Sediment connectivity in the Rhône Basin: from an isolated thunderstorm at Illgraben to a turbidity current in deep Lake Geneva

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In the Rhône canyon of Lake Geneva (Figure 1), turbidity currents are occasionaly present in summer. Based on velocity measurements in the canyon and discharge measurements at Porte du Scex in the Rhône 6 km upstream of Lake Geneva (Figure 1), Lambert and Giovanoli (1988) hypothesized that Rhône River floods and slides of sublacustrine deltaic deposits are the main causes of these turbidity currents. Here, we present another type of initiation: a strong sediment event along the sediment cascade of the Rhône basin, ending in a deep lake turbidity current without a significant increase in water discharge of the Rhône River. Using data available at the Illgraben catchment in Wallis (McArdell, 2016), at Porte du Scex, and our own velocity measurements in the Rhône canyon (Figure 1), we are able to follow the release of a strong sediment pulse from source to sink. At Illgraben, a debris flow, reaching the Rhône River, is triggered by a short and intense convective storm that does not significantly increases the Rhône water discharge (Bennett, 2014). Eleven to thirteen hours later, the fine sediment cloud is observed at Porte du Scex, which is situated 84 km further downstream, and subsequently a turbidity current is measured in the canyon. The observations demonstrate the high and fast sediment connectivity between specific high-alpine areas and the deep part of Lake Geneva.

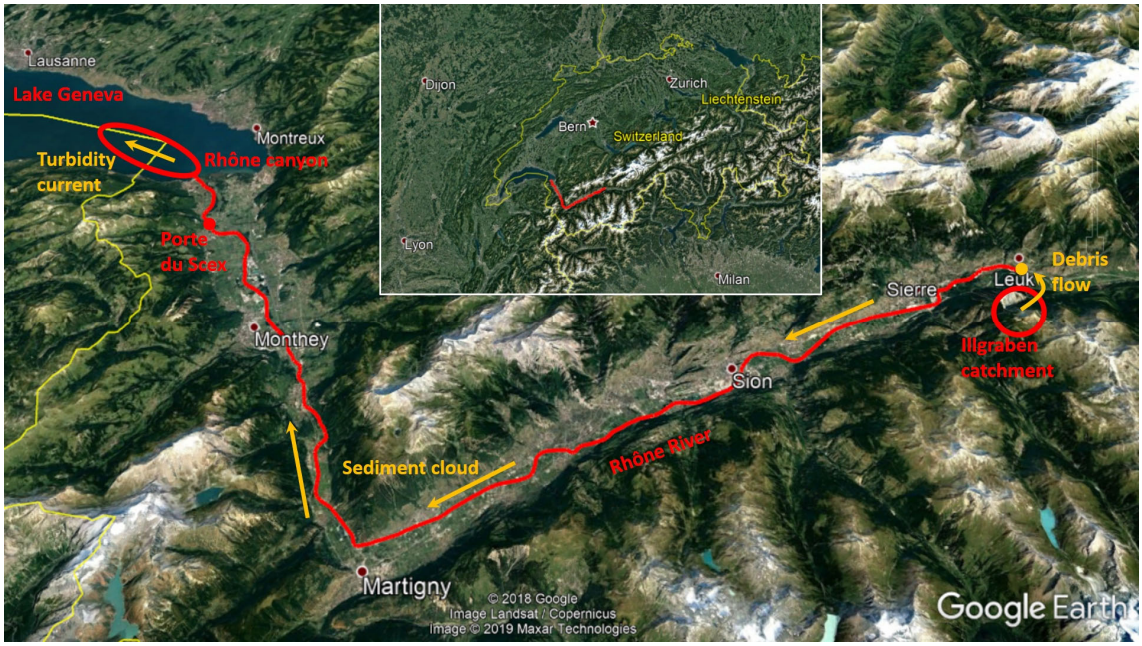

Figure 1. Situation of the observation sites in the upper Rhône catchment and processes involved in the sediment cascade from high alpin slopes to Lake Geneva during a strong sediment event.

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