SOE 7: Socio-economic models of climate change impact

Time: Friday 10:00–11:00 Location: H6

Topical Talk SOE 7.1 Fri 10:00 H6

Why Ergodicity Breaking from Climate Change matters in Ecosystems? — •Jan Nagler — Centre for Human and Machine Intelligence, Frankfurt

We show that and how ergodicity breaking due to temperature fluctuations adds up to the effects from rising temperatures and increasing fluctuations. Ergodicity breaking fluctuation-induced phenomena are well known in finance, where volatility can turn winning trading strategies into losing ones, or losing strategies into winning strategies. In physics, ergodicity breaking can result in an array of anomalous behaviours in stochastic systems. We show how ecosystems and evolutionary dynamics are affected. Ergodicity breaking in ecosystems may even dominate other effects from climate change. We report on a field study in nematodes on La Reunion Island that have adapted to temperature fluctuations. Ergodicity breaking leads to a shift of the adapted mean temperature, which we predict from first principles.

SOE 7.2 Fri 10:30 H6

Carbin dioxide emission quota attributions in a power system comprised of highly self-sufficient European actors — •Leon Joachim Schwenk-Nebbe[1,2], Marta Victoria[1,2], Gorm Bruun Andresen[1,2], and Martin Greiner[1,2] — [1]Department of Engineering, Aarhus University, Aarhus, Denmark — [2]iCLIMATE Interdisciplinary Centre for Climate Change, Aarhus University

The European countries all agree that carbon dioxide (CO2) emissions need to be decreased in the power sector. The ever dividing question is who must contribute by how much. We investigate possible near-future electricity system configurations where three aspects of collaboration between the individual countries are parametrized. First, the individual countries are attributed a CO2 emission quota in different ways. We show that a global carbon dioxide emission constraint with a global price leads to a particularly uneven emission distribution in a cost-optimal European electricity system. Different emission attributions are shown to strongly influence the required local emission prices. Second, they can collaborate by relaxing their need for autonomy and becoming less self-sufficient by placing generation capacity in countries with better prerequisites. Third, collaboration can also be strengthened by extending the cross-border transmission grid. We conclude that it is significantly easier for certain countries to decarbonize their electricity production than for others. We find that a deep collaboration between the European countries leads to not only a lowered total system cost but to CO2 emissions, and required CO2 prices that are much more equal between the European partners.