

Hydro-meteorological causes of ten-year floods throughout the Northeast United States

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A diagnostic study was performed to determine the hydro-meteorological causes of extreme floods in the Northeast United States. Most floods in this part of the U.S. occur between March and May, when precipitation from extratropical storm systems combine with post-winter snowmelt to produce high volumes of runoff into river basins. We determined the dates of floods that exceeded extreme thresholds through gauge stations at two basins: the Susquehanna in New York and Pennsylvania, and the St. John Basin in Maine. Composite maps of meteorological variables centered on the flood date show a low pressure center with a significant warm sector traveling over the basins several days before the flood, carrying with it moisture from the Atlantic and the Gulf of Mexico. In most cases this moisture precipitated into the basins as anomalously intense rainfall. Many extreme floods were also preceded several weeks earlier by anomalously high snow depths, which decreased to expected seasonal values by or before the flood date. And other times precipitation and/or snowmelt contributed to other surface-level mechanisms, such as ice jams, that were responsible for flooding. Extra-tropical systems also precede less extreme springtime floods, but usually with lower intensity and with smaller antecedent snow depths. Our findings do not sufficiently address the prospects for long-lead prediction of these flood events but they may be useful for identifying typical scenarios surrounding ten year floods in conjunction with more complex meteorological predictive models.