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Soil texture linking saltwater intrusion in coastal regions to surface soil salinity

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The sea level has risen notably in recent decades compared to the most recent millennia. This exposes coastal areas to hazards ranging from enhanced flooding and erosion to groundwater contamination and soil salinization referring to excess salt accumulation to a degree that adversely influences soil and environmental health (Hassani et al., 2020, 2021). This study focuses on how soil properties modify the near surface salt accumulation as a result of saltwater intrusion in coastal regions. To do so, we developed a predictive model, using software package FEFLOW, capable of describing the effects of soil texture and heterogeneity on the surface soil salinity as a result of saltwater intrusion through the unsaturated zone. For model validation, we used the field-scale data measured in "Alte Land"located in north Germany - an agriculturally significant area threatened by the increasing soil salinity. After the model verification, we conducted hypothetical numerical experiments to identify how soil texture, linking saltwater intrusion through unsaturated zone to the surface, influences surface soil salinity under different boundary conditions. Our results show how significant could be the changes in surface soil salinity as a result of minor changes in soil texture and heterogeneity. This highlights the importance of soil characteristics on surface soil salinity driven by the saltwater intrusion in coastal regions with the results relevant to soil health and land management in coastal regions.

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.

Hassani, A., Azapagic, A., Shokri, N. (2021). Global Predictions of Primary Soil Salinization Under Changing Climate in the 21st Century, Nat. Commun., 12, 6663.

Participation

In-Person

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.

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Primary authors: Mr SOBHI GOLLO , Vahid (Institute of Geo-Hydroinformatics, Hamburg University of Technology, Hamburg, Germany); Dr GONZÁLEZ , Eva (Geological survey of lower-Saxony, Hannover, Germany); Dr ELBRACHT , Jörg (Geological survey of lower-Saxony, Hannover, Germany); Prof. FRÖHLE, Peter (Institute of River and Coastal Engineering, Hamburg University of Technology, Hamburg, Germany); Prof. SHOKRI, Nima (Institute of Geo-Hydroinformatics, Hamburg University of Technology, Hamburg, Germany)

Presenter: Prof. SHOKRI, Nima (Institute of Geo-Hydroinformatics, Hamburg University of Technology, Hamburg, Germany)

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