EGU2020-15891, updated on 17 Jan 2022
https://doi.org/10.5194/egusphere-egu2020-15891
EGU General Assembly 2020

Spatio-temporal variability of global soil salinization delineated by advanced machine learning algorithms

Amirhossein Hassani, Adisa Azapagic, and Nima Shokri
The University of Manchester, Department of Chemical Engineering and Analytical Science, Manchester, United Kingdom of Great Britain and Northern Ireland (amirhossein.hassani@postgrad.manchester.ac.uk)

Soil salinity is among the major threats affecting the soil fertility, stability and vegetation. It can also accelerate the desertification processes, especially in arid and semi-arid regions. An accurate estimation of the global extent and distribution of the salt-affected soils and their temporal variations is pivotal to our understanding of the salinity-induced land degradation processes and to design effective remediation strategies. In this study, using legacy soil profiles data and a broad set of climatic, topographic, and remotely sensed soil surface and vegetative data, we trained ensembles of classification and regression trees to map the spatio-temporal variation of the soil salinity and sodicity (exchangeable sodium percentage) at the global scale from 1980 to 2018 at a 1 km resolution. The User's Accuracies for soil salinity and sodicity classification were 88.05% and 84.65%, respectively. The 2018 map shows that globally 944 Mha of the lands are saline (with saturated paste electrical conductivity > 4 ds m^{-1}), while 155 Mha can be classified as sodic soils (with sodium exchange percentage > 15%). Our findings and provided dataset show quantitatively how soil salinization is influenced by a broad array of climatic, anthropogenic and hydrologic parameters. Such information is crucial for effective water and land-use management, which is important for maintaining food security in face of future climatic uncertainties. Moreover, our results combined with the quantitative methodology developed in this study will provide us with an opportunity to delineate the role of anthropogenic activities on soil salinization. This information is useful not only for developing predictive models of primary and secondary soil salinization but also for natural resources management and policy makers.