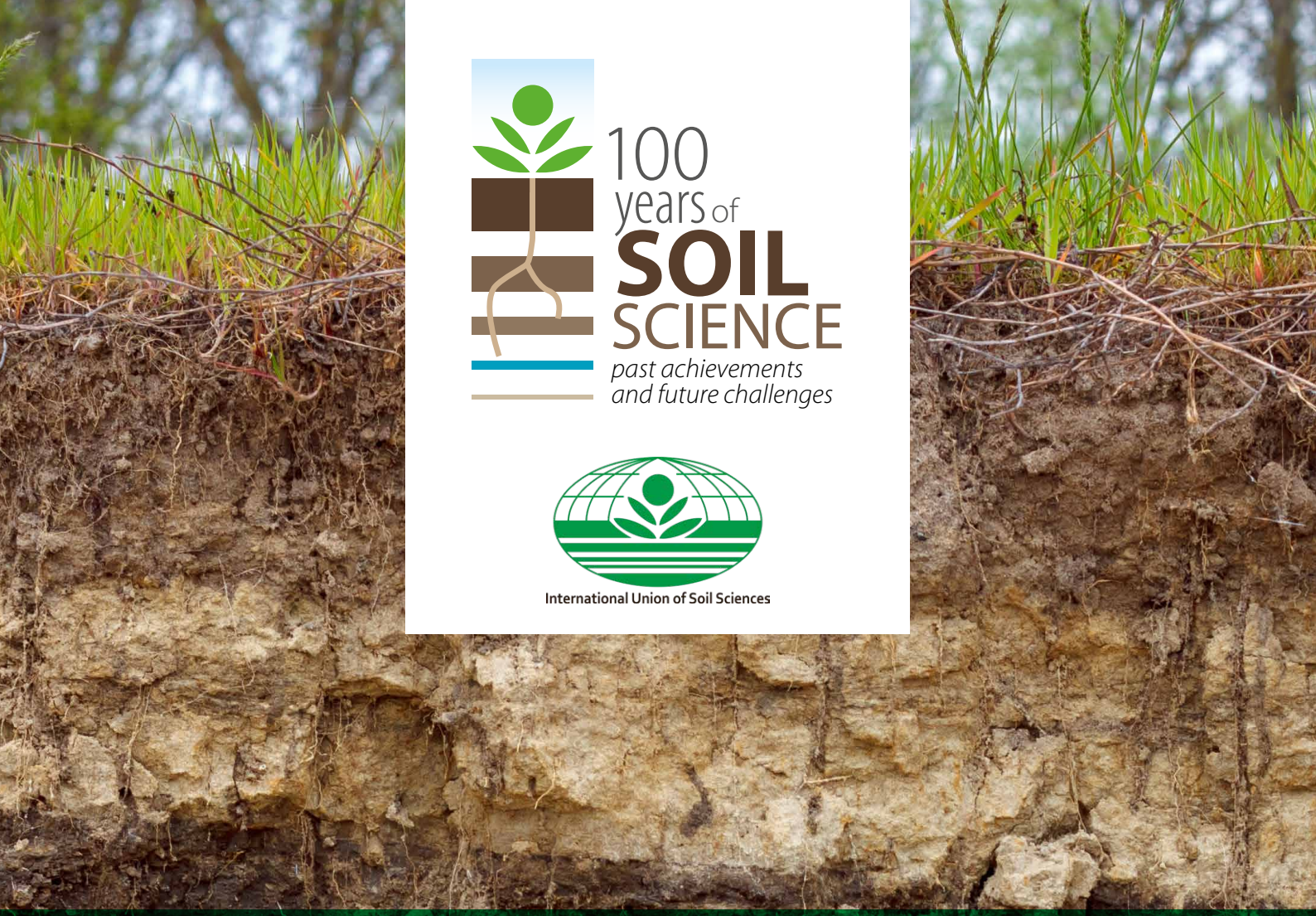

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ABSTRACT BOOK

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4. Soil health in achieving the Sustainable Development Goals
4.06 131649 - The centrality of organic carbon in balancing the multifunctional nature of soils for sustaining human and planetary health

INCREASING MICROBIAL FUNCTIONAL DIVERSITY AND ORGANIC MATTER STABILITY IN MOUNTAIN SOILS CAUSED BY TREELINE SHIFTS

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In the mountains, modern climate change is rapidly shifting the treeline on the meadows. This can affect soil microbial activity and the redistribution of soil organic matter (SOM) between its particulate (POM) and mineral-associated (MAOM) fractions. Decomposing more recalcitrant plant residues, such as forest litter, requires a wide variety of enzymes. Consequently, the treeline shifts may increase both the ability of soil microorganisms to metabolize diverse organic substrates (i.e., microbial functional diversity) and the accumulation of their degradation compounds in the MAOM fraction. To test this hypothesis, we chosen six forest-meadow ecotones on reserved and grazed slopes in the Northwest Caucasus of Russia. All slopes were of north-eastern exposure, steepness of 25-30 degrees, and had nonalkaline soil parent materials. Along each ecotone, plant material (above-ground herbaceous biomass, forest litter) and soil samples from the upper 0-10 cm layer were collected in 0.5 × 0.5 m plots in forest, treeline and meadow. Plant recalcitrance was determined by aromaticity index based on CP/MAS 13C-NMR analysis results. Microbial functional diversity was measured using the MicroResp™ technique and expressed as Shannon-Wiener index (Hclpp). MAOM was determined by wet sieving through 53 μm cells. From meadows to forests, plant residue recalcitrance increased, as evidenced by aromaticity index increasing from 0.21 to 0.25 (on average for both land uses). A similar average upward trend was found for Hclpp index (from 2.45 to 2.49) and MAOM portion (from 17% to 35%). This confirms our hypothesis that the tree expansion into meadows increases microbial functional diversity and SOM stability.

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Keywords: forest-meadow ecotone,mineral-associated organic C,plant aromaticity index