

# Analysis of 2009 Pollen Readings in Atlanta, GA, Baltimore, MD and Madison, WI

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## Background

Seasonal allergic rhinitis is a significant burden to public health primarily caused by airborne outdoor pollen. Pollen sources can differ spatially based on climate differences. Pollen readings from Atlanta, Baltimore and Madison were analyzed to identify differences and similarities for the 2009 pollen season. This study provides an initial baseline for the timing of the pollen season in these regions, and is a basis for the future development of an environmental public health pollen indicator and surveillance system.

## Methods

- Pollen readings were available for three different National Allergy Bureau (NAB) certified pollen counting stations in Atlanta, GA, Baltimore, MD and Madison, WI. The spatial locations of these three pollen counting stations are illustrated in Figure 1; the states differ in annual temperature and precipitation.
- Daily pollen totals were available by pollen species in Atlanta and Madison. Daily pollen totals for Baltimore were reported in tree, grass and weed (ragweed) categories. The Baltimore station used a separate text field to record names of trees (taxa) that produced pollen.

### National Allergy Bureau (NAB) Pollen Stations

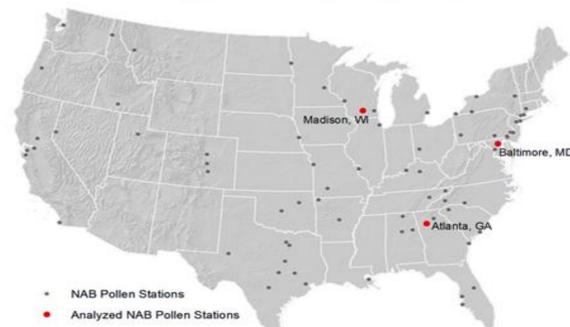


Figure 1: National Allergy Bureau pollen counting stations in the U.S. Data from the three stations in red (Madison, WI; Atlanta, GA; Baltimore, MD) were analyzed.

- To compare pollen results, Atlanta and Madison pollen observations were also grouped into the tree, grass and weed (including ragweed) categories. A daily pollen load value was computed.
- We conducted descriptive statistical analyses to identify differences in pollen attributes in the three states. The lower limit of the 99.9<sup>th</sup> percentile was used to define a location-independent measure for the start and end date of the pollen season.
- We also determined the mean and maximum for total daily pollen and the relative contribution of each pollen category to the daily pollen total.

Table 1: Pollen Season Dates, by Location

Station	Start Date	End Date	Season Length	Observations
Atlanta, GA	Jan. 7th	Dec. 10th	337 Days	240
Baltimore, MD	Feb. 27th	Sep. 11th	196 Days	154
Madison, WI	Apr. 8th	Sep. 3rd	148 Days	107

Table 2: Summary of Total Daily Pollen Counts, by Location and Category

Station	N	Mean Daily Pollen Count (CI)	Daily Pollen Count Max (Min)	Daily Tree Pollen Max	Daily Grass Pollen Max	Daily Weed Pollen Max
Atlanta	240	114.4 (69.2 – 160.2)	3583 (0)	3549	23	53
Baltimore	154	131.3 (70.8 – 191.8)	2310 (0)	2295	120	97
Madison	107	160.3 (100.3 – 220.3)	1831 (0)	1804	42	214

Units: pollen grains/m<sup>3</sup>

Figure 3: Pollen Counts, by Location and Category

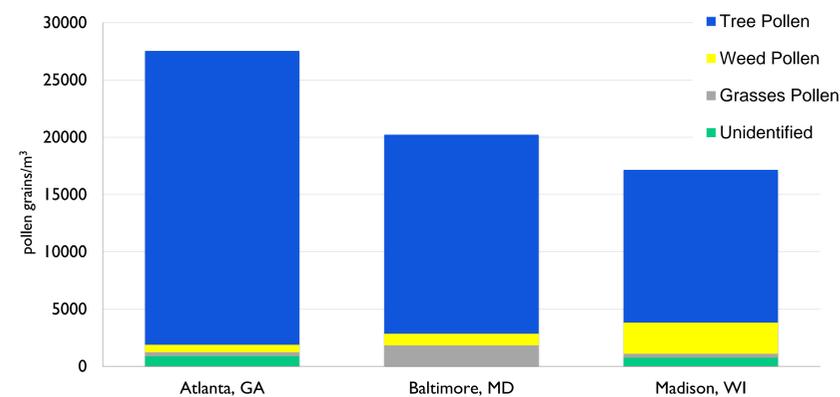
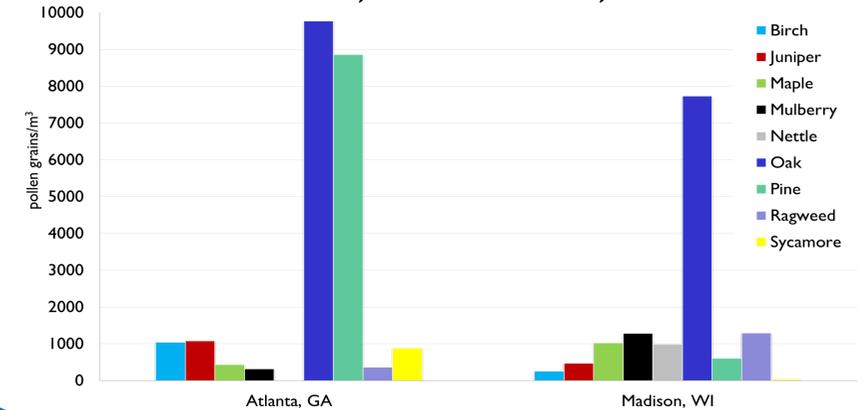


Figure 4: Total Tree Pollen Count by Plant Taxa: Atlanta, GA and Madison, WI



## Results

- Table 1 illustrates the pollen season length, by location. Atlanta's pollen season started the earliest and lasted longest, at 337 days. The Baltimore pollen season started earlier and lasted longer than the pollen season for Madison.
- The mean daily pollen count was higher in Madison and Baltimore in comparison to Atlanta (Table 2); it was likely due to Atlanta's longer pollen season. The maximum daily tree and grass pollen counts were highest in Atlanta, and the maximum daily weed pollen count was highest in Madison.
- The total annual pollen counts were highest in Atlanta (total pollen=27,535 grains/m<sup>3</sup>) and lowest in Madison (total pollen=17,151 grains/m<sup>3</sup>) (Figure 3). In all three locations, tree pollen represented the major pollen source that contributed to the observed counts. Weed pollen counts were highest in Madison; grass pollen counts were highest in Baltimore.
- When examining the tree pollen category by specific taxa, oak pollen counts were the highest in Atlanta and Madison (Figure 4). Pine pollen counts were also high in Atlanta.

## Conclusion

The data summarized illustrate differences in total pollen load and pollen type in three different geographic locations. Observed differences in pollen characteristics are related to climatic conditions such as annual temperature and rainfall. With the anticipated increases in temperature and carbon dioxide concentrations by the end of this century, pollen counts will likely increase, and specific pollen taxa will also likely change. These observations argue for the need of a national pollen monitoring system.

One challenge that was addressed in this poster was to identify an approach to compare pollen data when there are differences in the start date and duration of the pollen season. The approach used was to identify a percentile criterion to objectively define the start of the pollen season. To do this, we selected the lower limit of the 99.9<sup>th</sup> percentile for total daily pollen in Atlanta, Baltimore and Madison.

These data not only provide a baseline for the timing of the pollen seasons, but can also be used to help predict when higher pollen counts may adversely impact health outcome measures such as emergency department visits.

The data also provide a basis to design, implement and maintain a national pollen surveillance system.



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