

## ***Interactive comment on “Quantifying irreversible movement in steep fractured bedrock permafrost at Matterhorn (CH)” by Samuel Weber et al.***

**Samuel Weber et al.**

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Dear Mr. Isaksen and anonymous Referees,

We would like to thank for the detailed comments and constructive suggestions, which helped us to improve the manuscript. We hope that we have adequately addressed and answered all reviewer comments and changed the manuscript accordingly.

The referees state the topic is interesting and based on a very interesting 7 year time series of fracture displacements recorded at several locations at the Matterhorn. They highlighted several concerns which mainly concerned the clarity of the methodology, the focus and main result of the study and the introductory background information.

We addressed all these issues (and all the specific ones) raised by the referees and

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briefly outline here the more substantial changes/ revisions below.

- Regarding the misinterpretation of the focus: The focus of this study is not to predicting rock slope instabilities. To address this, we clarified the focus, purpose and novelty of this study in the abstract and introduction. Regarding the weakness of the initial conceptual model: We agree, the initial conceptual model was not consistent and contained some weaknesses. To be more precise, we now use the term “fracture kinematics” instead of “fracture dynamics”. We rewrote and shortened the conceptual model to an overview of the processes and related environmental controls and clarified the aim and research questions of the study in a separate section.
- Regarding difficulty in understanding methodology: We simplified and clarified the methods. We revised and clarified the whole method section. In particular, the LRM+ model was removed. Although it reproduced quite well fracture kinematics, it was not crucial for the main focus and analysis of this manuscript and could confuse readers. We also changed the term “summer offset” to “summer shift” with the abbreviation “SHT”. We further extended and improved the regression analysis to investigate the relation between fracture kinematics and temperature.
- Regarding the criticism of referee 2 that a qualitative analysis of raw data would have brought the same observations/conclusions, but the proposed model does not bring significant contributions or advantages: We disagree on this point. This work provides a new quantitative analysis based on a significantly longer time series (7 years vs. 2 years). The scientific advance of this contribution is to distinguish phases as well as the timing of irreversible displacements. Timing of irreversible kinematics is crucial to link the acting mechanisms to environmental forcing. Furthermore, the developed irreversible index provides useful indication on rock wall stability.

In the revised manuscript we addressed all the reviewers' comments and added in the general response one by one explanations and comments to the specific points of the referees. We also added additional figures and changed the figures in the manuscript according to the comments.

With kind regards

Samuel Weber

On behalf of all authors

Please also note the supplement to this comment:

<http://www.the-cryosphere-discuss.net/tc-2016-136/tc-2016-136-AC1-supplement.pdf>

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Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-136, 2016.

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