Introduction to the NCAR Weather and Climate Impact Assessment Science (WCIAS) Initiative

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Climate and weather create hazards and opportunities for society at multiple scales. The practice of identifying and evaluating the detrimental and beneficial consequences of phenomena such as weather and climate on natural and human systems is referred to as impacts assessment. However, to conduct effective, high quality assessments, researchers and society must have the appropriate methods, tools, and research.

The overarching, long-term goal of the WCIAS Initiative is:

To improve society's ability to manage weather and climate risks by creating and providing research tools and methods at the critical frontiers of impact assessment science.

The fundamental approach to development of the Weather and Climate Impact Assessment Science (WCIAS) Initiative has been to focus on themes in Impacts Assessment Science where there are *critical research gaps* and need *for rapid methodological advances*, as well as *need for integration across the physical atmospheric sciences, physical impacts and social science aspects of important assessment topics.*

The Initiative focuses on the development of methods and tools that can be used to produce high quality impacts assessments of weather and climate. It is organized around three themes: characterizing uncertainty in all phases of impacts assessment, extreme weather and climate events, and climate and health. These three themes were selected because they have been identified within the assessment community and through national and international assessments as particularly needing methodological development and integration (Sarewitz and Pielke, 2000, IPCC, 2002; IPCC WGI, 2004; Burke et al., 2001). They are also areas wherein NCAR physical science and statistical expertise could be leveraged and drawn towards environmental and societal components of the themes that could be developed within the Environmental and Societal Impacts Group (ESIG). This integration across NCAR is an important institutional goal of the Initiative.

The three themes are not isolated but are closely inter-related. Quantifying uncertainty regarding future climate extremes is a challenging research problem. Linkages between climate and health are highly uncertain, and extreme climate events figure prominently in climate-disease research. Human health is also a climate impact area of great complexity, to which the public is highly sensitive; and it thus requires careful, robust analysis.

The long-term scientific objectives for the three themes are the following:

- To support improved responses to weather and climate risks by understanding and characterizing the uncertainties throughout the assessment process that affect the decision-making process.

- To increase the resilience of human populations to extreme weather and climate events through improved tools, modeling and data.

- To catalyze and nurture an interdisciplinary research community studying the effects of climate on human health.

The projects selected for development within the Initiative were chosen because they concerned either discrete or integrating research that contributed to these larger goals. The projects described in the abstracts and papers of the review material may be grouped according to the sub-goals to which they contribute:

- To extend capabilities of climate scenarios by exploring forcing uncertainty and assumptions. Projects: *Uncertainty of Land Cover Forcing in SRES,* Climate *Variability of Past Centuries.*

- To quantify uncertainties in climate model simulations that support decision-making. Projects: *Pattern Scaling in Global Climate Models, Quantifying Uncertainty in Projections of Regional Climate Change.*

- To determine robust trends in extreme events of importance to society in observations and for the future. Projects: *Aviation Related Extremes, Extremes Toolkit, Spatial Scaling of Extremes, Extremes in Climate Models, Downscaling of Extreme Phenomena*.

- To work towards iterative end-to-end studies of weather and climate that includes societal use of forecasting of weather, climate, and their extremes in support of decision-making. Projects: *Integrated Water Resources: New Methods to Support Decision Making during Freshwater Ecosystem Service Evaluation; Climate Variability and Uncertainty in Flood Hazard Planning; Managing Wildfire Risks;* and *Decision Making as a Centerpiece.*

- To develop a long-term Climate and Health Program. Project: *The Annual NCAR/Johns Hopkins Summer Colloquium on Climate and Health.*

Some of these projects were begun in FY02, but most were initiated in the following year, and hence have been on going for only two years. Already, as can be seen in the detailed project abstracts and in the publications, considerable progress has been made, although much work is still needed to attain the long-term goals. It can be stated

incontrovertibly, however, that all projects have produced critical research products that have advanced us towards the attainment of both the discrete and integrating goals of the Initiative. It is also the case that virtually all of the research produced or in progress would have been neither undertaken nor accomplished without the support of the Initiative. In this regard, the WCIAS Initiative has already fulfilled the NCAR institutional goal for all the strategic initiatives of creating new and integrating research strands within NCAR.

References:

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