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# Implications of Different Worldviews to Assess Soil Organic Carbon Change

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Profound shifts have occurred over the last three centuries in which human actions have become the main driver to global environmental change. In this new epoch, the Anthropocene, human-driven changes such as climate and land use change, are pushing the Earth system well outside of its normal operating range causing severe and abrupt environmental change. Changes in land use management and land cover are intricately linked to the carbon cycle, but our knowledge on its spatially and temporally explicit impact on carbon dynamics across different scales is still poorly understood. To elucidate on the magnitude of change in soil organic carbon (SOC) due to human-induced stressors different philosophical worldviews may be considered including (i) empiricism – direct measurements of properties and processes at micro, site-specific or field scales; (ii) metaphysics and ontology – conceptual models to assess soil change (e.g., STEP-AWBH); (iii) epistemology – indirect approaches (e.g., meta-analysis or spectral informed prediction models); (iv) reductionism – e.g., carbon flux measurements; (iv) determinism – mechanistic simulation models and biogeochemical investigations (e.g., Century or DNDC); (v) holism – national or global soil databases and aggregate maps; or (vi) integral – fusing individual, social, economic, cultural and empirical perspectives. The strengths and limitations of each of these philosophical approaches are demonstrated using case examples from Florida and U.S.A. The sensitivity to assess SOC change and uncertainty, backcasting and forecasting ability, scaling potential across space and time domains, and limitations and constraints of different worldviews are discussed.