Eighth Workshop Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2017
Évora, Portugal, January 31st - February 3rd, 2017

QUASI-TIGHT COUPLING: WHY DO WE SEE IT? WHEN WOULD WE EXPECT IT?

Jürgen Vollmer

[1] Dipartimento di Scienze Matematiche, Politecnico di Torino, 10129 Torino

[2] Abt. Dynamik komplexer Fluide, MPI Dynamik und Selbstorganisation, 37077 Göttingen

[3] Inst. für Nichtlineare Dynamik, Georg-August-Universität Göttingen, 37077 Göttingen

juergen.vollmer@polito.it

Fluctuation-dissipation relations address the connection between fluctuations in a steady state and the response of that state to external perturbations. For equilibrium systems they have been formulated as Green-Kubo relations: the ratio of the entries of the covariance matrix and the corresponding susceptibility takes a universal value of two.

Here, we introduce a class of model systems that allows us to discuss exact solution of transport processes and their fluctuations for arbitrary driving; in particular far away from equilibrium. We show that the ratio of the susceptibilities and the corresponding (co-)variances takes constant values in large portions of parameter space. In the pertinent parameter regions we also observe tight coupling of currents, and a locking of Fano factors to constant values: the ratio of the steady-state currents and the associated diffusion coefficients takes non-trivial constant values in large regions of the parameter space.

Tight coupling of currents and a small variability of Fano factors are commonly observed in experiments on biophysical systems. We identify generic conditions for the emergence of these surprising new features of far-from-equilibrium transport processes.

 ISBN: 978-989-98750-3-6