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Changes in the timing of high river flows in New England over the 20th Century

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Abstract

The annual timing of river flows is a good indicator of climate-related changes, or lack of changes, for rivers with long-term data that drain unregulated basins with stable land use. Changes in the timing of annual winter/spring (January 1 to May 31) and fall (October 1 to December 31) center of volume dates were analyzed for 27 rural, unregulated river gaging stations in New England, USA with an average of 68 years of record. The center of volume date is the date by which half of the total volume of water for a given period of time flows past a river gaging station, and is a measure of the timing of the bulk of flow within the time period. Winter/spring center of volume (WSCV) dates have become significantly earlier (p<0.1) at all 11 river gaging stations in areas of New England where snowmelt runoff has the most effect on spring river flows. Most of this change has occurred in the last 30 years with dates advancing by 1â€“2 weeks. WSCV dates were correlated with March through April air temperatures

(*r*=â^'0.72) and with January precipitation (*r*=â^'0.37). Three of 16 river gaging stations in the remainder of New England had significantly earlier WSCV dates. Four out of 27 river gaging stations had significantly earlier fall center of volume dates in New England. Changes in the timing of winter/spring and fall peak flow dates were consistent with the changes in the respective center of volume dates, given the greater variability in the peak flow dates. Changes in the WSCV dates over the last 30 years are consistent with previous studies of New England last-frost dates, lilac bloom dates, lake ice-out dates, and spring air temperatures. This suggests that these New England spring geophysical and biological changes all were caused by a common mechanism, temperature increases.

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Keywords

Streamflow; Trend detection; Spring; Fall; Variability; Climate change

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