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Comparison principles for parabolic equations and applications to PDEs on networks

If a semi-bounded and symmetric but not essentially self-adjoint operator drives a PDE and boundary conditions have to be imposed and the corresponding solutions can often be compared: an efficient variational principle due to Ouhabaz shows e.g. that the solution to the heat equation with Neumann conditions dominates pointwise and for all times the solution of the heat equation with Dirichlet conditions and same initial data; whereas no such domination can hold if diffusion equations driven by two different elliptic operators under, say, Neumann b.c. are considered.

In this talk I am going to discuss how domination theory can be extended to study domination patterns that only hold on long time scales: I will present (purely spectral!) criteria that imply either "eventual domination" or "interwoven behavior" of orbits of semigroups. Our main application will be given by heat equations on networks: recently obtained results on spectral geometry for quantum graphs turn out to deliver prime examples where such criteria are satisfied.

This is joint work with Gregory Berkolaiko, Jochen Glück, James Kennedy, and Pavel Kurasov.