

*Natures's Notebook provides phenology observations for NASA Juniper Phenology and Pollen Transport Project*

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## Background/Question/Methods

Pollen can be transported great distances. Van de Water et al., 2003 reported *Juniperus* spp. pollen, a significant aeroallergen was transported 200-600 km. Hence local observations of plant phenology may not be consistent with the timing and source of pollen collected by pollen sampling instruments. Direct detection of air borne pollen via satellite is not practical. A practical alternative combines modeling and phenological observations using ground based sampling and satellite data.

*Juniperus* spp. pollen phenology may respond to a wide range of environmental factors such as day length, growing degree-days, precipitation patterns and soil moisture. Species differences are also important. These environmental factors vary over both time and spatial scales. Ground based networks such as the USA National

Phenology Network have been established to provide national wide observations of vegetation phenology. However, as the Network is still in the early phases of establishment and growth, the density of observers is not yet adequate to sufficiently document the phenology variability over large regions. Hence a combination of satellite data and ground observations can provide optimal information regarding *Juniperus* spp. pollen phenology.

#### Results/Conclusions

MODIS data was used to observe *Juniperus* spp. pollen phenology. The MODIS surface reflectance product (MOD09) provided information on the *Juniper* spp. cone formation and cone density. Ground based observational records of pollen release timing and quantities were used as verification. Approximately 10,818 records of juniper phenology for male cone formation for *Juniperus ashei*, *J. monosperma*, *J. scopulorum*, and *J. pinchotii* were reported by *Nature's Notebook* observers in 2013. These observations provided valuable information for the analysis of satellite images for developing the pollen concentration masks for input into the PREAM (Pollen REgional Atmospheric Model) pollen transport model. The combination of satellite data and ground observations allowed us to improve our confidence in predicting pollen release and spread, thereby improving asthma and allergy alerts.

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