

Interactive comment on “Regional soil erosion assessment based on sample survey and geostatistics” by Shuiqing Yin et al.

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Thank for agreeing with us that the paper addresses an interesting topic and fit into the scope of HESS. The referee mentioned that “Regional soil erosion assessment is still challenging due to the often-missing input data needed for such assessment.” which is the main reason why we proposed a method combining the sample survey and geostatistics. We understood the referee had three main concerns:

(1) It just does not make any sense to interpolate erosion data from single locations (with specific land use, slope, slope length, soils, rainfall and soil management) into a large area without taking these important variables into account.

Response: We actually did take these important variables into account to estimate regional soil loss whenever possible. One major point we want to make in the paper is

that the simple interpolation without using any of the available factor information (Model I) is not good. Our recommended approach uses all the factor information that are available in all area (land use, rainfall, soils), and uses spatial interpolation to impute other factor information which are only available at the sampled PSU (slope degree, slope length, practice and management, aggregated as Q) to all area. The rationale behind this approach is to exploit the spatial dependence among these factors to come up with better regional estimates. Since the reality in many developing countries is that we cannot have all factors measured in all areas in the foreseeable future, we believe our approach provide a viable alternative which is of practical importance.

(2) The authors present the Chinese variant of the USLE, which identified all important parameters of erosion (Eq. 1, P. 6, line 23), why not using these parameters as co-variables in an interpolation or apply the model itself.

Response: We can only obtain the information for all seven erosion factors in the CSLE in the Primary Sample Unit (PSU), not for the entire domain. For the entire domain, the information we can get in this stage is land use, rainfall erosivity (R) and soil erodibility (K). As explained in (1), we did apply the model itself by using parameters that are available in all area (land use, R and K) as covariate in our semi-parametric model (equation 5, 7 and 9), and interpolate the rest of the parameters aggregated as factor Q. The other factors including slope length, slope degree, biological, engineering and tillage practice factors are impossible or difficult to obtain for the entire domain in this stage. We sampled micro watersheds (PSU) to collect detailed topography information and conducted field survey to collect practice information. Previous research showed that topography factors should be derived from high resolution topography information (such as 1:10000 topography contour map or larger scale). Topography factors based on smaller scale of topography map (such as 1:50000 or 1:100000) in the mountainous area have large uncertainties. We can obtain 1:10000 topography contour map for the PSU, not for the entire domain. For the forest land, the vegetation coverage derived from the remote sensing data was used as the canopy density, which was combined

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with the vegetation fraction under the trees collected during the field survey to estimate the half-month biological practice factor. The vegetation fraction under the trees is of great importance in protecting soil and it cannot be derived from remote sensing images. Engineering and tillage practice factors were based on the sample field survey. They are not easy to be interpreted from images with common resolution.

(3) From the different interpolation models presented it is obvious that those taking some of the important erosion drivers into account (models II-V) outperform model I, which solely use the erosion data for interpolation. . . .I do not think that the presented approach is a promising pathway to follow.

Response: Our contribution in this paper is twofold. First, our study quantified how important the knowledge of land use, rainfall erosivity and soil erodibility in all area are for estimating regional soil loss (Land use is the key auxiliary information for the spatial model, which contributed much more information than R and K factors did. See Page 11 Line 8-9). Second, we introduced a new regional soil erosion assessment method, which is different from the area sample survey approach used by NRI in the USA and the multiplication of raster layers used by Europe, Australia, and many other regions (See Page 3 Line 18-30, Page 4 Line 1-13 for the detail). If the resolution of input data for the entire domain is enough to derive all the erosion factors, the multiplication of raster layers is a good choice. However, for many regions in the world, such input data is often not available, or the resolution is not adequate for the assessment, as the referee has mentioned. Therefore, the assessment method combining sample survey and geostatistics proposed in this study is valuable.

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