

Comparison between airborne pollen concentrations collected with Hirst type traps using different sampling inlets

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Background

In this study we have compared time series of pollen concentrations measured by Hirst type volumetric method [1] using regular wind vane inlet and Sigma-2 fixed inlet. The study aims to reveal to what extent sampling inlet introduces discrepancy in quantity when comparing measurements from different inlets.

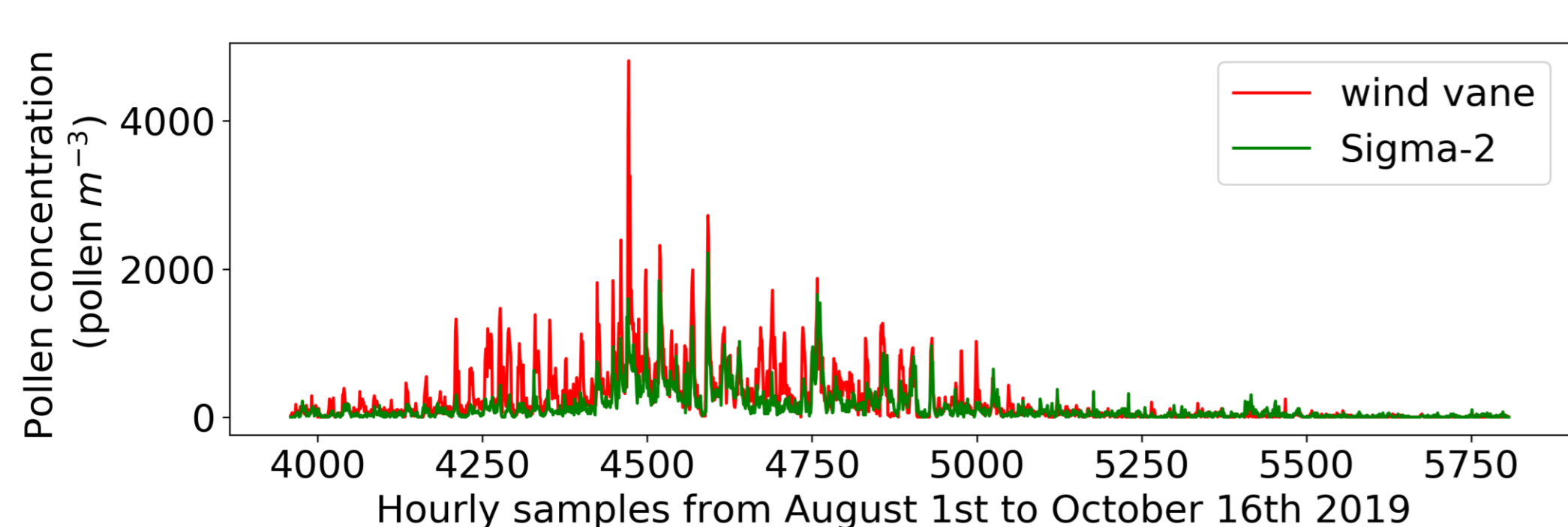
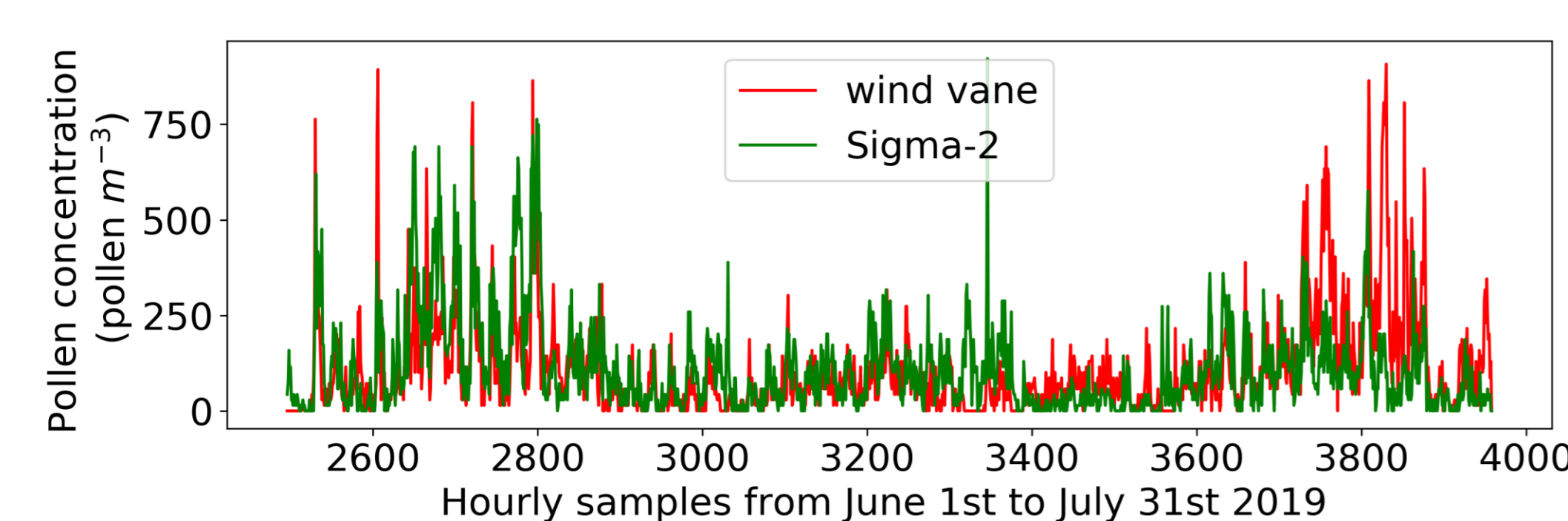
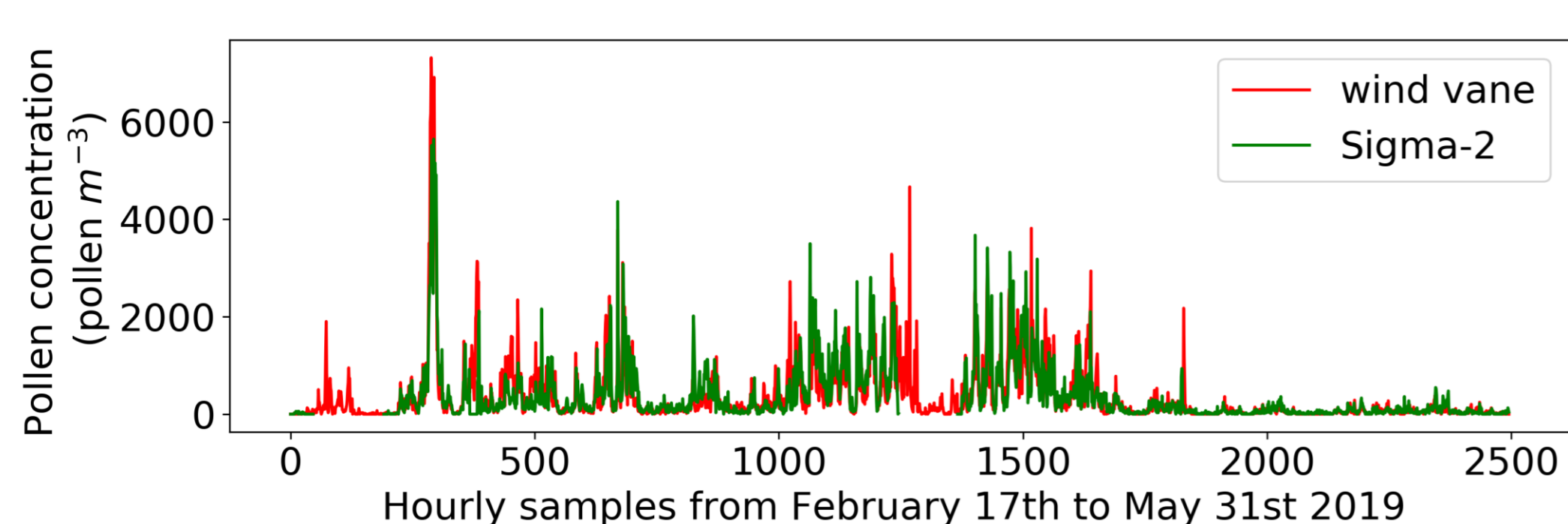
Methods

Airborne pollen samples were collected continuously from February to October 2019, using two “Lanzoni” VPPS samplers at the roof-level, on the top of the building of the Faculty of Sciences located in Novi Sad. For both instruments the same standard operating procedures were applied [2]. Meteorological conditions were recorded simultaneously with the automatic meteorological station measuring air temperature, relative humidity, wind speed and precipitation.



Results

Time series of hourly pollen concentrations recorded with different inlets expressed strong positive correlations with $r = 0.77$ (p -value < 0.01), however $RMSE = 317$ pollen m^{-3} .



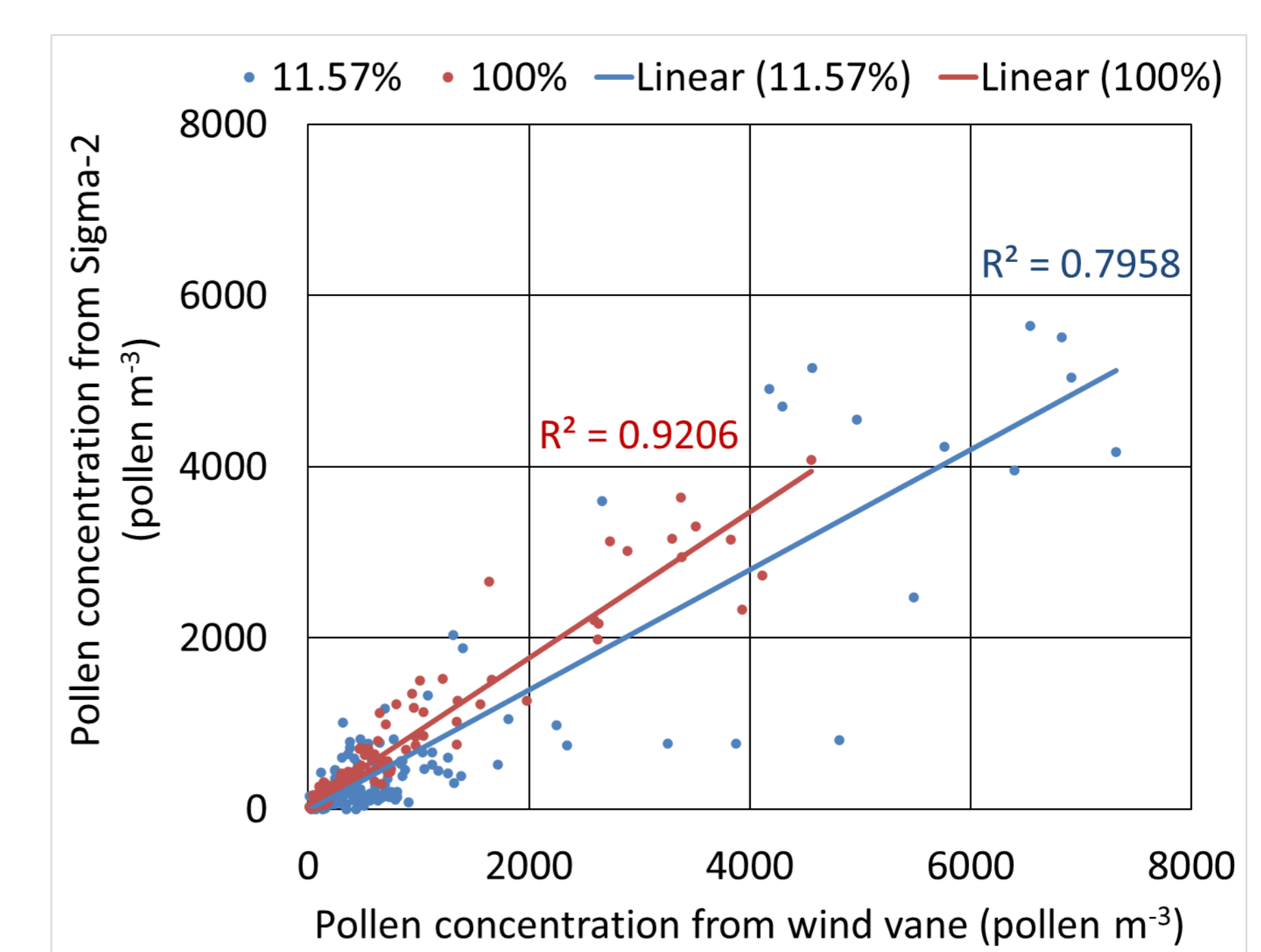
Hourly values	Absolute difference of airborne pollen concentrations (pollen m^{-3})
	correlation coefficient*
Wind speed ($m\ s^{-1}$)	-0.04
TKE ($m^2\ s^{-2}$)	-0.06
Temperature ($^{\circ}C$)	0.14
Relative humidity (%)	-0.05
Precipitation (mm)	-0.09
* p -value < 0.01	

Differences were both positive and negative over one full pollen season.

Absolute difference between hourly values showed very weak correlation with relevant meteorological parameters: temperature, humidity, wind speed and turbulent kinetic energy (TKE).

After we excluded instrumental variation and physical variation as the possible causes of the differences, human error was the only factor left over.

The alignment between the values originating from two sampling inlets is evident after **100%** of the surface was analyzed on six selected days, instead of **11.57%** which follows minimum requirements [2].



Conclusions

Meteorological conditions did not have notable influence on the sampling performance.

Human error including counting routine related to the minimum requirements was crucial in explaining the differences.

Sigma-2 inlet does not notably affect the quantity of pollen recorded by the Hirst type volumetric method.

Acknowledgement

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[1] Hirst, J.M. (1952). An automatic volumetric spore trap. *Annals of Applied Biology*, 39, 257-265. doi.org/10.1111/j.1744-7348.1952.tb00904.x

[2] EN16868 (2019). Ambient air - Sampling and analysis of airborne pollen grains and fungal spores for networks related to allergy - Volumetric Hirst method. European Standards.