A dynamical approach to the macroeconomic consequences of extreme events

S. Hallegatte (1)

(1) CIRED/CNRM (hallegatte@centre-cired.fr)

Extreme events are one of the main channels through which climate and socio-economic systems interact and it is likely that climate change will modify their probability distributions. The long-term growth models used in climate change assessments, however, cannot capture the effects of such short-term shocks. To investigate this issue, a non-equilibrium dynamic model (NEDyM) is used to assess the macroeconomic consequences of extreme events. In the model, dynamic processes multiply the extreme event direct costs by a factor 20. Half of this increase comes from short-term processes, that long-term growth models cannot capture. The model exhibits also a bifurcation in GDP losses: for a given distribution of extremes, there is a value of the ability to fund rehabilitation below which GDP losses increases dramatically. This bifurcation may partly explain why some poor countries that experience repeated natural disasters cannot develop. It also shows that changes in the distribution of extremes may entail significant GDP losses and that climate change may force a specific adaptation of the economic organization. These results show that averaging short-term processes like extreme events over the time step of a long-term growth model can lead to inaccurately low assessments of the climate change damages.