



Seasonal evolution of subglacial drainage system in the lower tongue of Hailuogou glacier, China, deduced by repeated dye-tracing experiments

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Dye tracing experiments were widely used in study of englacial and subglacial drainage system development. Tracer experiments provide information about hydraulic conditions of a drainage system if the tracer transport is identical to the flow of individual water particles. In this study, formation and seasonal evolution of subglacial drainage system in the lower ablation area of Hailuogou glacier ice tongue were revealed by repeated dye tracer (Rhodamine WT) experiments during the 2009 ablation season. Between 10 April and 28 October in 2009, 18 dye tracer experiments were conducted at the lower ablation area of Hailuogou glacier ice tongue. Using a simple advection-dispersion model (ADM), the transit velocity (v), the hydrodynamic dispersion coefficient (D) and the degree of tracer spreading (d) were deduced. Transit velocity v varied from 0.148 to 0.555 m s⁻¹, which is typical of those found at other glaciers. Dispersivity d shows a relatively high value than that found at other glaciers, which varied from 27.05 to 287.49 m² s⁻¹. Seasonal changes of those indexes indicated that hydraulic efficiency of subglacial drainage system of lower ablation area of Hailoukou glacier experienced low-high-low during the whole ablation season. Based on the well relationship between calculated channel cross-section areas (A) and air temperature, precipitation and discharge, a simple regression model was applied to deduce continuous seasonal changes of A . The results show that A , which is also the index of the size of subglacial channel, was more expansion in middle summer than that in the earlier and later ablation seasons.