Applied Mathematics Seminar

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

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Basin bifurcations and rate-induced thresholds for Atlantic meridional overturning circulation in a global oceanic box model

The Atlantic meridional overturning circulation (AMOC) has been observed to show multi-stability across a range of models of different complexity. For a physically derived global oceanic model, that is calibrated to runs of the FAMOUS coupled atmosphere-ocean general circulation model. We find the loss of stability of the 'on' state is due to a subcritical Hopf. This loss of stability via subcritical Hopf bifurcation has important consequences for the behaviour of the basin of attraction close to bifurcation. We consider various time-dependent profiles of freshwater forcing to the system, and find that transitions from the 'on' to the 'off' state can appear, even for perturbations that do not cross the bifurcation.

Alkhayuon, H., Ashwin, P., Jackson, L. C., Quinn, C., & Wood, R. A.: Basin bifurcations, oscillatory instability and rate-induced thresholds for Atlantic meridional overturning circulation in a global oceanic box model. Proceedings of the Royal Society A **475**, 2225 (2019)

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