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Dear Prof. Dr. Lorena Grabowski

Editor-in-Chief
SOIL

Greetings;

Attached please find the revised version of our manuscript entitled "**Mapping land degradation risk due to wind and water erosion**". Full revision has been carried out by responding to the comments and considering suggestions made by the reviewers. The implementation of those valuable comments and suggestions has significantly improved the quality of the paper for which we are grateful to the editor and the reviewers. I am also attaching a note in which major changes carried out in the paper have been explained. All revised parts have been highlighted in blue color.

I hope the emendations caused to consent the respected editor and make my paper well qualified for further processing leading to final acceptance and publication. The acknowledge receipt of the same and informing me about the final status of the paper is appreciated.
Sincerely,

Dr. M. Boroghani
Enclosure

Reviewer 3 # Revision comments:

The study is about “Mapping land degradation risk due to wind and water erosion”. Principles and methodology are well supported. However, I would like to consider some specific comments below as minor revision. In general, there are some grammar errors throughout the manuscript. Please check the spellchecking in addition to these minor issues.

Page 5: Only 23 dusty days are used ….. out of 500 dust days, I speculate…every year: 28 dusty days (2000-2020). I would like to see a histogram with MODIS AOD (500nm, 2000- 2020) at least for one key dust station. I think all days with AOD>0.5 (500nm) are dusty days. Is the use of 23 days really a representative approach?

Ans. this is true that all days when the AOD is less than 0.5 as the day of dust, and also the number of days that the synoptic stations in the area have recorded as the day of dust is much higher, but this dust may be in hours of the day or It happened last night that we could not see them on MODIS images. As you know, MODIS takes pictures daily, in the morning and the afternoon at 10.30 in the morning and 2.30 in the afternoon, so the dust that occurs in the area must be at the same time as the image that we can see on MODIS image. For example, if the dust occurs at 4 pm or night, it cannot be recorded, it may also be cloudy at the same time as the dust occurrence and the dust is not visible. As a result, a large number of dust events that occurred in the area cannot be recorded on MODIS and we cannot use it, otherwise, your opinion is completely correct and the number under investigation is less than the actual number of dust that occurred in the area.

Why not showing a correlation with wind speed vs AOD for several selected observational sites? Your argumentation is not very much convincing without some demonstrations (visualizations). One could get the impression, the work is based, at the end, on a few 'beauty data' only, but does not allow solid conclusions and does not provide insight into the complex problematic.

Ans. We used the horizontal visibility data (dust day) of synoptic stations to identify the dust source area. Then, the days when imaging was accompanied by dust were selected and images were used. We first identified the dust on the images using dust indicators and then we determined the dust source area with visibility. First, we used remote sensing techniques and then observations. visibility data (dust day) at the synoptic station indicates the day the dust occurred in the area and no longer needs wind speed data to prove it, although correlation can also emphasize this.

Did you consider these days with visibility less than 2 km as non fog/haze days? How did you differentiate between fog and dust?

Ans. We only used less than 2 kilometers horizontally for dust days, not fog days. To separate these two data, we used dust meteorological codes including codes 06, 07, 08, 09 and 30 to 35.

Once per day cannot be considered as high resolution?

Ans. True, once-a-day imaging has a lower resolution, such as Landsat and ... but for dust studies, images need to be taken daily to capture the dust. And since the dust is occurring on a large scale and requires images to be captured on a large scale, the MODIS image is the best image for dust studies and most studies on dust. The world uses these images.

Considering that the map of dust sources for Iran was prepared by the Geological Organization, why did you use satellite images to produce it? How accurate is your generated map compared to the ground map?

Ans. The use of satellite images to prepare a map of dust collection areas helps us to identify all dust collection centers, especially new and smaller ones. And because we have examined a period from 2005 to 2022, as a result, centers that may have been

inactive in some years can also be identified. In the map of the dust collection centers prepared by the Geological Organization, it is in the form of a zone (the area cannot be modeled) and also they have not identified all the centers and it is general, while the map prepared by satellite images is the face is pointy and partial. Considering that Iran is a vast country, without the use of satellite images and only using field survey, the map prepared is not accurate enough, and the map of the mapping organization is not up to date and has not identified new source. Another point is that the study area is also in Iraq, as a result, the use of satellite images creates homogenous conditions and that the mapping organization was prepared only for Iran, not neighboring countries.

How to deal with the satellite data with different spatial resolutions in the study?
Ans. Thank you for your detailed question. In machine learning, all the layers must be pixels, and we first prepared each layer with the satellite image (MODIS, Landsat and etc.) in ENVI software, and for modeling in the ArcGIS software, we unify the pixel size layers using resampling

Line 26: The water and aeolian soil erosion maps: revised
Line 32: the risk of land degradation in an inhabited region: revised
Line 43: soil erosion in a short time: revised
Line 49: has detrimental impacts on the Earth system: revised
Line 52: therefore necessary for developing a better understanding: revised
Line 85: to the increasing dust concentration in southwest Asia: revised
Line 118: That information is extracted from data collected during an own field survey paired with a previous research (delete “a” before previous) : revised
Line 141: in the ten-year period (add hyphen for “ten-year”) : revised
Line 162-163: constants taken during the initial calibration: revised
Line 168: we see dust aerosol in different colors and qualities in the MODIS images over 28 days: revised
Line 177-178: the identification and selection of appropriate dust sources and soil erosion-effective factors are necessary. : revised
Line 183: the Topographic Wetness Index (TWI), (Not Witness) : revised
Line 199: Annual rainfall (Fig. 3e) was obtained from: revised
Line 195: Mean annual rainfall was calculated using: revised
Line 261: The former is built while the RF model: revised
Line 276: three layers, namely, the input layer, the hidden layers: revised
Line 279: and the output layer is the maps of: revised
Line 304: and some indicators which were explained in section 2.1.2: revised
Line 356: similar results have been obtained in which RF with an accuracy of 45.8%: revised
Line 364: although the differences between FDA and ANN are in the statistical sense relatively small. : revised
Line 381: Distance from roads and rivers were recognized as the least important

factors: revised
Line 414: human activity is a contributing factor to the water-induced soil erosion. : revised
Line 425: the study area are at risk of soil erosion: revised
Line 428: The findings of the present study are therefore: revised
Line 431: The areas that fall under the category of both kinds (“falls” should change into “fall”) : revised
Line 435: the adverse impacts of water-induced soil erosion are known: revised