Socio-economic implications of stabilization scenarios from MIROC-ESM

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Setting a target for stabilization of climate in the long-term requires significant reductions in greenhouse gas (GHG) emissions at global scale. This involves important transformations in the society, basically affecting the future patterns of energy consumption and production, as well as the patterns of land use. Moreover, the cost for achieving such climate target may be considerable, thus, requiring an optimal allocation of efforts that minimizes the economic impact. This study presents the socio-economic implications of emission scenarios aiming at long-term climate stabilization, estimated with an integrated assessment model (IAM). Emission scenarios are obtained from the earth system model (ESM) Model for Interdisciplinary Research on Climate (MIROC-ESM). The outcomes on supply and demand of energy, land use, and mitigation costs are presented.
The emissions scenarios considered are consistent with the representative concentration pathway (RCP), and aim at a global radiative forcing by 2100 of around 4.5 W/m^2 (RCP4.5) and 2.6 W/m^2 (RCP2.6). The Global Change Assessment Model (GCAM) is applied to study the developments in energy, land use and emissions throughout the 21st century. GCAM is an IAM based on a partial equilibrium approach, which resolves the balance in supply and demand across the energy, land use and agricultural sectors.
Compared to the standard RCPs, the emission scenarios from MIROC-ESM presented lower levels of allowable anthropogenic CO_2 emissions for the same climate target. This is an outcome of the stronger feedback between the carbon-cycle and the climate, and the higher value for climate sensitivity assumed in MIROC-ESM in contrast to the climate model used in the development of RCPs. As a consequence, the changes in the energy and land systems are more drastic, while the cost of mitigations is higher. These differences are greater in the second half of the century.

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