

Evidence of rapid subglacial water piracy under Whillans Ice stream

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The subglacial water system of the lower Whillans Ice Stream on the Siple coast contains numerous connected subglacial lakes in three hydrological basins (northern, central and southern). We use ICESat data to derive estimates of lake volume change and regional thickness changes. By combining these results with a water budget model, we show that a uniform, localized thickness increase perturbed the hydropotential, resulting in a change in course of a major flowpath within the system in 2005. Water originating from upper Whillans and Kamb ice streams that previously supplied the southern basin became diverted toward Subglacial Lake Whillans (SLW). This diversion led to a ten-fold filling rate increase of SLW. Our observation suggests that water piracy may be common in the Siple Coast region, where the gentle basal relief makes the basal hydropotential particularly sensitive to small changes in ice thickness. Given the previously inferred connections between water piracy and ice stream slowdown elsewhere in the region, the subtle and complex nature of this system presents new challenges for numerical models.