Weekly Seminar: Fall 2010

Date: Friday October 22

Time: 11:00 AM

Location: Maryland Hall 110

Speaker: Somnath Baidya Roy (University of Illinois)

Title: *"Monitoring and modeling impacts of wind farms on local meteorology"*

Abstract

Wind power is one of the fastest growing energy sources in the world, most of the growth being in large wind farms that are often located on agricultural land near residential communities. This study explores the possible impacts of such wind farms on local hydrometeorology using a mesoscale model equipped with a rotor parameterization based on data from a commercial wind turbine. Results show that wind farms significantly affect near-surface air temperature and humidity as well as surface sensible and latent heat fluxes. The signs of the impacts, i.e., increase or decrease, depend on the static stability and total water mixing ratio lapse rates of the atmosphere. In this regard, the simulations can replicate the pattern of surface temperatures observed at the San Gorgonio windfarm in California. The magnitudes of these impacts are constrained by the hub-height wind speed but also depend to some extent on the size of the wind farms. Wind farms also affect the hydrometeorology of an area up to 18-23 km downwind. This lengthscale appears to be independent of the background wind speed but more work is required to conclusively estimate the lengthscale of wind farm wakes. This study is one of the first few to provide realistic estimates of possible impacts of wind farms. The model developed and used in this study can help in assessing and addressing the environmental impacts of wind farms thereby ensuring the long-term sustainability of wind power.