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## **Effects of Human Activities on the Atmosphere**

*Detecting the Atmospheric Response to the Changing Face of the Earth: A Focus on Human-Caused Regional Climate Forcings, Land-Cover/Land-Use Change, and Data Monitoring, Boulder, Colorado, 27–29 August 2007*

Human activities continue to significantly modify the environment. The impacts of these changes are highlighted, for example, in local-, regional-, and global-scale trends in modern atmospheric temperature records and other relevant atmospheric indicators. Studies using both modeled and observed data have documented these impacts. Thus, it is essential that we detect these changes accurately to better understand the impacts on climate and provide improved assessment of the predictability of future climate.

Therefore, the objectives of this National Science Foundation–funded workshop were two-fold. First, the workshop highlighted land-use/land-cover and ecosystem change and subsequent impacts on weather and climate. Participants discussed both long-term systematic change (e.g., agricultural land-use change, deforestation) and short-term abrupt change (e.g., rapid small-scale urbanization). Second, the workshop addressed new observing systems and issues associated with using the national data archive to monitor climate changes. Temperature is one key indicator of impacts of land-

use/land-cover change, and hence this workshop featured issues related to temperature observation and associated bias. However, biases associated with precipitation were also discussed.

Papers were organized under three sessions in order to discuss recent developments, including (1) observations of land-surface/ecosystems function changes and their interactions with weather and climate; (2) modeling effects of land-use/land-cover change and ecological processes on weather and climate; and (3) monitoring and quantifying land-use/land-cover change and ecological processes and their impacts on observational data including multidecadal surface air temperature trends and associated bias.

Participants discussed impacts of croplands on climate, land-use changes on temperature change, urbanization on precipitation, deforestation and soil moisture changes on monsoon and monsoon depressions, vegetation change and subsequent modification of plant biophysical properties on climate, impacts of man-made lakes on weather, and model representation of land use. Several papers also discussed the role of station histories in identifying land-use change, the important role the Climate Reference Network (CRN) can play in detecting the impacts of land-use change on climate, the effects of land use on precipitation measurement and bias correction, biases associated with United States Historical Climatology Network (USHCN) data and its use in land-change studies, and challenges associated with determining impacts of land-use change on the Tibetan Plateau.

More than 50 papers were presented, and the participants represented Australia, Canada, China, Colombia, India, Netherlands, Turkey, and the United States. A total of

16 graduate students and postdoctoral researchers were supported through travel grants from the NSF. A number of recommendations were made including a call for more accurate land-use/land-cover data for modeling and for better understanding of the interactions between changed land surface and the atmosphere; more studies on the impacts of wetlands, man-made lakes, agricultural land uses, and urbanization on weather and climate the monitoring of soil moisture, and the use of the CRN in conjunction with land-use/land-cover change studies and assessment of data quality in other networks. Details of the recommendations will be published in the form of several journal papers. Participants also recommended publishing a journal special issue. Papers presented at the workshop can be found at <http://cires.colorado.edu/science/groups/pielke/links/Detect/> and <http://kyclim.wku.edu/>.

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