Molds, pollens and storms: a link with respiratory allergy?

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Object of the study

- Strasbourg is a city with more than 275 000 citizens located in the east part of France, on the left bank of the Rhine. Its climate is a continental one according to the Köppen classification, with a high dispersal of temperature. During winter, snowfall can happened frequently while some summer days are very hot and dry. Located between two mountain ranges (the Vosges and the Black Forest), the city is protected against the winds (especially against the strong ones comming from the west) which causes a Foehn effect. Thanks to this natural protection, there are few and irregular rainfalls. However, the city is exposed to violent storms at the beginning and the end of summer. All these features favour the outbreak of pollution peaks every year.

- The Strasbourg Hospital allergology laboratory analyses the biological particles(pollens and molds) contents of the air, every week, from February to September.

- **The aim of the study is to identify the molds and the pollen present in the air after a storm and their potential impacts on health. The period of the study is 2008 to 2013.**

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- ANSES (**Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail**), État des connaissances sur l'impact sanitaire lié à l'exposition de la population générale aux pollens présents dans l'air ambiant., Rapport de l'ANSES (https://www.anses.fr/fr/documents/AIR2011sa0151Ra.pdf), janvier 2014 (State of art on the health impact related to the general population exposition at pollens present in the air)

Bibliography

- In January 2014,
  - (…) The Agency recommends to improve the knowledge on the interactions between pollens and atmospheric pollution (Ozone, NO2 ,particles).

  - Finally, the Agency advises to improve the knowledge on the climatic factors influencing the amount of pollens produced and released, the production of allergens in pollen (amount, temperature, stress, humidity…).

MATERIALS AND METHODS

The pollen trap

On the roof of the New Civil Hospital

The mode of data collection

Since January 2011, the pollen trap is located on the roof of the NHC (25 metres height = 82 feet). Before that, the trap was located on the Faculty of medecine building since 1991.

Every week, the allergology laboratory technicians collect the material to analyse it, they do the pollinic count with optical microscopy.

This trap contains:

- a motor which aspirates air thanks to a breathing orifice, with a flow rate of **10 L / min** (= human breathing),

- an adhesive band on a drum, on which the particles in the air are deposited by impaction

- a clock which permits to do **continuous** measures during a week.
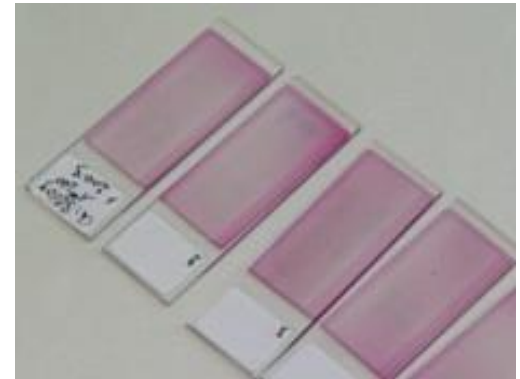

Pollen trap

Breathing orifice

Drum location

Motor

Adhesive band on a drum rotating thanks to a clock
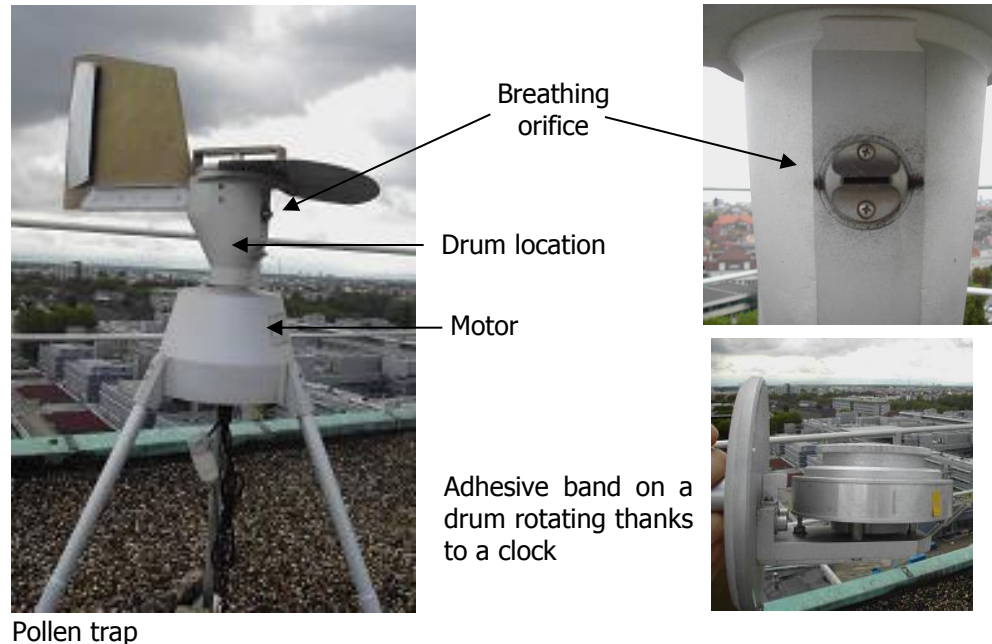
Analysis
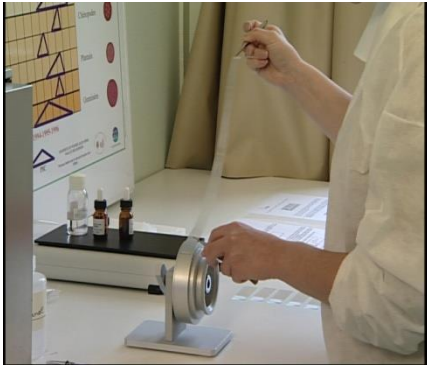
Collection of the drum band
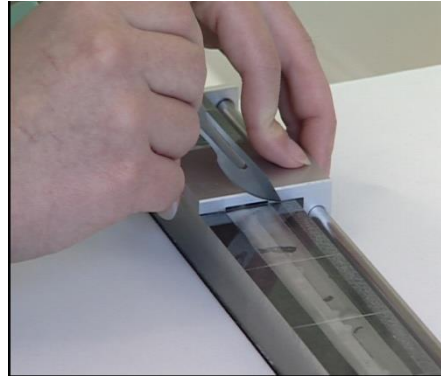
Dividing the band into daily sections

1 slide by day

Counting with a vocal recognition system

Daily concentrations (grains/m^3)

Pollens Count

Meteorological and air quality data collection

- <u>Météo France</u> : HR, daily average vapour pressure, T°C, rainfalls

- <u>Météo Orage</u> : lightning strikes between 2008 and 2013

- <u>ASPA</u>: (Association pour la Surveillance et l'Etude de la Pollution Atmosphérique), Schiltigheim-Alsace : data: O3, NO2, PM10

Clinical data collection

- Thanks to the emergency department and the DIM of HUS
  - 5 codes taken into account:
    - J209 : Severe bronchitis
    - J440 : COPD + pneumonitis
    - J449 : Chronic obstructive pulmonary disease (COPD)
    - J459 : Asthma
    - J46 : Acute severe asthma

Statistics

- Statistical methods
  - Regression model (A) for clinical data v/s variables weather (temperature, humidity), pollution (ozone, NO_2), molds (*Alternaria, Cladosporium, Didymella*), pollens (all taxa including grass pollens)
  - Regression model of *Didymella* (B) : explain the data related to *Didymella* with the variables weather and month of the year
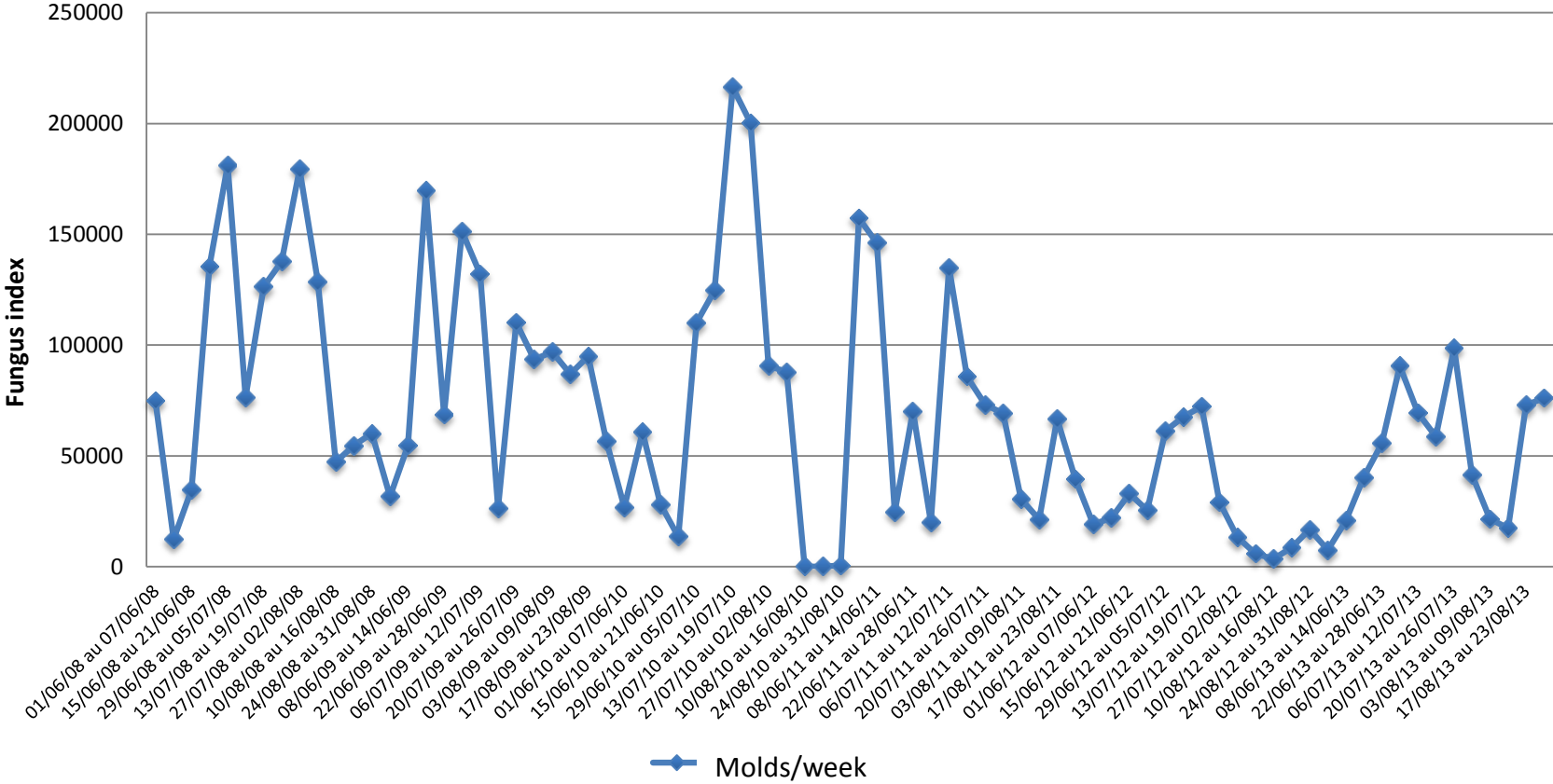 - Regression model for « health impact»* with the different variables of models A and *Didymella*

* Health impact= hospitalisations in the emergency department of HUS for respiratory distress

RESULTS

Exposure - Molds

Molds amount - Strasbourg - Summers 2008 to 2013

Legend: Molds/week

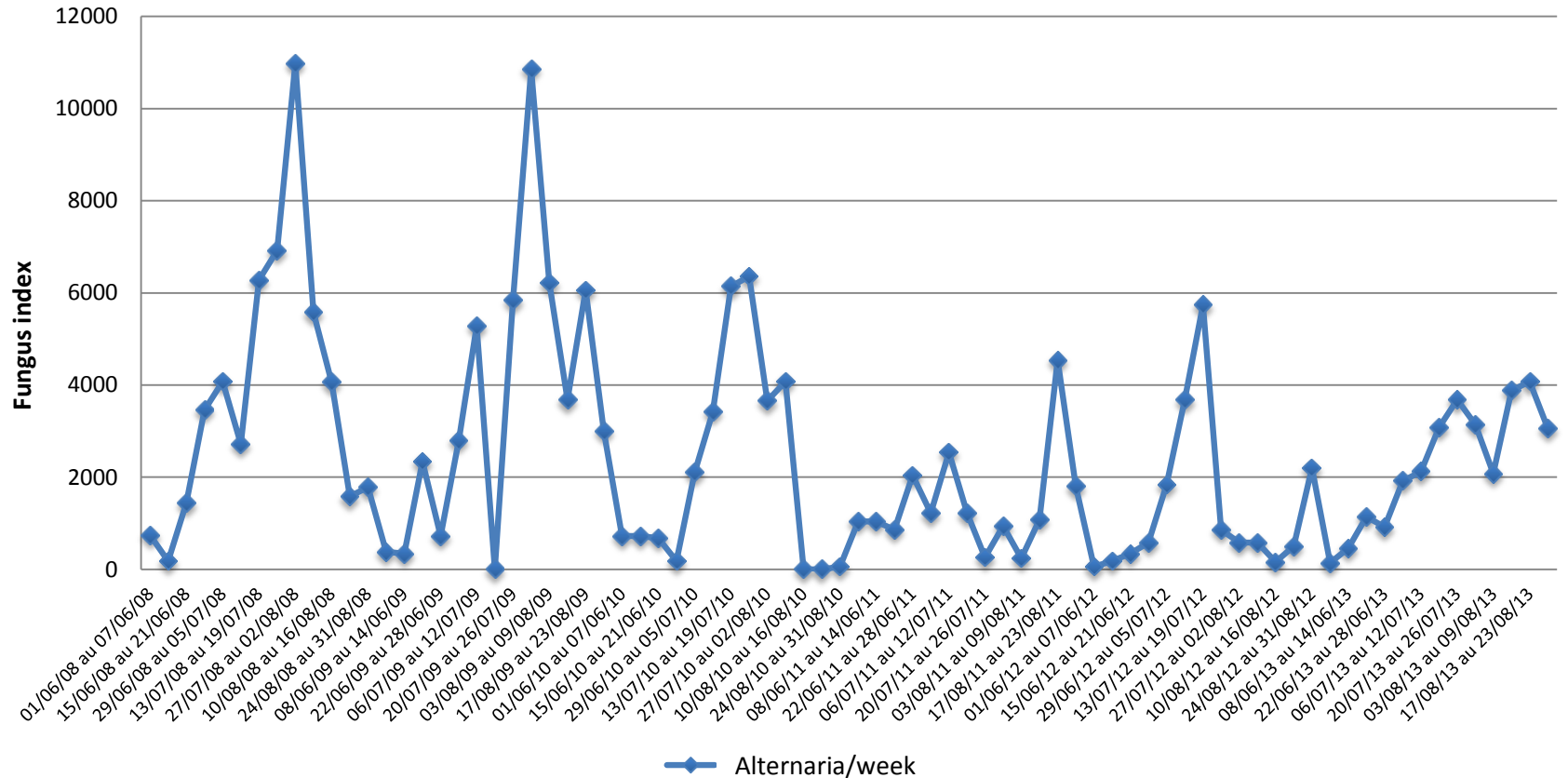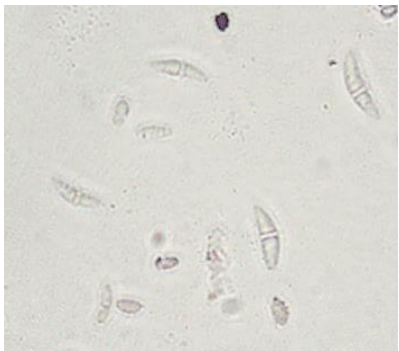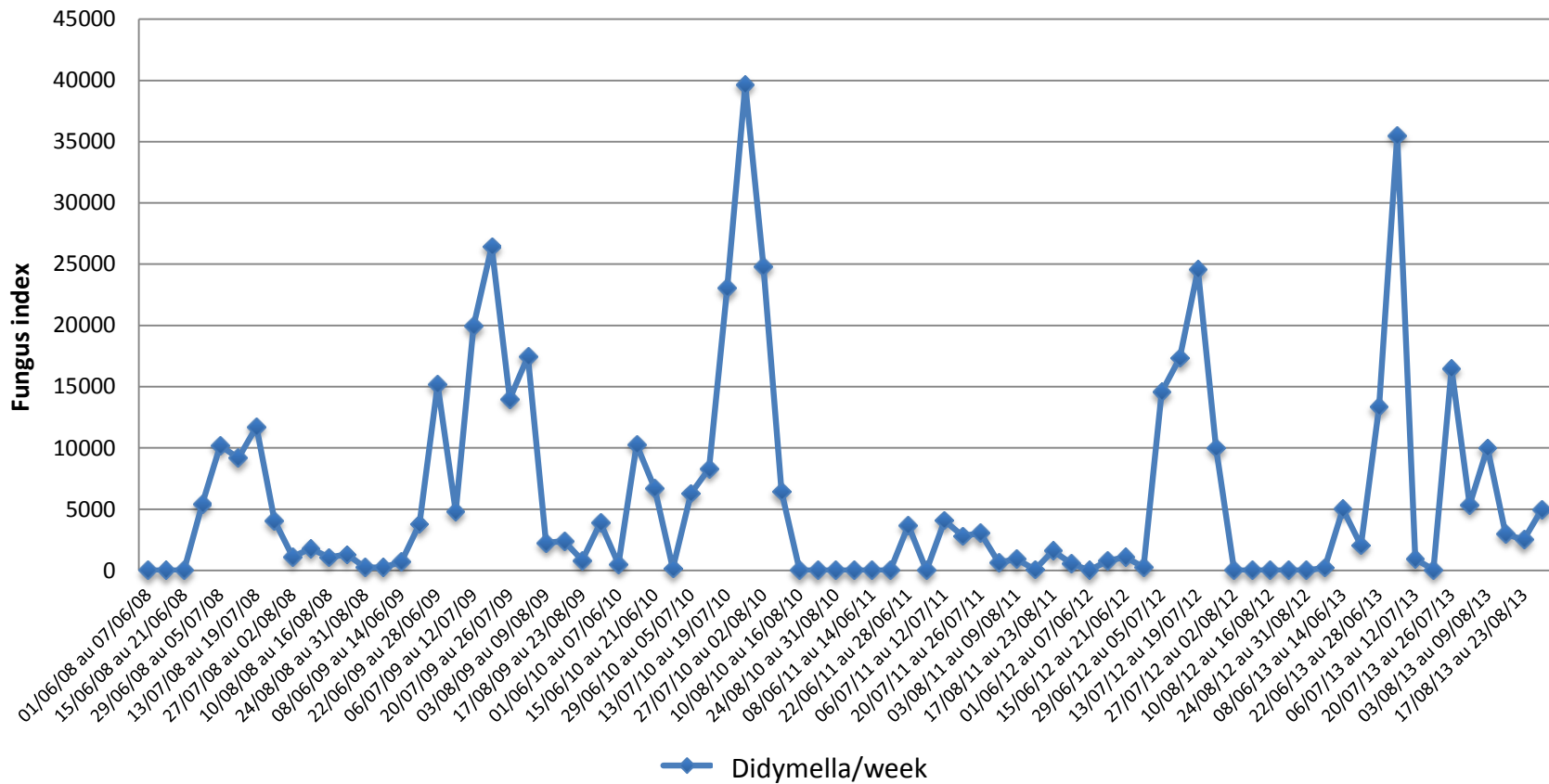# Exposure - Molds

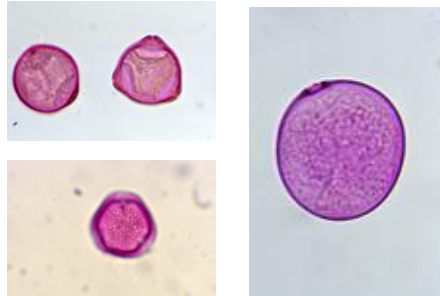

Alternaria amount - Strasbourg - Summers 2008 to 2013

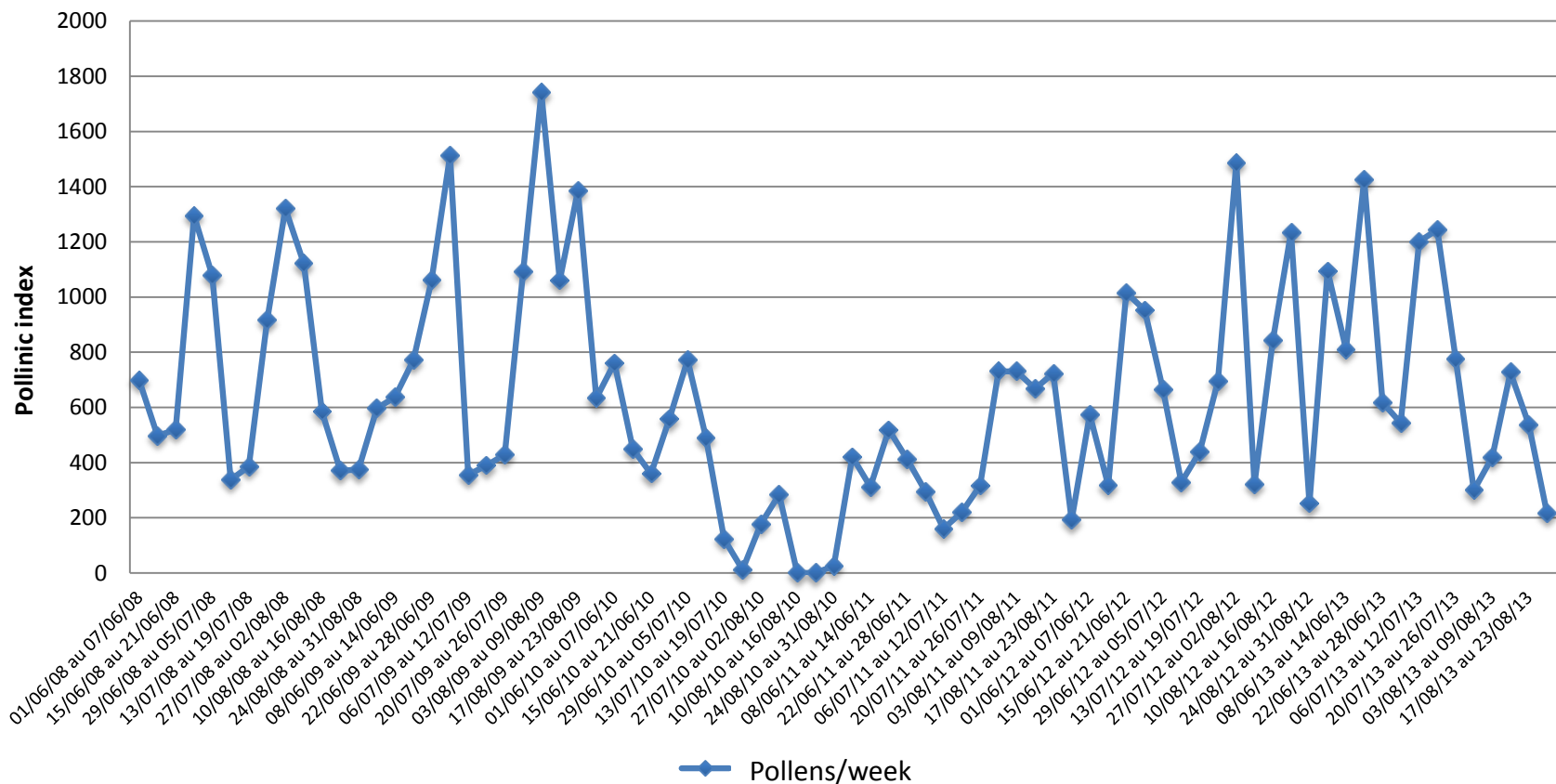# Exposure - Molds

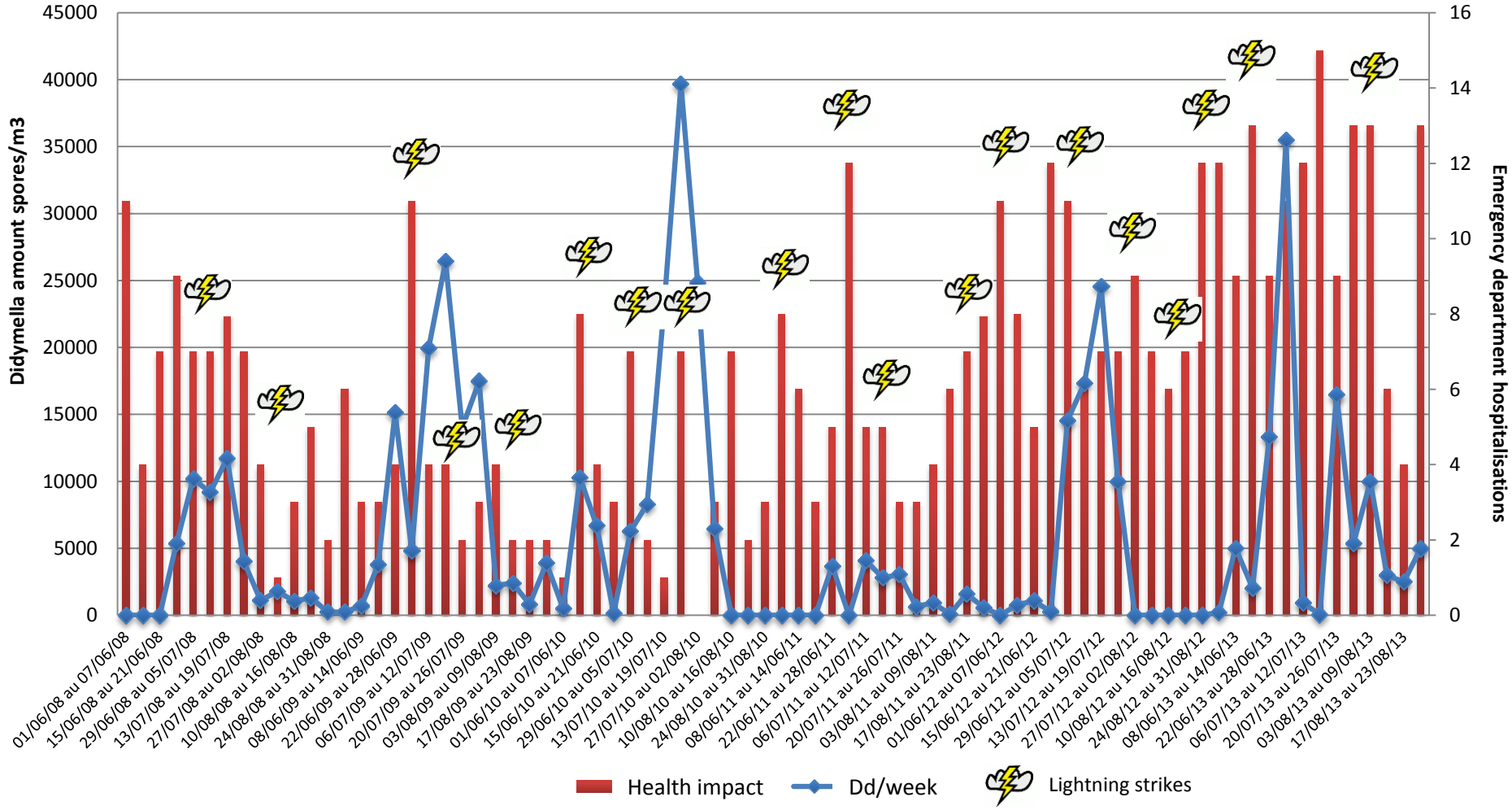### Didymella amount - Strasbourg - Summers 2008 to 2013

Exposure - Pollens

Pollen amount with all taxas combined - Strasbourg - Summers 2008 to 2013

Didymella amount in the air and hospitalisations in the emergency department because of respiratory distress
Summers 2008 to 2013

Grass pollens amount in the air and hospitalisations in the emergency department because of respiratory distress
Summers 2008 to 2013
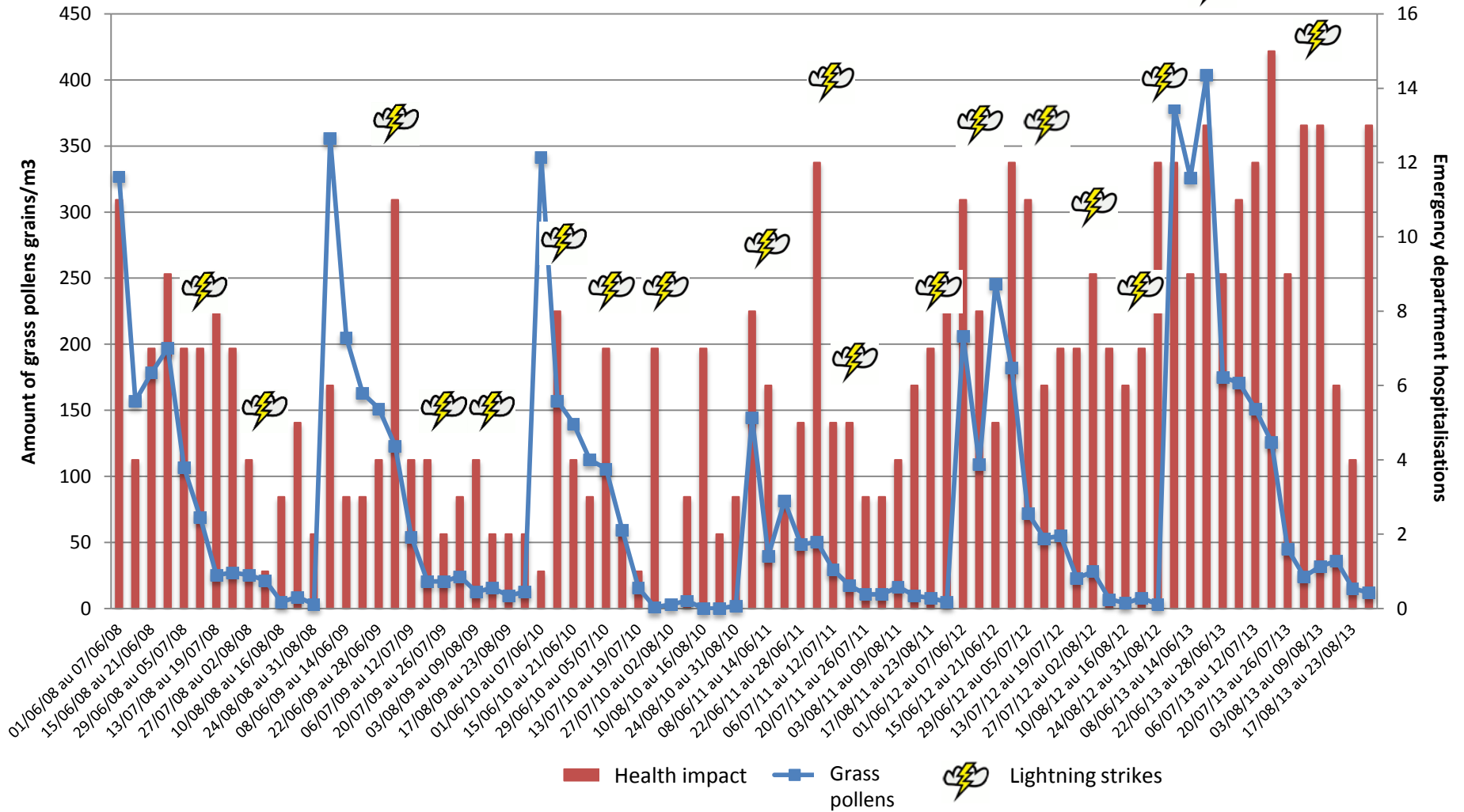
Results

- Statistical analysis
  - The regression models explain
    - « the health impact» with the variables PM10, NO_2, Ozone
    - The outbreak of Didymella by: the month of the year, the minimal temperature,the daily average vapour pressure.
  - « the health impact» is better explained when Didymella is added in the regression model.

Résultats

- Statistical conclusion
  - In taking account different factors: PM10, NO_2, Ozone, month of the year, minimal temperature, daily average vapour pressure, Didymella plays a role in the « health impact » data.

  - Most of the pollens improve regression models.

Conclusion

- The comparison of meteorological datas, Didymella and other molds spores concentrations, pollens, ozone and emergency for breathing problems allows an evaluation of relations between these factors.

- Stormy periods favour occasional increases of pollens and molds concentrations and therefore breathing problems.

Acknowledgments

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