Quantification of Environmental Drivers Underlying the Changes in Urban Vegetation Across the United States

Singh, Ridhima (School: Farragut High School)

Over the past few decades, urban areas have been experiencing expedited rates of vegetation growth, a phenomenon known as “urban greening.” The increased vegetation growth and greening trends which have been further exacerbated due to the effects of climate change have many implications for infrastructure, finances, and ecosystem productivity. However, research pertaining to the natural and anthropogenic drivers behind urban greening is still severely limited, hampering the ability to better understand and accurately predict the impact of greening trends. This project investigates changes in urban vegetation growth and their natural and anthropogenic drivers using a combination of spatial analysis, statistical modeling, and machine learning techniques. Satellite derived Enhanced Vegetation Index (EVI) data from 2001-2020 for various urban and adjoining rural areas across the US was analyzed along with climatology (precipitation, shortwave radiation, and temperature) and anthropogenic (atmospheric carbon dioxide concentration and nitrogen deposition) factors to quantify the contributions from the different variables. The partial correlation method was used to analyze the vegetation growth sensitivities to major climate variables, and the multiple regression model was used to examine the contributions of the climate and anthropogenic factors to long-term EVI variations. The findings of this research shows that urban greening exhibits an increasing trend and can be explained by changes in temperature and carbon dioxide concentrations. These results can be used to better assess the influence of both natural and anthropogenic factors on urban vegetation growth and its long term impacts on the urban ecosystem.

Awards Won: