



Flood and sediment dynamics in Lake Mondsee: insights from a hydro-sedimentary monitoring

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Detrital layers in lake sediments are increasingly exploited to establish continuous long flood chronologies. The annually laminated sediments of Lake Mondsee (486 m a.s.l., Upper Austria) provide a seasonally resolved flood layer record over the past 7000 years. However, detailed comparison of sediment and instrumental flood data revealed a partial mismatch emphasizing the need for a better understanding of hydrological and sedimentological processes leading to the formation of flood-triggered sediment layers.

For this purpose, a monitoring network was set up at Lake Mondsee recording run-off and suspended sediment concentration at the outlet of the main tributary, the Griesler Ache River, and collecting sediment within the lake at three-day-time intervals by sediment traps, one located 0.9 km off the main inflow (water depth: 55 m) and one in the deepest part of the lake (61 m) in a more distal position at a distance of 2.8 km.

Our monitoring data cover a period of 30 months from January 2011 to July 2013. The mean sediment flux in Lake Mondsee yields 4 g/(sqm*d) and exhibits (I) a pronounced seasonal variability and (II) a succession of 30 occasional peaks in mainly detrital sediment flux reaching values of up to 758 g/(sqm*d) at the proximal trap and 59 g/(sqm*d) at the distal trap. The comparison with runoff data revealed (I) coincidence of 83% of the sediment flux peaks with elevated runoff events spanning from 10 to 110 cbm/s, (II) empiric flood thresholds for triggering significant sediment influx in the proximal (20 cbm/s) and distal lake basin (30 cbm/s) and (III) a variable spatial sediment distribution. The latter is mainly due to the role of (i) flood duration, (ii) the existence of a thermocline in summer leading to favoured sediment transport in the upper water column and (iii) local sediment sources which episodically contribute additional detrital material. Monitoring floods of very different intensity and seasonal occurrence shows a complex relation between flood amplitude and sediment signal. This helps to identify uncertainties in the Lake Mondsee flood layer record and demonstrates the potential for a closer link of instrumental and sediment-based flood time-series.