

## Abstract: **Global Warming and Heavy Precipitation Design Values**

Kenneth E. Kunkel, David R. Easterling, Sarah Champion,  
Xungang Yin, Michael Squires, and Steve Stegall

The design of infrastructure that must deal with rainfall runoff uses design values of heavy rainfall that are a function of the average return period and duration of an extreme event. The relationships of intensity, duration, and frequency are known as Intensity-Duration-Frequency (IDF) relationships. One of the more confident outcomes of global warming is an increase in extreme precipitation due to the strong relationship between saturation vapor pressure and temperature. Thus, future increases in extreme precipitation are likely to be large and incorporation of non-stationarity into IDF relationships is necessary to provide for resilient infrastructure design. The objective of this study is to develop a framework for incorporating the potential impact of future climate change into the IDF values of heavy precipitation. Two main factors are involved: the capacity for atmosphere to produce extreme precipitation (water vapor concentration) and opportunities to receive extreme precipitation (weather systems). The weather system types being examined are extratropical cyclones (ETCs), tropical cyclones (TCs), and North American Monsoon moisture surges.

This project is funded by the Department of Defense (DoD) Strategic Environmental Research and Development Program.