

## LADCO Summer 2024 Internship

The Lake Michigan Air Directors Consortium (LADCO) is hiring a summer intern to conduct atmospheric science research in the Great Lakes region. The project will involve both examination of scientific literature and new analysis of environmental datasets.

**Applications are due on March 8 @ 5:00 Central.**

### Project Description

The Upper Midwest of the U.S. is a land-locked mid-latitude geographical setting where complex atmospheric physical and chemical processes interact with local emissions sources and air pollutant transport patterns. The weather in the region, which is modulated by dynamical processes associated with the Great Lakes, is a key driver of air pollution episodes. Periodically, upwind wildland and prescribed fire smoke is transported into the region resulting in unhealthy concentrations of ground level ozone ( $O_3$ ) and fine particulate matter ( $PM_{2.5}$ ). To understand the impact of transported smoke on air quality in the region, LADCO developed a screening tool based on satellite and surface observations to identify days in which fire smoke impacted pollution at surface locations in the Midwest.

To complement this screening tool, we need to examine regional meteorological conditions associated with high  $O_3$  and  $PM_{2.5}$  concentrations in the region with and without the influence of fire smoke. The internship project will be to analyze the meteorological patterns for fire smoke-influenced days and non-smoke days using the supervised and unsupervised Self-Organizing Maps (SOM)<sup>12</sup> analysis method. The intern will process surface and upper air meteorology data provided by LADCO using the SOM technique. The SOM will be used to identify the meso-scale meteorological patterns associated with different high pollution days. The intern will develop and apply methods for visualizing the key meteorological patterns identified by the SOM and for summarizing the conditions quantitatively.

The objectives of this project are (1) to improve the conceptual model of the high  $O_3$  and  $PM_{2.5}$  formation in the Midwest by identifying the associated regional meteorological conditions using the SOM method, and (2) to provide a basis for determining whether satellited-observed smoke reached the surface and enhanced ground-level  $O_3$  and  $PM_{2.5}$  concentrations.

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<sup>1</sup> [https://en.wikipedia.org/wiki/Self-organizing\\_map](https://en.wikipedia.org/wiki/Self-organizing_map)

<sup>2</sup> <https://cran.r-project.org/web/packages/kohonen/kohonen.pdf>

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The final products of the internship will be a report describing the intern's analysis and findings, and a presentation to staff from LADCO, U.S. EPA, and LADCO member states.

### **Position Requirements**

You must have completed at least your sophomore year at an accredited university. Preference will be given to applicants who are either currently enrolled in a university degree program or who recently graduated from a university. If you are not a U.S. citizen, you must have a valid and current student or work visa. Preference will be given to students majoring in a scientific field (including but not limited to atmospheric science, environmental science, biology, chemistry, engineering, geology, mathematics, meteorology, and physics). Students should have completed some environmental course work.

### **Additional Skills Desired:**

- Familiarity with and ability to program in interpreted programming languages such as MATLAB, R, and Python.
- Familiarity with handling large datasets in various formats such as GRIB and NetCDF formats.
- Experience analyzing and interpreting complex datasets, ideally focused on meteorological data.
- Working knowledge of statistics, including various statistical tests and spatial statistics.
- Access to online library databases (e.g., Web of Science) and electronic scientific journals.
- Experience in literature review of scientific papers and publications.
- Experience in research paper writing and presenting technical information to others.

### **Internship Details**

- Term: 8 weeks in June – August 2024 (exact timing is negotiable)
- Hours: 20-30 per week
- Location: Virtual
- Stipend: \$3,000 paid in two installments
- The intern will work remotely under the supervision of the LADCO Atmospheric Modeler

## **Application**

**Applicants should submit the following materials via email to the LADCO office manager ([heath@ladco.org](mailto:heath@ladco.org)) by March 8 @ 5:00 Central.**

- Cover letter that includes a 1-page statement describing your interest in the internship and your qualifications for the position. This statement should describe your experience reading and applying information from the scientific literature, analyzing environmental data or other complex datasets, and developing software tools for data analysis.
- A resume or CV that includes your full contact information, and describes your academic background, GPA, course work, academic honors or awards, and any relevant research or work experience.
- Two reference letters. Letters should address your academic abilities, accomplishments, work habits, potential as a researcher, and ability to participate in and benefit from an internship program in air quality science. Recommendations generally come from your professors or supervisors. Please include your reference letters with your application.

## **About LADCO:**

LADCO is an air quality research and planning organization located in Chicago. We work with state, local, and tribal air agencies in the Great Lakes region to fulfill their commitments under federal clean air regulations to improve air quality in the region. The LADCO region includes Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

LADCO provides equal employment opportunities to all employees and applicants for employment and prohibits discrimination and harassment of any type without regard to race, color, religion, age, sex, national origin, disability status, genetics, protected veteran status, sexual orientation, gender identity or expression, or any other characteristic protected by federal, state, or local laws.