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Short term dynamics of the debris-covered Miage Glacier

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Due to the often inaccessible nature of debris-covered glaciers, studies of their dynamics tend to be restricted to those using remotely sensed data. This paper presents data on the short-term glacier dynamics of the debris-covered Miage Glacier, Western Italian Alps. The glacier velocity was calculated from repeat occupation of up to 22 points using a differential GPS system over two melt seasons. Meteorological, hydrological and water chemistry data were collected over the same time periods, and the nature of the hydrological system was studied using dye tracing, to allow the short term variations in glacier dynamics to be understood in terms of the likely glacial drainage system and its evolution. The highest glacier velocities and the greatest velocity variability was found near to where a cluster of moulins enter the glacier, close to the limit of continuous debris cover. The melt from the clean and dirty ice occasionally led to inputs overcoming the channelized system (both in spring and mid-summer), leading to increased velocities. On the debris-covered lower glacier however velocities were lower and less variable, and significant speed-up was confined to a period when subglacial water was thought to have been transferred subglacially from higher upglacier. The subdued sub-debris melt signal is thought to be the cause of the reduced velocity variability, in spite of the hydrological system beneath this part of the glacier remaining inefficient.