Urban flows observatory, Sheffield
Data Content

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This document describes the current data which is collected by the Urban Flows Observatory in Sheffield. Any new data streams and instruments will appear at the end of the document.

There are currently four broad categories of quantities which we are measuring/collecting data, and up until this point in time, all sensors have been deployed **outdoors**

- Meteorological data: Air temperature, Bulb-temperature, Relative Humidity, Air Pressure, Wind speed, Wind direction, amount of precipitation, type of precipitation
- Air Quality data:
  - Particulate material: PM1, PM2.5, PM4, PM10, Total-Suspended-Particles, Particle-Density
  - Gaseous pollutants: NO, NO2, NOX, O3, SO2, CO
- Environmental/physical: Noise, CO2, solar radiation level.
- Traffic: flow and occupancy

Except for the traffic data-streams, all the others are collected by sensors provided by the project. Traffic data is provided by the Sheffield City Council.

We group sensors by what we call families, to represent instruments acquired from a single provider or which share similar characteristics. The description of each family of sensors follows:

Envirowatch:

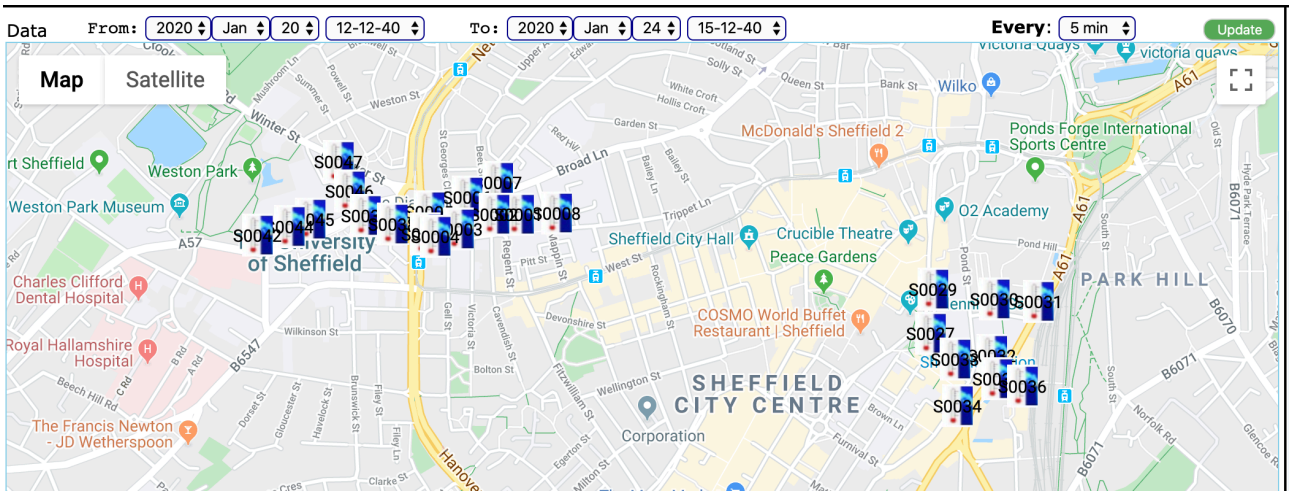
Number of installed instruments: 27
Frequency of observation: once every minute

Measurements:

Detector	Unit	Description
Air Temperature	C	Outdoors Air temperature
Relative Humidity	%	Relative Humidity
Noise	dB	Noise level
CO	ppm	Carbon monoxide
NO	ppb	Nitrogen monoxide
NO2	ppb	Nitrogen dioxide

The pods containing these instruments are located at a height of around 3 meters above the ground.

The following map shows the distribution of these sensors.



Air Monitors

Number of installed instruments: 15
Frequency of observation: every 15 minutes
Measurements:

Detector	Unit	Description
Air Temperature	C	Outdoors Air temperature
Relative Humidity	%	Relative Humidity
Atmospheric Pressure	hPa	Atmospheric pressure, not corrected to sea level
CO	ppm	Carbon monoxide
NO	ppb	Nitrogen monoxide
NO2	ppb	Nitrogen dioxide
NOx	ppb	All nitrogen oxides
O3	ppb	Ozone
SO2	ppb	Sulphur dioxide
PM1	µg/cm3	Particulate material less than 1 micro-metre in diameter
PM2.5	µg/cm3	Particulate material less than 2.5 micro-metres in diameter
PM4	µg/cm3	Particulate material less than 4 micro-metres in diameter
PM10	µg/cm3	Particulate material less than 10 micro-metres in diameter
Particle_Density	Part/cm3	Particle count
Particle_Sum	µg/cm3	Total suspended particles

Note that some sensors may or may not be present in every pod.
Pods are usually located about 3 metres above ground.

WeatherStations

Number of installed instruments: 15
Frequency of observation: every 15 minutes
Measurements:

Detector	Unit	Description
Air Temperature	C	Outdoors Air temperature
Relative Humidity	%	Relative Humidity
Atmospheric Pressure	hPa	Relative atmospheric pressure, not corrected to sea level
<WindSpeed>	m/s	Average wind speed
maxWindSpeed	m/s	Maximum wind speed
WindDirection	deg	Wind direction. North = 0, East = 90, South = 180, West = 270
CO2	ppb	Carbon dioxide
PrecipitationType		Precipitation type: 0 no precipitation 1: rain 2: snow
Precipitation	mm	Amount of precipitation
GlobalRadiation_min	W/m2	Minimum global radiation
GlobalRadiation_max	W/m2	Maximum global radiation
GlobalRadiation_avg	W/m2	Global radiation average

The minimum, maximum, and average refer to values measured between transmission of data

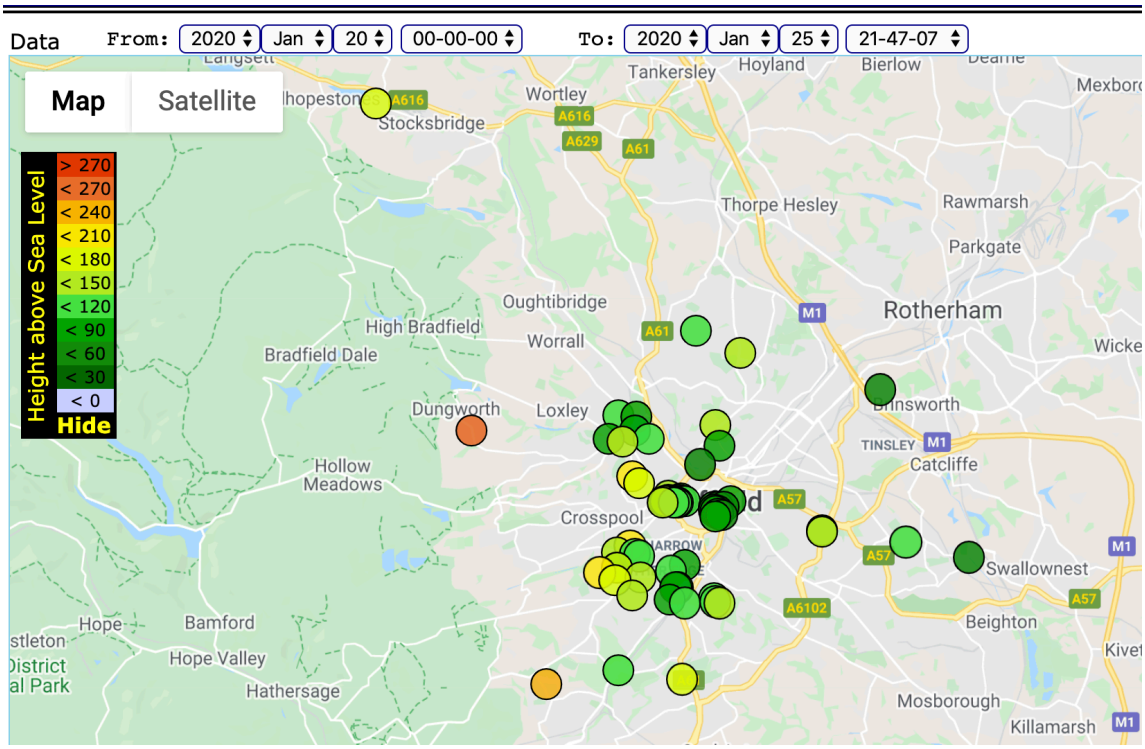
LuftDaten

Number of installed instruments: 55
Frequency of observation: every few minutes

Detector	Unit	Description
Air Temperature	C	Outdoors Air temperature
Relative Humidity	%	Relative Humidity
Atmospheric Pressure	hPa	Atmospheric pressure, not corrected to sea level
PM1	µg/cm3	Particulate material less than 1 micro-metre in diameter
PM2.5	µg/cm3	Particulate material less than 2.5 micro-metres in diameter
PM10	µg/cm3	Particulate material less than 10 micro-metres in diameter

This set of instruments is part of the community supported network of sensors. The observatory does not have much control as to where they are located, hence some issues may occur, like the enclosure being mounted facing in such a way that direct sunlight falls on it, altering the temperature reading. The enclosures are not designed to reflect sunlight, hence they can get quite warm.
There is another issue with the measured relative humidity. In some sensors values of 100% occur very often.
The particulate sensors (and the atmospheric pressure) seem to be consistent within the set, but we have no easy way to estimate individual sensors random or systematic uncertainties.

Despite these limitations, the dataset lends itself to do trend analysis.



SSC Flow

Number of installed instruments: 655
Frequency of observation: every 5 minutes
Measured quantity:

Detector	Unit	Description
Traffic flow	cars/min	Traffic flow
Interval	minutes	Interval between observations
Amount	vehicles	Number of vehicles measured during the period

This set of instruments is operated by the Sheffield City Council and it is composed of magnetic loops located at street level across the city.

Note that **traffic flow** is the only quantity we make available in the open portal.
We have noticed that the data for some sensors is not always continuous, with some sensors reporting one reading per day.

The observatory only harvests this dataset, having no control on how information is collected and propagated.