

**Large-scale climate controls of Interior Alaska river ice breakup**

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Frozen rivers in the Arctic serve as critical highways due to lack of roads, therefore it is important to understand the key mechanisms that control the timing of river ice breakup. The relationships between springtime Interior Alaska river ice breakup date and the large-scale climate are investigated for the Yukon, Tanana, Kuskokwim, and Chena Rivers for the 1949-2008 period. The most important climate factor that determines breakup is April-May surface air temperatures (SATs). Breakup tends to occur earlier when Alaska April-May SATs and river flow are above normal. Spring SATs are influenced by storms approaching the state from the Gulf of Alaska, which are part of large-scale climate anomalies that compare favorably with ENSO. During the warm phase of ENSO fewer storms travel into the Gulf of Alaska during the spring, resulting in a decrease of cloud cover over Alaska, which increases surface solar insolation. This results in warmer than average springtime SATs and an earlier breakup date. The opposite holds true for the cold phase of ENSO. Increased wintertime precipitation over Alaska has a secondary impact on earlier breakup by increasing spring river discharge. Improved springtime Alaska temperature predictions would enhance the ability to forecast river ice breakup timing.