Dynamics of the Aget back-creeping push-moraine from 1998 to 2017

Julie Wee

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Glacier forefields within the belt of discontinuous permafrost are complex glaciological systems. Present-day landforms – such as push-moraines – existing in these systems are legacies of the interrelation between glacial and periglacial morphodynamics. The coexistence of glaciers and permafrost suggests that one can influence the other as a function of Holocene climate fluctuations. Knowledge of these interactions remains sparse. This study aims to gather elements contributing to the better understanding of these systems to help fill the knowledge gap.

Electrical resistivity measurements, which were carried out in 1998 to understand the impact of the advance of a small cirque glacier during the Little Ice Age (LIA) on pre-existing frozen debris, provided evidence for the frozen state of an active back-creeping push-moraine, morphologically similar to an active rock glacier. These measurements were repeated in 2017 to assess the evolution of permafrost in the push-moraine and its immediate surroundings. In combination with respectively 20-year and 15-year time series of surface temperature and displacement, data comparison indicates an overall permafrost degradation, which supposedly contributes to the decelerating behaviour of the push-moraine. The decrease of the creep rate of the Aget push-moraine is likely caused by a gradual geometrical readjustment and an advanced state of ice melt in some parts of the push-moraine, and consequently a change in friction at the shear horizon, hindering creep processes. Such observations reflect the influence of ice content on surface dynamics.

Supervisor : Prof. Reynald Delaloye