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Type: Oral Presentation

Climate change and primary soil salinization: A global scale perspective for the 21st century

Tuesday, 31 May 2022 14:50 (15 minutes)

Soil salinization refers to the excessive accumulation of soluble salts in soil to a degree that adversely influences environmental, human, and animal health. Soil salinization poses an existential threat to ecosystem functioning, socioeconomic structure, and food security. The projected climate change will influence almost all key factors driving soil salinization. For example, rising temperature in summer will lead to higher evapotranspiration which in turn increases salt concentration in soil solution leading to expansion of the lands with higher salinity levels. Yet, quantification of the soil salinity response to projected climate change has been rarely investigated. Given the complexity of the processes influencing soil salinization at the regional to continental scales (Hassani et al., 2020), here we apply Machine Learning (ML) algorithms to build predictive models of naturally occurring soil salinity and estimate the variations of soil salinity in the world's dryland areas (lands with an Aridity Index ≤ 0.65), under different projected climate change scenarios by 2100 (Hassani et al., 2021). These predictive models map data-driven relations between the experimentally measured soil electrical conductivity (as a measure of soil salinity) and a set of purely spatial and spatio-temporal auxiliary data based on soil/land properties and output of Global Circulation Models (adopted from both Fifth and Sixth Phases of the Coupled Model Inter-comparison Projects, the so-called CMIP5 and CMIP6) to predict the soil salinity, expressed as saturated paste electrical conductivity at each time, location, and depth. Under different greenhouse gas concentration trajectories, analysis of the predictions made for the 2071 - 2100 period identifies the dryland areas of South America, southern and Western Australia, Mexico, southwest United States, South Africa, Spain, Morocco, and northern Algeria as the salinization hotspots, compared to the reference period (1961 - 1990). Conversely, we project a decrease in the soil salinity of the drylands spread across the northwest United States, the Horn of Africa, Eastern Europe, Turkmenistan, and west Kazakhstan in response to climate change for the similar periods. The predictive tool developed here can be used for projection of other dynamic soil properties such as soil nutrients and pH under changing climate.

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Country

Norway

References

Hassani, A., Azapagic, A., Shokri, N. (2020). Predicting Long-term Dynamics of Soil Salinity and Sodicity on a Global Scale, Proc. Nat. Acad. Sci., 117(52), 33017-33027, doi.org/10.1073/pnas.2013771117.

Hassani, A., Azapagic, A., Shokri, N. (2021). Global Predictions of Primary Soil Salinization Under Changing Climate in the 21st Century, Nat. Commun., 12, 6663. doi.org/10.1038/s41467-021-26907-3.

Time Block Preference

Time Block A (09:00-12:00 CET)

Participation

In person

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