**Workflow for data analysis**

**Use Master Script to source all the other scripts in correct order!**

**Logger**

* Read in data and create list
  + Separate scripts for separate datasets
* Set all loggers to same start time (same interval)
  + Interpolate data to 1 min intervals and
  + Reduce again to 10 min values
* Use calculated offset (reference thermometer) to correct data
  + Use offset from test in the lab and subtract the offset from temperature data
  + Offset for logger 33 is missing -> check that
* Decompose the time series (plot seasonality, trend and noise)
* Tidy up data regarding spikes
  + Set a threshold for a rise in temperature that are regarded as spikes and therefore set to NA
    - For water: threshold of 2.5°C/10min, remove 2h of data (negative drop -5°C)
    - For air: threshold of 5°C/10min, remove 30mins of data
* Plots
  + plot the tidy data in pairs (water, settlement, vegetation)
  + plot overviews for all water logger/ vegetation logger/ sealed area logger
  + plot the water temp together with air temp to see warming/cooling effect
* Split data into day and night datasets (creates separate lists)
  + Two hours per day for dawn are removed
  + Works for every dataset
* Plot the day and night datasets and save to file
  + Add the sunrise and sunset as vertical lines to the plots
  + Add description and type of location to plots
* Statistics:
  + Test for normality and, subsequently do ttest or Wilcoxon significance test for green vs grey infrastructure
  + Get mean, median and standard deviation for daily, nightly and 24h data
  + Plot statistics
* Map
  + Isarithmic map with interpolation of points through inverse path distance weighing

Use extra script for data in 30 min intervals (September to November)

* start time correction for 30 min values
* Set threshold for spikes
  + Water: 5°C/30 min (remove two hours of data)
  + Air:10°C/30 min (remove 30 min of data)

**Supplementary weather data**

* Windspeed, -direction (FMO – DWD)
  + mean wind rose
  + relation wind speed to air temperature
* Temperature (reference temp) (FMO – DWD)
* Shortwave radiation (GeoDach)

**Netatmo data**

* Merge both the temperature data and the metadata
* Perform QAQC in 4 steps 🡪 reduced stations to 22
  + Level A: Filter out inconsistent metadata, timestamps and use only stations with 80% data per day/per month
  + Level B: Filter for monthly average and standard deviation of daily min temp (reg. reference temp.)
  + Level C: Filter out stations with radiative errors (and single values with rad errors)
  + Level D: Filter out outliers
* Plot
  + On map
  + On map with logger
  + Overview plot for all stations

**To Do – Data analysis:**

* Create (working heatmap) -> check out other possibilities
* Check where NAs have gone
* Try and puzzle matching time frames together?
* Use 3 sd as QAQC (check QAQC for CSD)
* Tidy up split script with new dawn/dusk values
* Plot stats (add legend to grid plot)
* Download cloudiness data
* Get atmospheric stability data?
* For map: get landuse data of MS as spatial polygons dataframe
* Change temperature axis in winter graphs
* Do something with ULB water logger (fell dry)

**To Do – Fieldwork**

* Find out exact distance in meters between logger pairs
* Check Logger IDs and coordinates (some missing)

**To Do – Literature**

* Split weather effects in Citavi
* Read paper about wind effects (again)

**Ideas/considerations Aasee**

* Effect of shallowness
* Effect surface area
* Trees around Aasee #check how many NAs were added to data
* Large space (Aaseekugeln) 🡪 distinguish effect green space/cooling due to water
* Warming at nighttime (when water temp > air temp)
* Fountains for fish -> suppl evaporation