FAST ANALYSIS OF URBAN METEOROLOGICAL OBSERVATIONS WITH THE USER-FRIENDLY METOBS-TOOLKIT

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Working with and analysis of observational data is often challenging and time consuming. **Problems** that frequently occur when handling data of observational campaigns, low-cost networks or crowdsourced data, are:

- measurement errors & biases
- missing (meta)data
- varying data storage formats
- inconsistent or asynchronous measurement frequencies

The open-source Python toolkit MetObs **aims to overcome** these **issues** by providing:

- a framework for the entire flow from raw sensor data to a dedicated analysis
- the possibility to apply it to various types of non-traditional networks without any formatting issues
- the possibility to incorporate geographical data and create various graphics to analyse meteorological measurements

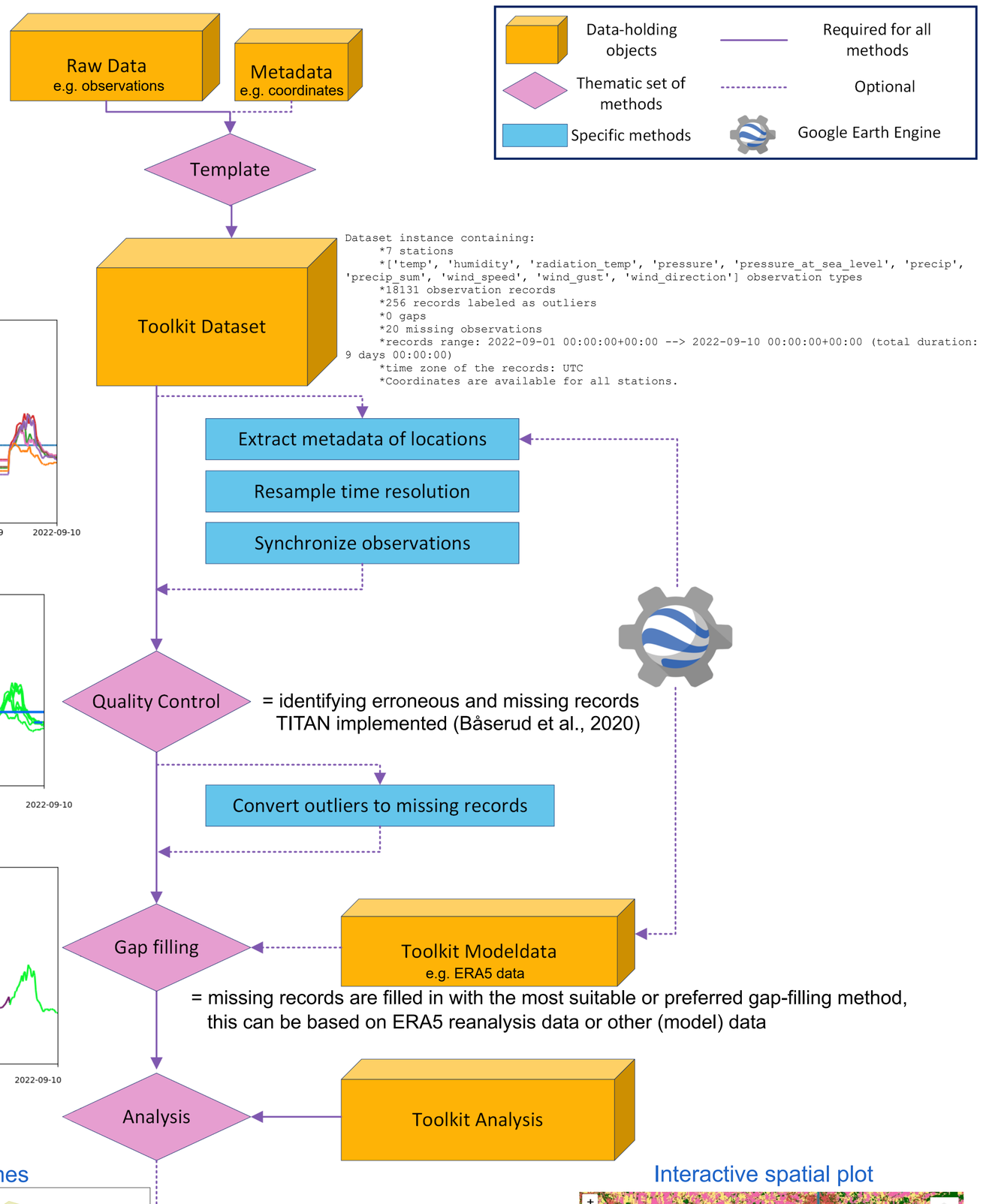
MetObs Toolkit

Abstract

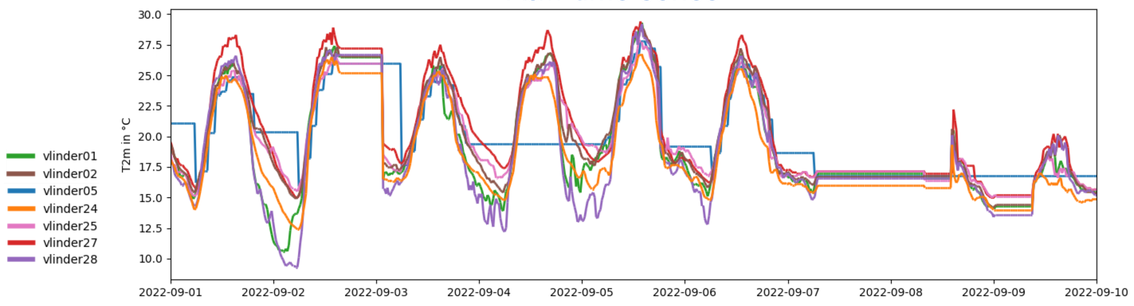
Paper

Sharing is encouraged

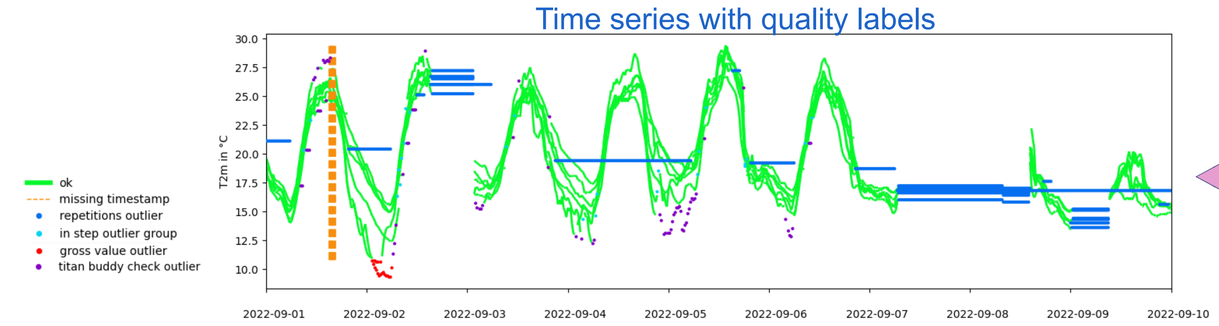
MetObs-toolkit Framework



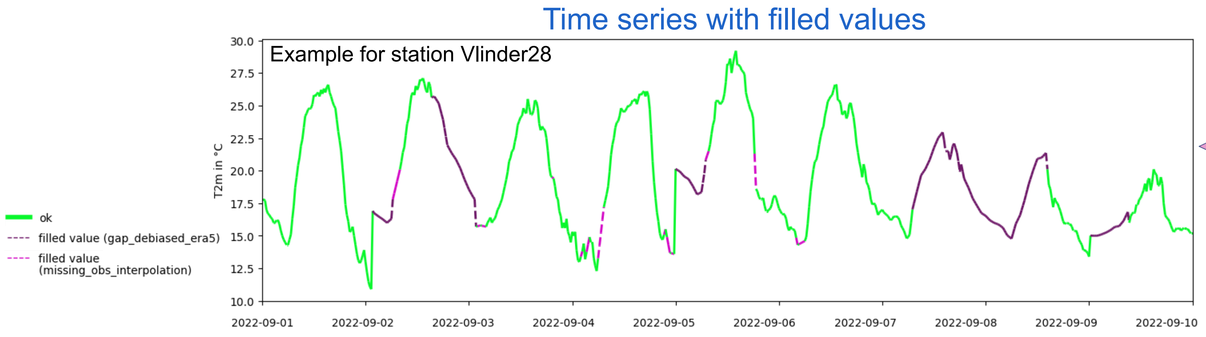
Raw time series



Time series with quality labels



Time series with filled values



Metadata retrieval

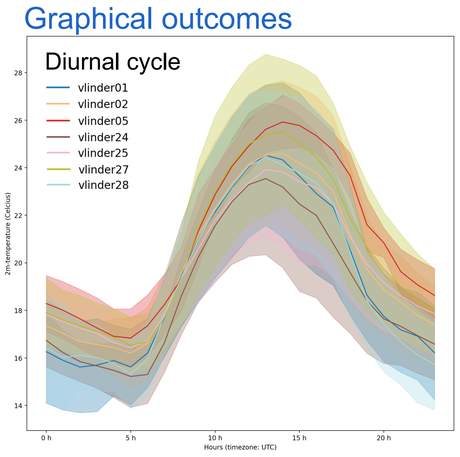
Input

name	lat	lon	call_name
vlinder01	50.98044	3.815763	Proefhoeve
vlinder02	51.02238	3.709695	Sterre
vlinder05	51.05266	3.675183	Watersport-baan
vlinder24	51.16702	3.572062	Het Leen
vlinder25	51.15472	3.708611	Kluizen
vlinder27	51.0581	3.728067	Ottogracht
vlinder28	51.03529	3.769741	Gentbrugse Meersen

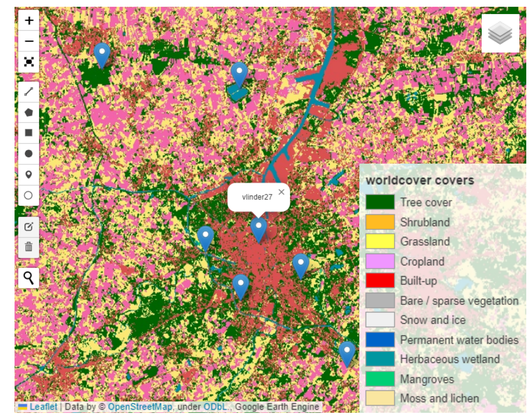
Output

name	lat	lon	call_name	LCZ	…	water_500m	pervious_500m	impervious_500m
vlinder01	50.98044	3.815763	Proef-hoeve	Low plants (LCZ D)	…	0.000	0.905	0.095
vlinder02	51.02238	3.70969 5	Sterre	Open midrise	…	0.055	0.521	0.424
vlinder05	51.05266	3.67518 3	Watersport-baan	Water (LCZ G)	…	0.130	0.748	0.122
vlinder24	51.16702	3.57206 2	Het Leen	Dense trees (LCZ A)	…	0.003	0.967	0.030
vlinder25	51.15472	3.70861 1	Kluizen	Water (LCZ G)	…	0.838	0.131	0.031
vlinder27	51.0581	3.72806 7	Ottogracht	Compact midrise	…	0.011	0.066	0.923
vlinder28	51.03529	3.76974 1	Gentbrugse Meersen	Open lowrise	…	0.000	0.665	0.335

Graphical outcomes



Interactive spatial plot



Conclusion & Contribution

The toolkit contains a user-friendly framework to process raw sensor data into statistics and various plots, and incorporates geographical data through the use of the Google Earth Engine. The MetObs-toolkit is an evolving project that responds to the community's needs and inputs. As an example, a graphical user interface (GUI) for the toolkit has been developed and contributions, ranging from ideas to implementations, can be made via the GitHub-platform.

REFERENCES:
Vergauwen et al. (2024). MetObs - a Python toolkit for using non-traditional meteorological observations. Journal of Open Source Software, 9(95), 5916, https://doi.org/10.21105/joss.05916
Båserud et al. (2020). TITAN automatic spatial quality control of meteorological in-situ observations. Adv. Sci. Res., 17, 153–163, https://doi.org/10.5194/asr-17-153-2020

CODE AVAILABILITY: https://github.com/vergauwenthomas/MetObs_toolkit

DOCUMENTATION: https://metobs-toolkit.readthedocs.io/

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