

Interactive comment on “Short-term velocity variations of three rock glaciers and their relationship with meteorological conditions” by V. Wirz et al.

Anonymous Referee #2

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General Comments:

Within the discussed paper data from six automated GPS stations is presented. The data is used to reconstruct local surface velocity variations at three rock glaciers over a three-year observation period. Ground surface temperature data (from iButtons) and recordings from weather stations and webcams are used to support the interpretation of the collected GPS data. In contrast to previous studies (which are covered extensively in the introduction section), the presented study allows the reconstruction of local intra-seasonal surface velocity patterns thanks to the high temporal resolution of the performed GPS measurements. The presented study therefore applies a novel approach (= automated, long-term GPS measurements on a rock glacier) to address a

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relevant research question (= temporal patterns of rock glacier surface velocity). The study confirmed previous investigations by showing clear seasonal patterns with rapidly increasing surface velocities after the beginning of snow melt and a comparatively slow deceleration in autumn. Water infiltration into the rock glacier seems to play a crucial role in the immediate acceleration of rock glacier surface velocity, which was impossible to detect in studies, which operate with coarser temporal measurement resolutions.

While the scope and research questions are clearly defined, the paper (still) has some significant weaknesses, which are addressed within the following sections ('specific comments' & 'technical comments').

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Specific Comments:

- Parts of the paper are redundant to Wirz et al. 2015 (e.g. instrumentation section). Redundant parts should be trimmed and cited. While it is understandable that the results of measurement campaigns are divided into more than one publication, it can also be confusing for the reader/scientific community.

- In Figure 1 the potential causes for creep velocity variations are portrayed schematically. The reasoning started within this figure could be extended in more detail and structure to the discussion section. The potential consequences of water infiltration at different times of the year on the rock- and ice-mechanical properties could be discussed in a more structured way (interesting aspects such as the (ir)relevance of active layer formation for observed velocity variations and different lag times could be addressed in more detail).

- While the authors acknowledge that care has to be taken when point measurements are extrapolated, they (repeatedly) assume that a rock glacier's velocity field is 'homogenous' (490:1). However, the irregular surface (ridges, depressions etc.) show that there have to be significant variations in creep velocities over longer time scales.

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- It would be interesting for the reader to get more information on the properties of the investigated rock glaciers. Maybe it would also be possible to characterize the rock glaciers based on ALS data instead of a 25m DEM.

- In some sections language could be more fluent and precise (e.g. 5.2.2, 5.2.3, 5.2.4)

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Technical Comments:

please refer to attached document.

Please also note the supplement to this comment:

<http://www.earth-surf-dynam-discuss.net/3/C293/2015/esurfd-3-C293-2015-supplement.pdf>

Interactive comment on Earth Surf. Dynam. Discuss., 3, 459, 2015.