Ref:
Title: Estimating the heavy metal contents in entisols from a mining 2 area based on improved spectral indices and Catboost

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Reviewer comments:

L45. In my view, the characteristics of the ongoing research outlined in L45-49 should be relocated to the final paragraph in L111.

L50-52. Revise to “Malley and Williams (1997) were the first to employ hyperspectral remote sensing…”.

L54. The meaning of "the direct inversion of heavy metal concentrations" is not clear. Are you referring to the linear correlation between the spectral bands and the concentration of mineral elements?

The introduction is deficient in literature that discusses previously developed spectral indices or bands correlated with the respective metal elements. For instance in L64, the author should give some examples of indexes and mineral concentration correlations.

L68-67. Additional details about how the complexity of the soil impacts hyperspectral methodology should be included.

L70. In this part, information about how the solar radiation affect the hyperspectral measurement should be included.

Additionally, it would be interesting to explore the literature on sensors already employed for measuring soil hyperspectral data and their correlation with statistical methodologies for grouping hyperspectral data to correlate with soil metal concentrations.

L80. The meaning of " indirect measurements of heavy metal concentrations " is not clear.

L84. Revise to “absorption”.

L89-91. Is not clear “for estimating indirect inversion based on the concentrations of Fe elements or organic matter and their characteristic bands”.

L99. What is the correlation of the respective elements with the hyperspectral characteristics?

L111. Is not clear what is “spectral inversion”.

L126-127. Give specific percentage of the synthesis.
L130. Give the dimensions of the specific research area.
L142. Provide the procedure for collecting soil samples.
L145. Add company and City of the equipment.
L183. Add type, company and City of spectrometer.
L184. More details about the sensor are needed. It is unclear what the distance was between the sensor and the soil, and whether the sensor was positioned along the vertical axis of the soil surface.
L206. In what statistic environment was the RCBP build?

L212. How?
L214. Define the acronym SI
L234-238. In my view, the note should be as part of the manuscript in material section rather than being presented as a legend.
L240. In what computer environment was the Catboost build?

L271. With the RCBP method? Specify.
L280-281. Is the coefficient significant? Define.

L291. One bracket is missing.
L285-292. This method requires a more detailed analysis in the material section.
L313. Are the coefficients significant?
L332-350. The paragraph is overly complex and unclear

L358. Spatial analysis is not addressed in the material section.
L359-367. Generally, the results present data that were inadequately described in the material section. Additionally, the methodology that should have been described in the material section is presented in the results.

There is a deficiency in the discussion.