

**Referee comment to:**

Journal: HESS

A review of the (Revised) Universal Soil Loss Equation (R/USLE): with a view to increasing its global applicability and improving soil loss estimates

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**General comments:**

This review paper presents a comprehensive overview of studies applying the R/USLE all over the world and provides information on how different studies have adapted the equations to calculate the factors of the USLE to local conditions. In addition, studies dealing with limitations of the USLE and future developments of the approach are mentioned. The authors explain that they provided this review to serve as a reference for other researchers working with the USLE.

In general, a review of the USLE is well placed in HESS. The authors have done a very diligent work by summarizing many publications applying the USLE. In addition the manuscript provides some helpful hints, as for example the advice to be careful with the units of the USLE-factors used in different studies (i.e. for the K-factor in Chapter 2.2).

However, my major objection is, that the manuscript provides only an overview of existing studies and that a critical examination of the approaches presented in the manuscript is missing. Thus, I cannot see a significant own contribution of the authors besides the summary of existing studies on the application of the USLE. The manuscript should thus be thoroughly revised and provide a critical analysis of the approaches presented to gain new insight in the topic. Further comments for revision of the manuscript are given in the following:

- The introduction is very general. It should be worked out, why this review of the USLE is necessary and what is its benefit in relation to other reviews. In addition, the objectives are not clear and included at various locations in the introduction. Thus, the introduction should clearly motivate this review, leading to focused objectives at the end of the introduction (see also specific comments).
- The authors promise, that they will provide guidance which equation is most appropriate for a range of different geoclimatic regions (Page 2, line 17 – 18). However, the advices are very general and the studies presented in Chapter 2 seem to be randomly picked. For example, Chapter 2.1 provides a comprehensive overview of 19 studies that have derived approaches to estimate R-factors for different regions or have applied these approaches (Table 3). Furthermore, the authors summarize various studies using approaches to calculate R-factors in regions other than those for which they were developed. Following this, a simple calculation example is provided (Page 6, line 8 – 16 and Figure 1): In this example, 2 equations developed for Portugal and 1 equation developed for New Zealand are applied to a watershed in New Zealand (Figure 1). As expected, the equations developed for Portugal do not match the seasonal variation in New Zealand. The authors conclude that it is important to understand the regional

applicability of rainfall erosivity equations (Page 6, line 17-18). Although many studies were reviewed, the main result of Chapter 2.1 is a very general statement drawn on the basis of a simple example.

If such examples are provided, they should cover a much larger number of approaches and data of different regions to derive useful conclusions to guide other users of the USLE. It would be much more important to analyze, if approaches for R-factors could be transferred to regions with similar climate characteristics for which no detailed data is available and what criteria should be applied to do this.

- In Chapter 2.2 only studies for the US are presented. It would be interesting, how studies in other regions deal with K-factors?
- Chapter 3 is about limitations of the R/USLE. As before, only existing studies dealing with the limitations of the USLE are summarized and a critical analysis of the limitations is missing (see also specific comments).  
The topic of validation of estimated soil loss rates by using the USLE is mentioned only briefly. In my opinion, it is one of the major limitations of the USLE that it is so difficult to validate the estimated soil loss rates. This topic should be discussed in more detail.
- In Chapter 4 again only studies are summarized which are dealing with further developments of the USLE, but again, a critical analysis is missing.
- The conclusions are very general.
- The abstract is very brief. It should be thoroughly revised according to the revision of the manuscript.

### **Specific comments:**

- Page 1, line 22 – Page 2, line 5: The introductory part on soil erosion is very long and not specific for the USLE. It should be shortened and focused.
- Page 2, line 6 – 13: In this section, a few review papers on erosion models are presented. It is not clear, why these reviews have been selected. I suggest to focus on previous reviews of the USLE and to work out, why the additional review presented in this paper is necessary and what will be the benefit of it.
- Page 2, line 15 – 19: I suggest to move this section to the objectives at the end of the introduction.
- Page 2, line 28 – 29: move to objectives at the end of the introduction. In addition, it should be made clear, which limitations of the USLE are analyzed.
- Page 2, line 30 – 34: redundant to the section above. Include the information not yet provided in line 19 – 27 into this section.
- Page 3, line 10 – 13: The objectives of the study mentioned at various locations in the introduction should be summarized at the end of the introduction (see comments above).
- Page 3, line 19 – 26: In my opinion, this information fits better in the introduction.
- Page 4, line 1 – 5: some additional objectives are mentioned in this section → should be moved to a focused section presenting the objectives at the end of the introduction.

- Page 3, Chapter 2: Some general information on the USLE should be provided, i.e. that it was developed from soil loss rates on plot experiments.
- Page 11, line 6: the information on the R/ULSE unit plot is also essential for the other factors. It should be mentioned in the preface of Chapter 2, i.e. page 3, line 19 - 26.
- Page 20, line 2 – 10: in this paragraph it is stated, that the application of the USLE outside the US may lead to over or under-prediction of actual soil loss. This statement implies that the application of the USLE in the US leads to correct prediction of soil loss. This is not true. Over or under-prediction of actual soil loss rates is also due to the simplicity of the approach. Furthermore, it is stated that the USLE also may lead to uncertainties in predicted soil loss if it is applied to larger scales than the plot scale. Again, this statement implies that predictions for the plot scale are correct, which is not true.
- Page 21, line 26 – 29: redundant to Chapter 2.3

#### **Technical corrections:**

- Page 2, line 5: “This” → “The”
- Page 5, line 4 - 7: check wording
- Page 6, line 8: “differents” estimates → “different”
- Page 13, line 14: include “the” before “upslope”
- Page 17, line 5: “were” → where
- Page 21, line 14: Grovers → Govers
- Page 21, line 24: include “of” before “watersheds”
- Page 22, line 1 – 2: Check wording / grammar
- Page 22, line 34: available → availability