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# River conferences under temperate valley glaciers

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Both geophysical measurements (ground penetrating radar) and hydrological inference has shown that subglacial drainage networks are dendritic and that means that they must have confluences. In general, there are very few studies of rivers under glaciers and almost no consideration at all of confluences, despite the fact that they could be a critical parameter in understanding coupling at the ice-sediment bed interface. Subglacial channels, normally known as conduits, are typically associated with the combined effect of hydraulic pressure driven ice melt (which opens them) and ice overburden pressure (which closes them). Inferences from dye break out curves shows that has the efficiency of ice melt increases progressively during the summer ablation season, melt rates closure rates and a channelized system becomes progressively more effective. Most recently, measurements at the Upper Arolla Glacier show that the effects of this growing efficiency is an evolution in the subglacial hydrological system towards higher peak flows and lower base flows later in the melt season. This increases the probability that late in the melt season, sediment transport becomes discontinuous, with overnight deposition and daytime erosion. This would in turn produce the rapid reductions in sediment transport capacity overnight needed to deposit sediment and to block conduits, increase basal water pressure and explain the hydraulic jacking observed in snout marginal zones at a time when it should not be expected.

The question that follows is what effects do confluences have on this process? The geometry of subglacial channels is such that when they join they lead to rapid changes in hydraulic geometry. Crucially, these are likely to have a non-linear impact upon sediment transport capacity, which should reduce disproportionally in the conduits downstream of the junction. Thus, it is possible that confluence zones under glaciers become sites of very rapid sediment accumulation and blockage overnight. In this paper, we present some one-dimensional coupled hydraulic sediment transport modelling to show this process. It suggests that the dendritic form of the subglacial drainage network is the primary reason why sediment blockage occurs and suggests the need for a more in-depth assessment of how sediment moves through confluences under glaciers.