

M. Thibaudon¹, G. Oliver¹, J. Nagy¹, S. Kawashima²

¹ RNSA 11 Chemin de la Creuzille, Le Plat du Pin, 69690 Brussieu (France)
² Université de Kyoto, Japon

Currently, information about allergy risk for public is based on past metrological data. The information is not in real time, it is the major disadvantage of using Hirst-type pollen traps.

In 2013, the reliability of a new device for measuring in real time the amounts of particles (organic?) in air was evaluated. The aim of this equipment, already used for this purpose in Japan, is to prevent daily the allergic population from pollens risks. To carry out this study, a Japanese particle counter (YAMATRONICS KH-3000-01) and a RNSA classical pollen trap were used in parallel. Data from automatic particle counter were collected hourly and grouped into an Excel file. These data were compared with pollens data from Lyon, obtained with a traditional pollen trap. This comparison, to be more visual, was designed as double-scale curves and statistical analysis of correlation.

Materials et Methods

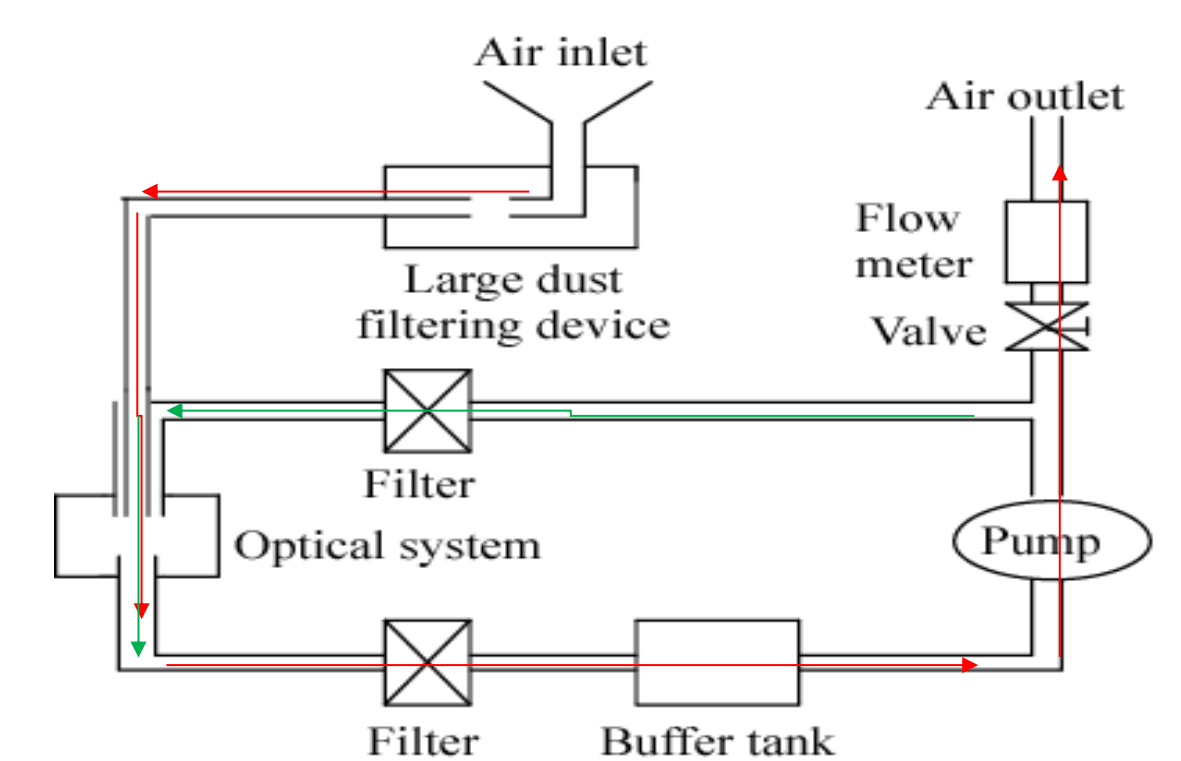


Automatic particle counter:

- The air is drawn into the device at a rate of 4.1 L/minute and is freed from large particles (> 100 microns) thanks to a filter.
- The air containing the particles is introduced into the optical system where it passes through a laser beam. Whenever a particle passes through the laser beam, it causes a dispersion of light. These dispersions are recorded, digitized and transferred to a computer.
- After passing through the optical system, the air is "cleaned" with a second filter.
- A portion of this air exits thanks to a pump, while the rest will go again through the optical system to prevent it from clogging.

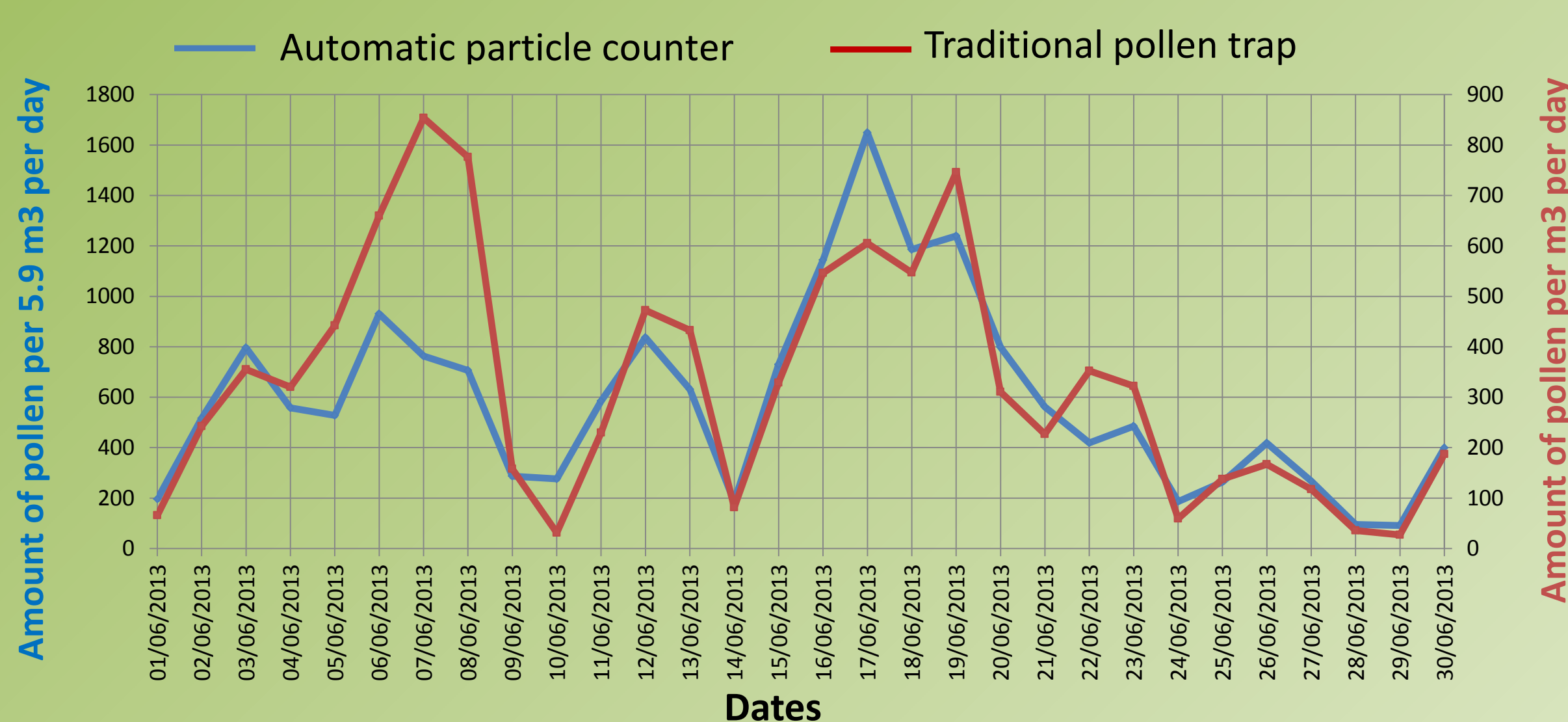
Type Hirst pollen trap:

- Air is drawn at a rate of 10 L/min. The particles in the air are impacted on a coated band traveling continuously in front of the trap opening at 2 mm/hour.
- Then the band is divided into seven sections of 24 hours and prepared for microscopic observations.
- The analysis is performed using an optical microscope at x400 magnification, using the criteria from the determination pollens key prepared by RNSA. It provides quantitative and qualitative data (grains/m³/unit of time).



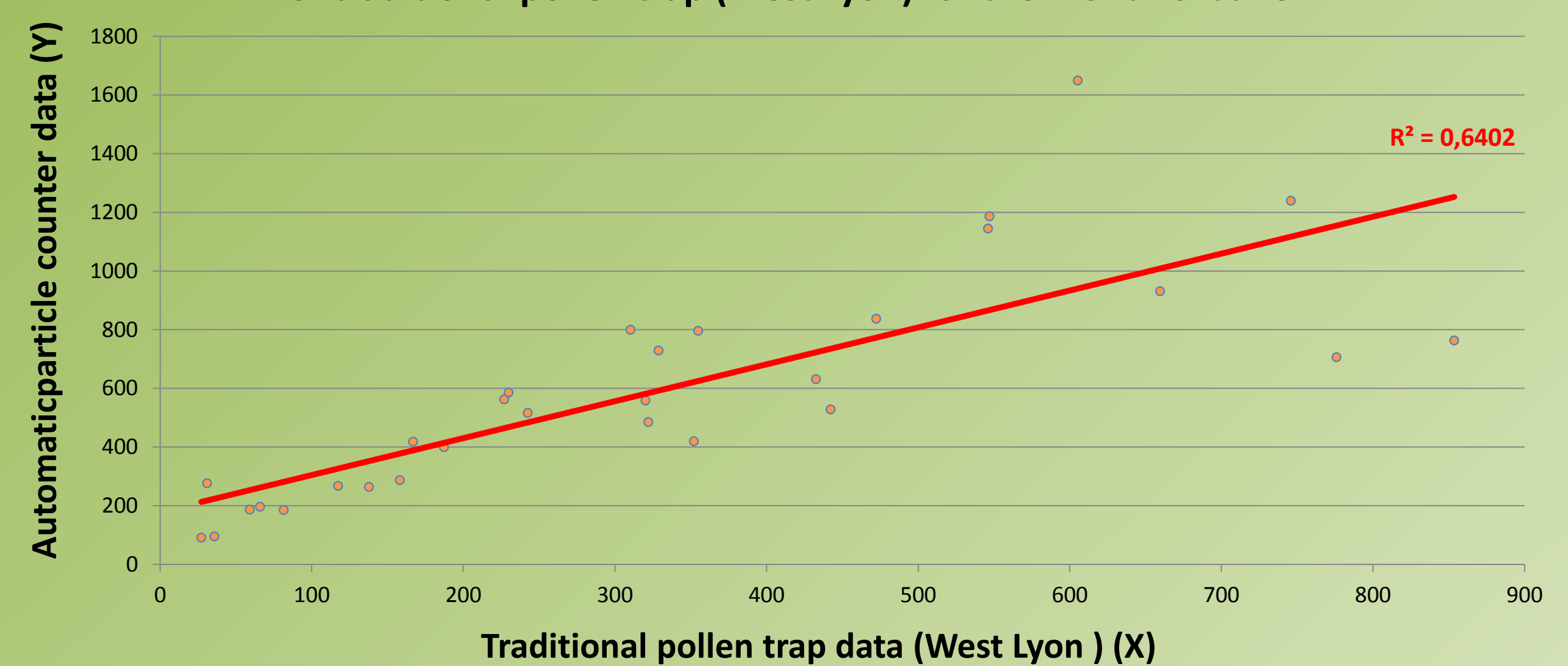
Results

Comparison of the daily pollens amounts measured by the automatic particle counter and a traditional pollen trap (West Lyon) for the month of June



Month	Number of matching days	Number of mismatched days	Percentage of matching days
April	24	6	80%
May	29	2	95%
June	28	2	95%
July	25	6	80%
August	27	4	87%

Correlation between the data of automatic particle counter and those of traditional pollen trap (West Lyon) for the month of June



- When the different curves, corresponding to the month of April to August, are observed there is a certain consistency of the data. In June, a strong consistency of both types of data is visible on the curve. Spikes arrive the same days.
- Statistical analysis resulted in a coefficient of determination R^2 which allowed to define the percentage of the variance of a data which can be explained by the other data (and vice versa). R^2 for June is 0.6402, which measure how close the data are to the fitted regression line. We can conclude from these results that there is a link between X and Y for this month.

➤ The curves thus obtained have enabled to make a table of matching and non-matching days between the two types of data. Which was defined as mismatched day is when the two curves do not follow the same trend (increase or decrease of the amount of particles in the air compared to the previous day) and when the two points of this day appear quite far away. The table allows to highlight some consistency between data from the automatic particle counter and data from the traditional pollen trap. The months of May and June have the most consistent relationship between the two data sets, they each have two mismatched days in the month, which corresponds to 95% of matching days.

➤ The results for the period tend to show a correlation between the two types of data compared for this study. From these results, it seems that the automatic particle counter detects a majority of the pollens present in the air.

The information which are actually provided on allergic risks with type Hirst pollen traps are very useful but are based on past information which is not yet sufficiently sharp and precise.

The study of the Japanese automatic particle counter during 2013 has shown that this type of device used daily in real-time prediction of allergic risks can have a great future. This type of sensor, and therefore data associated to it, allows to obtain more relevant information on the particles present in the air in real time.

However, the results of this preliminary study must be confirmed in order to provide "on line" reliable information to the allergy sufferers and their referring physicians.