POST-DOCTORAL POSITION: Air Pollutant and Climate Change Effects on Crop Yield

RESEARCH PROBLEM: Ozone is a damaging air pollutant, significantly reducing ecosystem photosynthesis and crop yields. The effects of ozone on crop production are tested using experimental facilities such as the Free Air Concentration Enrichment (FACE) facility in Champaign, IL and through historical time-series regression modeling and process-based modeling. Previous work suggested that soybean and maize yields were more sensitive to ozone pollution during hot and dry growing seasons. This is a somewhat counter-intuitive finding based on the physiology of crops. Currently, the interactive effects of drought stress and ozone pollution are being tested at SoyFACE. The focus of a new post-doctoral position is to test how ozone pollution impacts solar induced fluorescence (SIF) using the SoyFACE facility and to expand time-series modeling of air pollutants, climate data and crop productivity to other U.S. crops and to investigate the relationship between historical ozone and climate data with satellite retrievals of GPP and crop yield.

OBJECTIVES: 1) Synthesize long-term ozone data from field work and literature to conduct meta-analysis. 2) Large-scale data analysis: collate novel high-resolution surface ozone datasets and ozone data from the EPA’s Air Quality System, yield data and statistics, satellite-based SIF record (including GOME-2, OCO-2/-3, TROPOMI, and downscaled versions of these data), satellite-based GPP record (e.g. SLOPE GPP), and climate records (e.g. precipitation, temperature and potential evapotranspiration data). 3) Examine the empirical and mechanistic linkages between ozone exposure and crop-specific GPP, SIF and yields. 4) Perform anomalies analysis and machine learning analysis to identify the most important factors affecting inter-annual GPP, SIF, and yield changes. 5) Develop a statistical framework to quantify the sensitivity of GPP, SIF, and yields of different crops to ozone exposure. 6) Use the SoyFACE experimental facility to ground-truth relationships between ozone and drought stress, SIF and GPP.

The post-doctoral fellow will work closely with Dr. Elizabeth Ainsworth from USDA ARS and Dr. Kaiyu Guan from UIUC on data analysis and modeling, and other colleagues at USDA ARS and UIUC who have led multiple research projects on physiology of ozone damage and crop monitoring. The post-doctoral associate will participate in weekly group meetings, present findings at local and national meetings, and engage farmer groups and industry at collaborative field days. This training will poise the post-doctoral associate for important career opportunities in data science and crop modeling that are in increasing demand in agriculture.

APPLICATION PROCESS: To ensure full consideration, qualified candidates must send a cover letter, CV, and contact information of three references via email with the subject “Air Pollution Postdoc” to linxin@illinois.edu. All requested information must be submitted to the above email in order for your application to be considered. Incomplete applications will not be reviewed. Qualified applicants will be immediately reviewed upon receiving the application while the search may continue until the position is filled. We will only give feedback to those candidates that we plan to interview. For further information, please contact: Ms. Xin Lin (linxin@illinois.edu).