



## **Parameterization of stochastic multiscale triads**

Jeroen Wouters (1,2), Stamen Dolaptchiev (3), Valerio Lucarini (1,4,5), and Ulrich Achatz (3)

(1) Meteorological Institute, University of Hamburg, Hamburg, Germany, (2) School of Mathematics and Statistics, University of Sydney, Sydney, Australia, (3) Institut für Atmosphäre und Umwelt, Goethe-Universität Frankfurt, Frankfurt am Main, Germany, (4) Department of Mathematics and Statistics, University of Reading, Reading, UK, (5) Walker Institute for Climate System Research, University of Reading, Reading, UK

We discuss applications of a recently developed method for model reduction based on linear response theory of weakly coupled dynamical systems. We apply the weak coupling method to simple stochastic differential equations with slow and fast degrees of freedom. The weak coupling model reduction method results in general in a non-Markovian system; we therefore discuss the Markovianization of the system to allow for straightforward numerical integration. We compare the applied method to the equations obtained through homogenization in the limit of large timescale separation between slow and fast degrees of freedom. We numerically compare the ensemble spread from a fixed initial condition, correlation functions and exit times from a domain. The weak coupling method gives more accurate results in all test cases, albeit with a higher numerical cost.