

EGU22-12402

<https://doi.org/10.5194/egusphere-egu22-12402>

EGU General Assembly 2022

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## Soil Eukaryotes Diversity in the EU - Environmental drivers in agricultural land, forests and grasslands

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Despite that all above-ground life depends on that below-ground, the knowledge on soil biodiversity is still very limited. Conservation activities have been often postponed due to missing data. For example, this was the case in previous EU Common Agricultural Policy agreements, when environmental indicators for soil biodiversity were meant to be integrated comparable to biodiversity indicators in place. While massive sequencing of soil biodiversity contributes significantly to shredding light on below-ground life, sampling methods are not adequately harmonised, preventing the establishment of reliable quantifiable conservation targets. In addition, broad-scale studies are often biased towards microorganisms and hence, in the majority of the published literature, eukaryotes, and more specifically, animals and protists, are neglected. Therefore, in a first EU-wide study of 885 sites, we investigated the response of environmental factors (i.e., soil properties, biogeographical location and climate) and land cover (cropland, grassland and woodland) on soil eukaryotic diversity. The LUCAS survey and previously published studies provided soil, climate and land cover data. DNA metabarcoding of the 18S genes allowed us to assess the diversity of animals, protists and fungi, but due to their high variability in body size, we grouped them into micro-, meso- and macrofauna. For the bioinformatics analyses, we clustered sequence reads into amplicon sequence variants using DADA2 and thereafter, we assessed alpha and beta diversity and the relationships between eukaryotic diversity and environmental drivers using regression, ordination, and variance partitioning analyses. Our results allowed us to identify potential indicator species for EU soils, representing the effect of different drivers on eukaryotic diversity. These findings will help to understand the links between soil abiotic and biotic patterns at large scale, pathing the way for quantifiable goals to be included in conservation activities and policies.