



Dear Colleagues!

The V. Kupradze Institute of Mathematics at the University of Georgia is pleased to invite you to the Online Tbilisi Analysis & PDE Seminar. The seminar is held bi-weekly on Wednesdays at 20:00 (GMT+4) local time in Tbilisi.

Talk on October 28, 2026

Speaker: Prof. Volker John, Weierstrass Institute for Applied Analysis and Stochastics and Freie Universität Berlin, Germany;

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<https://www.wias-berlin.de/contact/staff/index.jsp?lang=1&name=john>

The title of the lecture: “Finite element methods respecting the discrete maximum principle for convection-diffusion equations”

Abstract: Convection-diffusion-reaction equations model the conservation of scalar quantities. From the analytic point of view, solution of these equations satisfy under certain conditions maximum principles, which represent physical bounds of the solution. That the same bounds are respected by numerical approximations of the solution is often of utmost importance in practice. The mathematical formulation of this property, which contributes to the physical consistency of a numerical method, is called Discrete Maximum Principle (DMP). In many applications, convection dominates diffusion by several orders of magnitude. It is well known that standard discretizations generally do not satisfy the DMP in this convection-dominated regime, where solutions typically exhibit layers, which are very thin regions with a steep gradient. In this case, one faces a multiscale problem with the layers being subgrid scales that cannot be resolved on affordable grids. It turns out to be a challenging problem to construct discretizations that, on the one hand, respect the DMP and, on the other hand, compute accurate solutions.

This talk presents a survey on finite element methods, with a main focus on the convection-dominated regime of the steady-state problem, that satisfy a local or a global DMP. It reveals that for the steady-state problem there are only a few discretizations, all of them nonlinear, that at the same time satisfy the DMPs and compute reasonably accurate solutions, e.g., algebraically stabilized schemes. Moreover, most of these discretizations have been developed in recent years, showing the enormous progress that has been achieved lately. A brief discussion of the evolutionary problem will be provided as well.

This talk is joint work with Gabriel R. Barrenechea (Glasgow) and Petr Knobloch (Prague).

Date: October 28, 2026

Time: 20:00 (GMT+4) local time in Tbilisi;

(Compare to your local time: <https://www.timeanddate.com/worldclock/georgia/tbilisi>);

How to join:

The seminar is organized on the [Google Meet](#) platform. If you are already registered, you do not need to register again. Otherwise, to join the seminar, please send an email to kim@ug.edu.ge or register here:

<https://forms.gle/xfQJ9fg1uqe7CrZw6>.

You will then receive further information.

WEB of Seminar: <https://ug.edu.ge/en/tbilisi-analysis-and-pde-seminars>.

Organizers:

1. R. Duduchava, Institute of Mathematics, University of Georgia, Tbilisi, Georgia
2. E. Shargorodsky, Department of Mathematics, King's College London, UK
3. A. Meskhi, Kutaisi International University, Kutaisi, Georgia

- Video Call Link: <https://meet.google.com/fes-ughx-mob>
- Invitation (Calendar) Link: <https://calendar.app.google/7GxkYetKVZVAEpze8>

Secretary:

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Technical support:

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Google Meet Join Information

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