.

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Specifications

All the visualizations and information in this document are based on footprints generated by STILT, a lagrangian atmospheric transport model. Output footprints are presented on a grid with 1/12×1/8 degrees cells (approximately 10x10 km) where the cell values represent the cell area's estimated surface influence ("sensitivity") in ppm / (µmol/ m^2s) on the atmospheric tracer concentration at the station. The footprints for a given station vary in time according to meteorological conditions. Individual footprints in combination with an anthropogenic emission database (EDGAR) and a biogenic model (VPRM), which models the exchange of the tracer between the atmosphere and the natural surface vegetation, results in estimates of the anthropogenic emissions contribution, and the biogenic component, on the CO_2 mixing ratio at the station.

For the maps and the land cover polar graph, an average footprint of all three-hourly footprints (2920) for 2018 has been used. In the **sensitivity area map** the 192 000 cells have been aggregated depending on their distance to (100 km intervals), and direction of (15 degrees bins), 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 population data are from GEOSTAT (2011) and point source emissions data from E-PRTR (2017). The resulting values in the population map are mainly interesting for inter comparisons between areas, whereas the point source emissions were converted to estimated contribution to the CO_2 mixing ratio at the station. The descriptions of the maps include what quartiles the station falls into in terms of absolute ranking among the labeled atmospheric stations. The first quartile includs the stations with the lowest total average values.

The **land cover polar graphs** is similar to the maps in that the center represents the location of the station and 15 degrees directions bins have been used to aggregate data. Each land cover type of the CORINE (2018) dataset is weighted by the average 2018 footprint. The legend shows the breakdown of the influence area to the major land cover types, and the area of a land cover type in the figure represents its presence in each direction of the station. The dominant land cover type is closest to the center, with the less significant land cover types displayed in ascending order. The **land cover bar graph** is a simpler way to visualize land cover type by direction. Eight 45 degrees bins around the station is represented by stacked bars.

The **seasonal variations table** summarizes the anthropogenic and biogenic contributions. The biogenic contributions include respiration (CO_2 input to the atmosphere) and Gross Ecosystem Exchange (GEE, CO_2 uptake by the biosphere). On the STILT result visualization page individual footprints with associated estimates of respiration and GEE are found and the averages considering all footprints for 2018 are found in the 2018 column. The remaining variables – sensitivity, point source contribution and population – are the total values of summarizing all footprint cells in the maps for the 2018 values. Averages for the different parts of the year are computed relative to the yearly averages.

Values in the 2018 column of the seasonal variations table are used in the **multiple variable graph** to place the selected station relative to other atmospheric stations in the ICOS network. The placement on the y-axis is determined relative to the minimum and maximum variable values of all the stations in the graph. 0% means that it is the station with the lowest variable value, and 100% the highest.

Additional resources

More specifics about the processing of the ancillary data layer 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 generate a characterization for a hypothetical station. The only requirement is that footprints have been generated using the STILT on demand calculator.