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Evidence of surface lowering at supraglacial lakes on debris-covered glaciers in the Himalayas

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Surface lowering at supraglacial lakes was investigated at Khumbu Glacier and Ngozumpa Glacier in the Nepal Himalayas. Supraglacial lakes with high turbidity were associated with areas of large surface lowering and relatively thin debris layers. Conversely, supraglacial lakes with low turbidity were located at glacier termini, where the glacier surface has been slightly uplifted and covered with a thick debris mantle. Lakes with high turbidity were connected to englacial conduits, and/or surrounded by ice cliffs, and received an inflow of meltwater. The water in these lakes is warmed prior to flowing out through englacial conduits. On the other hand, supraglacial lakes with low turbidity do not contribute to glacier ablation, since they have no inflow or outflow. Therefore, supraglacial lakes with low/high turbidity located on the lower part of a glacier are a reliable indicator of small/large amounts of surface lowering. Areas that show minor surface change indicate the location of a bank that is damming lake water, and areas with large surface lowering may indicate the location of a large and expanding glacial lake.