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Reconstructing Glacial Lake Vitim and its cataclysmic drainage to the Arctic Ocean

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A large glacial lake (23500 km^2/3000 km^3) was formed when the River Vitim, one of the largest tributaries of the Lena River in Siberia, Russia, was blocked by glaciers from the Kodar Mountains. This lake, Glacial Lake Vitim, was subsequently drained in a large outburst flood that followed the rivers Vitim and Lena to the Arctic Ocean. Evidence of a cataclysmic drainage was first identified in the form of a large bedrock canyon in the area of the postulated ice dam. The enormous dimensions of this feature (6 x 2 x 0.3 km) suggest formation via a drainage event of extreme magnitude, and field inspection downstream revealed giant bars $>$100 m above the valley floor, similar to those described from cataclysmic floods elsewhere. We present chronological constraints for the duration of the ice dam and for the timing of the flood based on terrestrial cosmogenic nuclides and optically stimulated luminescence. Given that the volume of Glacial Lake Vitim was significantly larger than other well known lakes associated with cataclysmic outbursts—glacial lakes Missoula (northwestern USA) and Chuja-Kuray (Altai Mountains, Russia)—it is pertinent to assess the possible climatic consequences of Lake Vitim's drainage. The outburst flood from Glacial Lake Vitim is likely among the largest floods documented on Earth thus far. Possible impacts include rapid change of climate and precipitation patterns in the area of the former glacial lake, major disturbance along the flood course to the Arctic, and perhaps even regional-scale climatic feedbacks linked to altered sea ice dynamics in the Arctic Ocean.