Machine learning–based observation-constrained projections reveal elevated global socioeconomic risks from wildfire

Objective: Constrain the future CMIP6 wildfire changes and socioeconomic risks.

Approach: Develop a hybrid machine learning and emergent constraint framework to constrain future fire carbon emissions simulated by CMIP6 models using multi-source historical observations.

Results/Impacts: The constrained ensemble indicates a weaker increase in future global fire carbon emissions but higher increase in wildfire exposure in major socioeconomic factors compared with the default ensemble. Such elevated socioeconomic risks are primarily caused by the compound regional enhancement of future wildfire activity and socioeconomic development in the western and central African countries, necessitating an emergent strategic preparedness to wildfires in these countries.

Next Step: Expand current framework to estimate evolution of other global and regional climate or ecosystem variables, especially those with extensive local impacts.

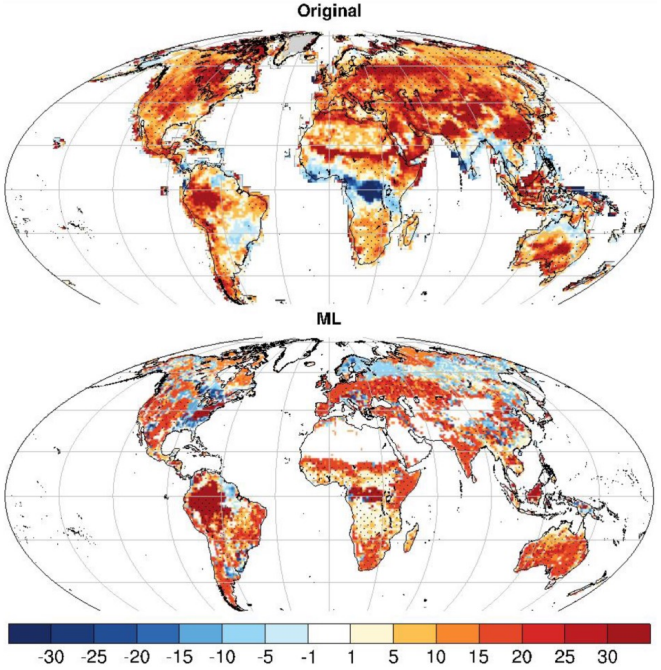

Figure: Unconstrained (Original) and constrained (ML) multimodel mean trend in fire carbon emissions (units: change per decade) from the 2010s to 2090s.

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