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Interactive comment on "Seasonal Dynamics of Rainfall Erosivity in Switzerland" *by* S. Schmidt et al.

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Dear Anonymous Referee #2,

We are pleased to receive your detailed review on our discussion paper and appreciate all your contributions and comments, which will help us to improve the manuscript. Furthermore, we are glad that you mentioned the practical importance of the discussed paper for soil erosion estimations with the (R)USLE model. You raised some concerns and questions in your general comment as well as in the supplement material. We'll answer these main concerns in this short reply. I also would like to direct your attention to our reply to Referee Comment #3. As we commented to Referee #1, a detailed author comment and revised manuscript version will follow after we collected all reviews.

In the general remark, Referee #2 raised the concern of limited novelty of the

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Discussion paper

manuscript and showed similarities (number of stations, methodology based on regression-kriging) of the present manuscript to Meusburger et al. (2012).

The manuscript “Seasonal Dynamics of Rainfall Erosivity” by Schmidt et al. (2016) and “Spatial and temporal variability of rainfall erosivity factor for Switzerland” by Meusburger et al. (2012) are related to each other by region and authors. Although the methodology seems to be similar, the present study is not only an advancement as we add new know-how but contributes totally new aspects with seasonal components, erosivity density and cumulative daily sums per biogeographic region. We emphasize the production of monthly R-factor maps for Switzerland (instead of the annual average, presented by Meusburger et al. 2012). Since spatial and temporal mapping is done, the quality of covariates was significantly improved compared to the previous study which enhanced the geostatistical capacity. Meusburger et al. (2012) used latitude, longitude, average annual precipitation, biogeographic units, aspect (25m) and elevation (25m). In our new study, the covariates (see Table 1 in manuscript) used for predicting the monthly R-factors have a spatial resolution down to 2m (SwissTopo3D Digital Elevation Model) and an at least monthly temporal resolution. As large parts of the study are situated in the Alpine region, we noticed a high intra-annual variability which requests a variety of erosivity influencing covariates. The database in the present study was extended by 23% (from 71 to 87) compared to Meusburger et al. (2012), and some stations were upgraded with longer time series. Referee #2 pointed out that the temporal distribution of EIs (and therefore R-factors) is needed to calculate seasonal K- and C-factors. Our long-term aim is a seasonal soil erosion risk assessment for Switzerland based on a dynamic approach. That assessment could not be realized with an R-factor map, which aggregates R-factors either regionally or temporally as was done by Meusburger et al. (2012). We are confident that the paper will be of interest to the scientific community (use of regression-kriging with stepwise variable selection based on high resolution data, LOOCV as an improved cross validation method, monthly assessment) as well as to agricultural management, stakeholders and policy makers (detailed discussion of spatio-temporal R-factor distribution, spatial variation mapping, daily cumulative sums, erosivity density).

Further, Reviewer #2 wondered why we used different precipitation datasets for the calculation of monthly erosivity density (EDmo) presented by the ratio of monthly rainfall erosivity (hourly gauging station measurements) and monthly precipitation (RhiresM)?

There are two possibilities to map EDmo for Switzerland. One is to calculate it for the 87 stations points based on the measured data and to interpolate the results with spatial covariates. The other way to create such a map is a pixel-by-pixel approach by directly dividing the R-factor map by ready available precipitation maps (according to equation 4). We followed the second option since it avoids an additional spatial interpolation step and it makes use of the high spatial resolution precipitation dataset (RhiresM). Among the input data of an average of 457 stations used to create RhiresM are all available automatic tipping bucket gauges of MeteoSwiss, which were also used as input data for the monthly (Schmidt et al., 2016) and annual R-factor calculations (Meusburger et al., 2012). Indeed, snow is included in RhiresM, but that is the intention of the ratio between rainfall erosivity (generally omitting snow) and precipitation (including snowfall).

Reviewer #2 suggests to show the coefficient of variation map instead of the range map (month with max R minus month with minimum R; Figure 5).

The coefficient of variation (CV) is a good factor to present the degree of variation at a certain location, but because it is presented in percentage, it does not point to the high extreme R factors. We decided to include the range map because we can illustrate the extremes and map areas that “suffer” most from monthly varying erosivity among a year. As visible in the attached CV map, those regions, which have high CV (dark brownish colors, the eastern central Alps close to the border of Austria and the northern central Alps) are partial areas with lowest monthly R-factors in most of the months. We will follow the suggestion of the referee and include the CV map to present the percentage of variation in addition to the range map in the revised manuscript.

Lastly, it was recommended to check the references carefully.

As we stated in the “Short comment to RC #1” (doi:10.5194/hess-2016-208-SC1), we are aware of discrepancies in our bibliography (we are sorry, this should not have happened and was due to a formatting problem) and are working on it for the revised version.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-208, 2016.

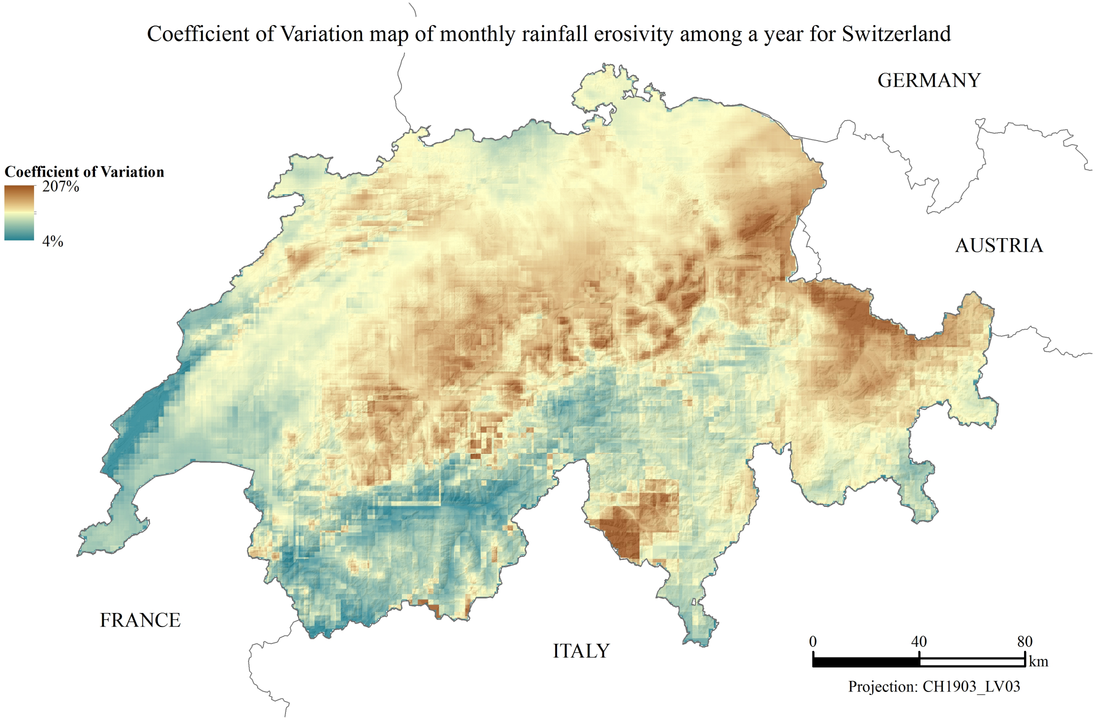

Fig. 1.

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