



Enhancement of Afternoon Thunderstorm Activity by Urbanization in a Valley for the Past Four Decades: Taipei

Tsing-Chang Chen (1) and Ming-Cheng Yen (2)

(1) Department of Geological and Atmospheric Sciences, Iowa State University, Ames, IA, U.S.A. (tmchen@iastate.edu), (2) Department of Atmospheric Sciences, National Central University, Chung-Li, Taiwan

Located in northern Taiwan, Taipei is a metropolis surrounded by hills and mountains that form a basin in which two river valleys funnel the surface airflow of this basin to the open sea. Because of the southwest monsoon, summer is a dry season in northern Taiwan but is the season of maximum rainfall in the Taipei basin. This unusual summer rainfall maximum in Taipei is largely produced by afternoon/evening thunderstorms—in particular, on the downwind side and slopes of mountains south of the city. The population in the city of Taipei and the county in which this city is located has more than tripled during the past four decades while land use for building and surface construction increased by a factor of 3. This urbanization may contribute to an increase of 1.5°C in daily mean temperature, a decrease of 1°C in daily temperature range, an increase of more than 67% in the frequency of afternoon/evening thunderstorms, and an increase of 77% in rainfall generated by thunderstorms. These findings may explain the reduction in the water supply deficit to the Taipei metropolitan area and the ground subsidence of the Taipei basin caused by the excessive use of groundwater. Results of this study also provide important information for urban planning and pollution control and for management of the increasing traffic hazards caused by the enhanced thunderstorm activity and rainfall.