Research Grant CNCS-UEFISCDI
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Boundary value problems for elliptic systems on non-smooth domains with applications in fluid mechanics

October 5, 2011–October 4, 2016

Director: Professor Mirela Kohr
Faculty of Mathematics and Computer Science
Babeş-Bolyai University, Cluj-Napoca
Financed by National Authority for Scientific Research (ANCS), through CNCS-UEFISCDI
www.cncs-uefiscdi.ro; www.uefiscdi.ro
Host institution of the project: Babeş-Bolyai University, Cluj-Napoca, Romania

A. Research team:

1. Professor Mirela Kohr (director)
2. Associate Professor Cornel Pintea
3. Associate Professor Teodor Groşan
4. Dr. Denisa Fericean (member as a PhD student in the period October 5, 2011 - December 31, 2012)
5. PhD Student Nicolae - Valentin Păpară (member as a PhD student in the period February 1, 2013 - October 4, 2016)

B. Project summary:

The main focus of this project is the study of an important range of boundary value problems for elliptic partial differential equations or elliptic pseudodifferential operators on non-smooth domains, by combining modern methods in pseudodifferential operator theory, potential theory, Caldern-Zygmund theory, theory of interpolation spaces, geometric function theory. A special attention will be devoted to a large class of transmission problems for linear elliptic partial differential operators with constant/variable coefficients and, more generally, elliptic pseudodifferential matrix type operators, such as the Stokes and pseudodifferential Brinkman operators on Lipschitz domains in Euclidean setting or in Riemannian manifolds, and with data in L^p, Sobolev and Besov spaces. Boundary value problems for semilinear elliptic systems, or boundary value problems for linear elliptic systems with nonlinear boundary conditions, and problems describing time evolution free boundaries, are also considered. These problems are closely related to several areas of low Reynolds number fluid dynamics and porous media, and have applications in biology, geology, chemistry, including porous media flows on non-smooth domains, flows with time evolution free boundaries, the propagation of elastic waves in biological tissues, chemical processes, etc.

C. Objectives

- **Objective 1**. The study of transmission problems for pseudodifferential Brinkman operators on Lipschitz domains in compact Riemannian manifolds and in L^p, Sobolev and Besov spaces
- **Objective 2**. Analysis of the Robin-transmission problems for elliptic systems, such as the Brinkman and Stokes systems, on non-smooth domains and L^p, Sobolev or Besov spaces
- **Objective 3**. Analysis of boundary value problems for linear elliptic systems with nonlinear boundary conditions on Lipschitz domains, and the data in L^p, Sobolev and Besov spaces
- **Objective 4**. Analysis of boundary value problems for semilinear elliptic equations on non-smooth domains in $\mathbb{R}^n$ or compact Riemannian manifolds. Applications to porous media flows
- **Objective 5**. Mixed (Dirichlet-Neumann) transmission problems for the Stokes and Brinkman equations, on creased Lipschitz domains in $\mathbb{R}^n$ and the data in Sobolev spaces
- **Objective 6**. a) Study of boundary value problems for Stokes and pseudodifferential Brinkman type operators on manifolds with boundary and cylindrical ends, or on Lipschitz manifolds

  or, alternatively
  b) Elliptic pseudodifferential boundary value problems on crack domains with low regularity
- **Objective 7**. The study of the Navier-Stokes-Brinkman interface problem in Sobolev spaces and Lipschitz domains in $\mathbb{R}^2$
- **Objective 8**. The study of time evolution free boundary problems on smooth/rough domains

D. Contributions of the PhD students

D. Fericean

Papers

1. **D. Fericean**, *Strongly Φ-like functions of order α in two-dimensional free boundary problems*, Appl. Math. Comput. (**ISI**), **218** (2012), 7856-7863; Impact factor/2015: 1.345.
2. **D. Fericean**, **T. Groşan**, **M. Kohr**, W.L. Wendland, *Interface boundary value problems of Robin-transmission type for the Stokes and Brinkman systems on n-dimensional Lipschitz domains. Applications*, Math. Meth. Appl. Sci., **36** (2013), 1631-1648; Impact factor/2015: 1.002.
3. **D. Fericean**, *Layer potential analysis of a Neumann problem for the Brinkman system*, Mathematica (Cluj), **55** (**78**), no. 1 (2013), 39-50 (**BDI**).

PhD Thesis

D. Fericean finished her PhD studies at the end of September 2012, and in November 29, 2012, she had the public presentation of her PhD thesis *Techniques of potential theory and geometric function theory in the study of some problems in fluid mechanics*, Babeş-Bolyai University, Cluj-Napoca. Adviser Professor Mirela Kohr. This thesis deals with problems in a direct connection with the thematic area of our research grant. Indeed, part of this thesis is based on the Objectives 1, 2 and 8 of this research grant, and the above mentioned papers [1]-[3] played an essential role in the construction of three chapters of the PhD Thesis of D. Fericean.

Denisa Fericean obtained the PhD in Mathematics.

Conferences

1. 8th International Symposium on Geometric Function Theory and Applications, 27-31 August, 2012, Ohrid, Macedonia
   D. Fericean, *Strongly Φ-like functions of order α in two-dimensional free boundary problems* (communication).

N.V. Păpară

Papers

1. **N.V. Păpară**, *Convergence of the Neumann series for a Helmholtz-type equation*, Studia Univ. Babeş-Bolyai (Mathematica), **61** (2016), 109-116.
2. **N.V. Păpară**, *An iterative method for a fourth order transmission problem*, submitted 2016.

PhD Thesis

The subject of the PhD thesis of N.V. Păpară is in connection with main research objectives of this grant. The adviser of his PhD thesis is Professor Mirela Kohr. The main research interest of N.V. Păpară is related to iterative methods and potential theory for boundary value problems related to elliptic partial differential equations.

Conferences

1. 12th International Symposium on Geometric Function Theory and Applications (GFTA 2016), August 25-28 2016, Alba Iulia, Romania; http://gfta2016.uab.ro/
   N.V. Păpară, *Iteration techniques for fourth order and second order partial differential equations* (contributed talk)
2. N.V. Păpară, *Schramm Loewner evolution* (*Procese Schramm Loewner*), November 1, 2012; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca; http://math.ubbcluj.ro/ mecgrup/
3. N. V. Păpară, *Iterative techniques for fourth order biharmonic-type equations*, September 20, 2016; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

E. Achievements

E1. ISI Publications

1. **M. Kohr**, M. Lanza de Cristoforis, S. E. Mikhailov, W. L. Wendland, *Integral potential method for a transmission problem with Lipschitz interface in* $\mathbb{R}^3$ *for the Stokes and Darcy-Forchheimer-Brinkman PDE systems*, Z. Angew. Math. Phys., **67**:116, no. 5, 1-30, 2016, DOI: 10.1007/s00033-016-0696-1; Impact factor/2015: 1.560.

2. **M. Kohr**, S. E. Mikhailov, W. L. Wendland, *Transmission problems for the Navier-Stokes and Darcy-Forchheimer-Brinkman systems in Lipschitz domains on compact Riemannian manifolds*, J. Math. Fluid Mech., DOI: 10.1007/s00021-016-0273-6, to appear; Impact factor/2015: 1.023.

3. I. Graham, H. Hamada, G. Kohr, **M. Kohr**, *Support points and extreme points for mappings with A-parametric representation in* $\mathbb{C}^n$, J. Geom. Anal., **26** (2016), 1560-1595; Impact factor/2015: 1.109.

4. **M. Kohr**, M. Lanza de Cristoforis, W.L. Wendland, *On the Robin-transmission boundary value problems for the nonlinear Darcy-Forchheimer-Brinkman and Navier-Stokes systems*, J. Math. Fluid Mech., **18** (2016), 293-329; Impact factor/2015: 1.023.

5. **M. Kohr**, M. Lanza de Cristoforis, W.L. Wendland, *Poisson problems for semilinear Brinkman systems on Lipschitz domains in* $\mathbb{R}^n$, Z. Angew. Math. Phys., **66** (2015), 833-864; Impact factor/2015: 1.560.

6. **M. Kohr**, **C. Pintea**, W.L. Wendland, *Poisson-transmission problems for* L^∞ *perturbations of the Stokes system on Lipschitz domains in compact Riemannian manifolds*, J. Dyn. Diff. Equat., **27** (2015), 823-839; Impact factor/2015: 1.110.

7. **T. Groşan**, **M. Kohr**, W.L. Wendland, *Dirichlet problem for a nonlinear generalized Darcy-Forchheimer-Brinkman system in Lipschitz domains*, Math. Meth. Appl. Sci., **38** (2015), 3615-3628; Impact factor/2015: 1.002.

8. R. Gutt, **M. Kohr**, **C. Pintea**, W.L. Wendland, *On the transmission problems for the Oseen and Brinkman systems on Lipschitz domains in compact Riemannian manifolds*, Math. Nachr., **289** (2016), 471-484; Impact factor/2015: 0.688.

9. I. Graham, H. Hamada, G. Kohr, **M. Kohr**, *Extremal properties associated with univalent subordination chains in* $\mathbb{C}^n$, Math. Annalen, **359** (2014), 61-99; Impact factor/2015: 1.366.

10. **M. Kohr**, M. Lanza de Cristoforis, W.L. Wendland, *Boundary value problems of Robin type for the Brinkman and Darcy-Forchheimer-Brinkman systems in Lipschitz domains*, J. Math. Fluid Mech., **16** (2014), 595-630; Impact factor/2015: 1.023.

11. **M. Kohr**, **C. Pintea**, W.L. Wendland, *Neumann-transmission problems for pseudodifferential Brinkman operators on Lipschitz domains in compact Riemannian manifolds*, Comm. Pure Appl. Anal., **13** (2014), 175-202; Impact factor/2015: 0.926.

12. **M. Kohr**, M. Lanza de Cristoforis, W.L. Wendland, *Nonlinear Neumann-transmission problems for Stokes and Brinkman equations on Euclidean Lipschitz domains*, Potential Anal., **38** (2013), 1123-1171; Impact factor/2015: 0.956.

13. **M. Kohr**, **C. Pintea**, W.L. Wendland, *Layer potential analysis for pseudodifferential matrix operators in Lipschitz domains on compact Riemannian manifolds: Applications to pseudodifferential Brinkman operators*, Int. Math. Res. Not., **2013**, No. 19 (2013), 4499-4588; Impact factor/2015: 1.031.

14. **M. Kohr**, **C. Pintea**, W.L. Wendland, *Dirichlet-transmission problems for pseudodifferential Brinkman operators on Sobolev and Besov spaces associated to Lipschitz domains in Riemannian manifolds*, ZAMM · Z. Angew. Math. Mech., **93** (2013), 446-458; Impact factor/2015: 1.293.

15. **D. Fericean**, **T. Groşan**, **M. Kohr**, W.L. Wendland, *Interface boundary value problems of Robin-transmission type for the Stokes and Brinkman systems on n-dimensional Lipschitz domains. Applications*, Math. Meth. Appl. Sci., **36** (2013), 1631-1648; Impact factor/2015: 1.002.

16. **M. Kohr**, D. Medková, W. L. Wendland, *On the Oseen-Brinkman flow around an* $(m-1)$*-dimensional solid obstacle*, Monatsh. Math., DOI 10.1007/s00605-016-0981-2, to appear; Impact factor/2015: 0.664.

17. **D. Fericean**, *Strongly* Φ*-like functions of order* α *in two-dimensional free boundary problems*, Appl. Math. Comput., **218** (2012), 7856-7863; Impact factor/2015: 1.345.

18. D. Andrica, D. Mangra, **C. Pintea**, *The circular Morse-Smale characteristic of closed surfaces*, Bull. Math. Soc. Sci. Math. Roumanie, **57 (105)** (2014), 235-242; Impact factor/2015: 0.395.

19. **T. Groşan**, C. Revnic, I. Pop, D.B. Ingham, *Free convection heat transfer in a square cavity filled with a porous medium saturated by a nanofluid*, Int. J. Heat Mass Transfer, **87** (2015), 36–41; Impact factor/2015: 2.857.

20. R. Gutt, **T. Groşan**, *On the lid-driven problem in a porous cavity. A theoretical and numerical approach*, Appl. Math. Comput., **266** (2015), 1070-1082; Impact factor/2015: 1.345.

21. R. Trîmbiţaş, **T. Groşan**, *Fully developed mixed convection in a non-Darcy porous medium saturated by a nanofluid in the presence of internal heat generation*, J. Porous Media, to appear; Impact factor/2015: 0.807.

E2. Proceedings

1. **M. Kohr**, M. Lanza de Cristoforis, W. L. Wendland, *Nonlinear Darcy-Forchheimer-Brinkman system with linear Robin boundary conditions in Lipschitz domains*, in "Complex Analysis and Potential Theory with Applications" (T. Aliev Azeroglu, A.Golberg, S.Rogosin eds.), 111–124, Cambridge Scientific Publishers, 2014. ISBN 978-1-908106-40-7

E3. Book chapters

1. **M. Kohr, C. Pintea**, *On the invertibility of some elliptic operators on manifolds with boundary and cylindrical ends*, in: "Topics in Mathematical Analysis and Applications", Springer volume, **94** (2014), 483-500, Editors: Th. M. Rassias, L. Toth.

2. D. Andrica, D. Mangra, **C. Pintea**, *Aspects of global analysis of circle-valued mappings*, in: "Topics in Mathematical Analysis and Applications", Springer volume, **94** (2014), 79-110, Editors: Th. M. Rassias, L. Toth.

E4. BDI Publications

1. **D. Fericean**, *Layer potential analysis of a Neumann problem for the Brinkman system*, Mathematica (Cluj), **55** (**78**), no. 1 (2013), 39-50.

2. **N.V. Păpară**, *Convergence of the Neumann series for a Helmholtz-type equation*, Studia Univ. Babeş-Bolyai (Mathematica), **61** (2016), 109-116.

E5. Preprints and papers submitted for publication

1. P. Curt, **M. Kohr**, *Some geometrical properties of free boundaries in the Hele-Shaw flows*, submitted (2016).

2. **M. Kohr**, **C. Pintea**, *On an inverse problem related to a Hele-Shaw flow*, submitted (2016).

3. **M. Kohr**, S.E. Mikhailov, *Dirichlet-transmission problems for the Navier-Stokes and Darcy-Forchheimer-Brinkman systems in Lipschitz domains with interior cuts*, preprint (2015).

4. R. Peter, **C. Pintea**, *Differentiable maps with uncountable critical sets*, submitted (2016).

5. **N.V. Păpară**, *An iterative method for a fourth order transmission problem*, submitted (2016).

E6. Findings

- Report-2011-romanian
- Report-2011-english

- Report-2012-romanian
- Report-2012-english

- Report-2013-romanian
- Report-2013-english

- Report-2014-romanian
- Report-2014-english

- Report-2015-romanian
- Report-2015-english

- Report-2016-romanian
- Report-2011-2016-english

E7. Research visits

- University of Toronto, Department of Mathematics; invited by Professor Ian Graham (April 23-May 14, 2012; August 16-August 29, 2012) (M. Kohr).
- University of Padova, Department of Mathematics, June 18-June 22, 2012; invited by Professor Massimo Lanza de Cristoforis (M. Kohr).
- University of Toronto, Department of Mathematics; invited by Professor Ian Graham (April 22-May 14, 2013; August 9-August 24, 2013) (M. Kohr).
- University of Toronto, Department of Mathematics; invited by Professor Ian Graham (April 22-May 13, 2014; August 5-August 22, 2014) (M. Kohr).
- University of Padova, Department of Mathematics, June 23-June 27, 2014; invited by Professor Massimo Lanza de Cristoforis (M. Kohr).
- University of Toronto, Department of Mathematics; invited by Professor Ian Graham (April 22-May 14, 2015; August 17-August 29, 2015) (M. Kohr).
- University of Stuttgart and University of Wuerzburg, May 28-May 31 2015 (research visits), invited by Prof. W.L. Wendland and Prof. O. Roth (M. Kohr).
- University of Padova, Department of Mathematics, June 21-June 24, 2015, invited by Professor Massimo Lanza de Cristoforis (M. Kohr).
- University of Padova, Department of Mathematics, August 30-September 2, 2015, invited by Professor Massimo Lanza de Cristoforis (M. Kohr).
- University of Toronto, Department of Mathematics; invited by Professor Ian Graham (April 22 - May 11, 2016; August 13 - August 26, 2016) (M. Kohr).
- Brunel University London, Department of Mathematics; invited by Professor Sergey E. Mikhailov (June 14 - June 19, 2016) (M. Kohr)
- University of Padova, Department of Mathematics, July 25-August 4, 2016, invited by Professor Massimo Lanza de Cristoforis (M. Kohr).

E8. Conferences

- Harmonic and Complex Analysis and its Applications, Puerto de la Cruz, Tenerife, Canary Islands, Spain, March 5-9, 2012; http://hcaa2012.webs.ull.es/
  M. Kohr, *Potential analysis for elliptic boundary value problems on Lipschitz domains in Riemannian manifolds* (**invited parallel session lecture**)
- 9th International Conference on Harmonic Analysis and Partial Differential Equations, El Escorial, Madrid (Spain), June 11-15, 2012;
  http://www.uam.es/departamentos/ciencias/matematicas/AFA/Escorial2012/
  M. Kohr, *Potential analysis for elliptic boundary value problems on Lipschitz domains in Riemannian manifolds* (poster; joint work with C. Pintea, W.L. Wendland); **C. Pintea** (participant).

- 8th International Symposium on Geometric Function Theory and Applications, 27-31 August, 2012, Ohrid, Macedonia; http://www.euro-math-soc.eu/node/2370
D. Fericean, *Strongly Φ-like functions of order α in two-dimensional free boundary problems* (communication).

- Tenth Advanced Course in Operator Theory and Complex Analysis, Sevilla, June 9 -13, 2013; http://congreso.us.es/ceacyto/2013/
M. Kohr, *Poisson problems for semilinear elliptic systems in Lipschitz domains* (**contributed talk**)

- Joint International Meeting of the AMS and the Romanian Mathematical Society, June 27-30, 2013, Alba Iulia (Romania);
http://imar.ro/ams-ro2013/description.php;
M. Kohr, **C. Pintea** (participants)

- 9th International ISAAC Congress, Krakow, August 5-9, 2013;
http://www.isaac2013.up.krakow.pl/
M. Kohr, *Poisson problems for semilinear Brinkman systems in Lipschitz domains* (**lecture**)

- 5th International Conference on Application of Porous Media, Cluj-Napoca, August 25-28, 2013; http://www.cs.ubbcluj.ro/ icamp2013/
M. Kohr, *Poisson problems for semilinear Brinkman systems on Lipschitz domains. Applications* (**Plenary speaker**)

- 9th International Symposium on Geometric Function Theory and Applications, Işsik University, Istanbul (Turkey), August 26-30, 2013; http://gfta.isikun.edu.tr/
M. Kohr, *Poisson problems for semilinear elliptic systems in Lipschitz domains. Applications* (**communication**)

- Mini-courses in Mathematical Analysis 2014, Padova, June 23-27, 2014; http://minicourses.dmsa.unipd.it/
M. Kohr, *Boundary value problems of Robin-transmission type for the nonlinear Darcy-Forchheimer-Brinkman and Navier-Stokes systems. Applications* (**Invited talk**)

- 25th International Workshop of Operator Theory and its Applications (IWOTA 2014), Amsterdam, July 14-18, 2014; http://www.math.vu.nl/ran/iwota2014/
M. Kohr, *Boundary value problems of Robin-transmission type for the nonlinear Darcy-Forchheimer-Brinkman and Navier-Stokes systems. Applications*
(**Lecture** in the Section *Partial differential operators and potential method*, organized by Roland Duduchava and Vladimir Rabinovich)

- 10th International Symposium on Geometric Function Theory and Applications, Oradea, August 25-28, 2014; **C. Pintea**, *On the invertibility of some elliptic operators on manifolds with boundary and cylindrical ends* (**communication**)

- Mini-courses in Mathematical Analysis 2015, Padova, June 22-26, 2015; http://minicourses.dmsa.unipd.it/

M. Kohr, *Boundary value problems of transmission type for the Stokes and Darcy-Forchheimer-Brinkman systems in weighted Sobolev spaces on Lipschitz domains in* $\mathbb{R}^3$ (**Invited talk**)

- The Eighth Congress of Romanian Mathematicians, June 26 - July 1, 2015, Iaşi; http://www.imar.ro/congmatro8/conf.php
  M. Kohr, *Boundary value problems of transmission type for the Navier-Stokes and Darcy-Forchheimer-Brinkman systems in weighted Sobolev spaces* (**Invited talk** in the section Mechanics, Numerical Analysis, Mathematical Models in Science);
  C. Pintea (participant)

- Tenth UK Conference on Boundary Integral Methods (UKBIM 2015), 13-14 July 2015, Brighton, UK; http://www.cem.brighton.ac.uk/ukbim2015/
  M. Kohr, *Transmission problems for the Stokes and Darcy-Forchheimer-Brinkman systems in weighted Sobolev spaces on Lipschitz domains* (communication)

- International Conference on Nonlinear Operators, Differential Equations and Applications (ICNODEA), July 14-17, 2015, Cluj-Napoca, Romania; http://www.cs.ubbcluj.ro/ icnodeacj/
  M. Kohr, *Transmission problems for the Navier-Stokes and Darcy-Forchheimer-Brinkman systems in weighted Sobolev spaces on Lipschitz domains* (**Invited speaker**)

- Mathematics of Finite Elements and Applications (MAFELAP 2016), Brunel University London, UK, June 14 - 17, 2016;
  http://people.brunel.ac.uk/ icsrsss/bicom/mafelap2016/
  M. Kohr, *Boundary value problems for a nonlinear Brinkman system with variable coeffcients in Sobolev and Besov spaces on Lipschitz domains* (**Invited speaker** in the mini-symposium "Boundary-Domain Integral Equations" organized by Sergey E. Mikhailov and David Natroshvili)

- International Conference on Complex Analysis and Related Topics. The 14th Romanian-Finnish Seminar, June 20 - 24 2016, Bucharest, Romania;
  http://imar.ro/RoFinSem2016/conf.php
  M. Kohr, *Boundary value problems for nonlinear Brinkman systems in Lipschitz domains* (contributed talk);
  C. Pintea, *Global injectivity criteria and applications* (contributed talk)

- The 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, July 1-5, 2016, Orlando, Florida, USA;
  http://www.aimsciences.org/conferences/2016/
  M. Kohr, *Boundary value problems for nonlinear Brinkman and Navier-Stokes equations with variable coefficients in Lipschitz domains* (**Invited speaker** in the special session "Theory and applications of boundary-domain integral and pseudodifferential operators" organized by Sergey E. Mikhailov and David Natroshvili)

- 14th International Conference on Integral Methods in Science and Engineering (IMSE 2016), 25 - 29 July 2016, Padova, Italy;
  http://events.math.unipd.it/imse2016/

M. Kohr, *Boundary value problems for nonlinear Brinkman systems in Lipschitz domains* (conference talk); member in the Organizing Committee and Program Committee (M. Kohr)

- 12th International Symposium on Geometric Function Theory and Applications (GFTA 2016), August 25-28 2016, Alba Iulia, Romania; http://gfta2016.uab.ro/
  N.V. Păpară, *Iteration techniques for fourth order and second order partial differential equations* (contributed talk)

- 13ème Colloque Franco-Roumain en Mathématiques Appliquées, 25-29 August 2016, Iaşi, Romania; http://www.math.uaic.ro/cfr2016/index.php?info
  C. Pintea, *Global injectivity results for some classes of operators and applications* (contributed talk)

- 13ème Colloque Franco-Roumain de Mathématiques Appliquées, 25-29 August 2016, Iaşi, Romania; http://www.math.uaic.ro/cfr2016/index.php?info
  M. Kohr, *Boundary value problems for nonlinear Brinkman and Navier-Stokes equations with variable coefficients in Lipschitz domains* (**Plenary speaker**)

E9. Seminar talks

- N.V. Păpară, *Schramm Loewner evolution* (*Procese Schramm Loewner*), November 1, 2012; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca; http://math.ubbcluj.ro/ mecgrup/

- T. Groşan, *Transport problems in porous media saturated with nanofluids* (*Probleme de transport în medii poroase saturate cu nanofluide*), March 7, 2013; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- C. Pintea, *Properties of M-B monotone operators. Applications* (*Proprietăţi ale operatorilor M-B monotoni. Aplicaţii*), March 14, 2013; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- M. Kohr, *Poisson problems for semilinear Brinkman systems on Lipschitz domains*, June 6, 2013; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- M. Kohr, *Robin problems for the Brinkman and Darcy-Forchheimer-Brinkman systems*, December 5, 2013; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- C. Pintea, *On the invertibility of some elliptic operators on manifolds with boundary and cylindrical ends*, April 10, 2014; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- T. Groşan, *Convective flow in cavities filled with nanofluid saturated porous media*, November 13, 2014; Seminar talk: Seminar of the Research Group on Mechanics and

Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- C. Pintea, *Global injectivity criteria via monotonicity*, November 13, 2014; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- M. Kohr, *Boundary value problems for nonlinear elliptic systems in domains with interior cuts. Applications*, November 20, 2014; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- C. Pintea, *Operations with monotone operators and the monotonicity of the resulting operators*, March 19, 2015; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- **M. Kohr**, *Transmission problems for the Navier-Stokes and Darcy-Forchheimer-Brinkman systems in weighted Sobolev spaces on exterior Lipschitz domains in* $\mathbb{R}^3$, May 28, 2015; Seminar talk: Institute for Applied Analysis and Numerical Simulation, Stuttgart University, Stuttgart (Germany) http://www.ians.uni-stuttgart.de/am/lehre/Instituts-Oberseminar/index.html

- C. Pintea, *Minimal convex coverings*, November 19, 2015; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- T. Groşan, *Mathematical models of heat transfer in nanofluid saturated porous media*, November 26, 2015; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- C. Pintea, *Monotonicity and local/grobal injectivity results*, March 10, 2016; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

- N.V. Păpară, *Iterative techniques for fourth order biharmonic-type equations*, September 22, 2016; Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

External collaborators of Professor Mirela Kohr

- Professor Massimo Lanza de Cristoforis, Dipartimento di Matematica, Università degli Studi di Padova, Italy
  - Research visits at Babeş-Bolyai University, Faculty of Mathematics and Computer Science, February 2012, February 2013, February 2014, February 2015, April 2016.

- Professor Sergey E. Mikhailov, Department of Mathematics, Brunel University London, United Kingdom
  - Research visit at Babeş-Bolyai University, Faculty of Mathematics and Computer Science, July 2014, May 2015.
- Professor Wolfgang L. Wendland, Institut für Angewandte Analysis und Numerische Simulation, Universität Stuttgart, Germany
  - Research visit at Babeş-Bolyai University, Faculty of Mathematics and Computer Science, April 2014, July 2016.
    1. Prof. Dr. Wolfgang L. Wendland, *On the coupled Darcy-Stokes flow*, April 17, 2014;
       Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/
    2. Prof. Dr. Wolfgang L. Wendland, *On Potential Methods for Porous Media Flows*, July 18, 2016;
       Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/
- Dr. Dagmar Medková, Mathematical Institute, Prague, Czech Republic
  - Research visit at Babeş-Bolyai University, Faculty of Mathematics and Computer Science, June 2014.
    1. Dr. Dagmar Medkova, *L^p solution of the Robin problem for the Oseen equation*, June 05, 2014;
       Seminar talk: Seminar of the Research Group on Mechanics and Astronomy, Babeş-Bolyai University, Cluj-Napoca http://math.ubbcluj.ro/ mecgrup/

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