Asymptotic Analysis and Numerical Simulations in networks of thin vessels

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The talk briefly presents the results of asymptotic analysis for non-Newtonian flows in thin tube structures (see G. Panasenko, K.Pileckas, and B.Vernescu "Steady state non-Newtonian flow with strain rate dependent viscosity in thin tube structure with no slip boundary condition", Mathematical Modelling of Natural Phenomena 17, 2022, 36pp. www.mmnp-journal.org (open access)) and introduces the method of partial asymptotic dimension reduction (PADRED) (see G. Panasenko, K.Pileckas, "Partial asymptotic dimension reduction for steady state non-Newtonian flow with strain rate dependent viscosity in thin tube structure", J.Math. Fluid. Mech., 25:11, 2023, `https://doi.org/10.1007/s00021-022-00749-5`). The computation of the leading term of the solution is related to the equation on the graph, which is an elliptic nonlinear problem. We introduce a numerical method to solve the equation on the graph and apply it to the realistic network of vessels.