Sebastian A. Altmeyer, PhD

Personal

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Citizenship:	Germany
Date of Birth:	03.03.1981

Scientific Interest

Fluid Dynamics

Physics, fluid flow, fluid mechanics, numerical analysis
Transition to turbulence, invariant solutions, flow instabilities
Pattern formation, nonlinear dynamics, bifurcation theory
Complex fluids like Ferrofluids, coherent structures
Shear flows, Pipe flow, Taylor-Couette-flow, plane Couette flow
Dynamical System Theory

Statistics

Extreme events, universal scaling law

Education

11/2007 – 09/2011	**Ph.D. in Physics** with Prof. Manfred Lücke at Universität des Saarlandes (UdS). Dissertation title: *Investigations of complex vortex flow with Newtonian fluid and ferrofluid in the Taylor-Couette system.*
07/2006 – 06/2007	**Diploma in Physics** with Prof. Manfred Lücke at Universität des Saarlandes (UdS). Diploma thesis: *Linear stability analysis of spiral vortex structures in the Taylor-Couette system*, Award for best Diploma thesis.
04/2003 – 06/2006	**Degree in Physics**; Academic study of theoretical physics and mathematics at Universität des Saarlandes (UdS).

Professional Experience

09/2017 – present	Serra-Húnter Fellow; **assistant professor (tenure track)**, in **Aerospacial Engineering** at Universitat Politécnica de Catalunya (UPC), Spain.
07/2013 – 08/2017	**Postdoctoral researcher** with Prof. Björn Hof at Institute of Science and Technology (IST), Austria.
02/2013 – 06/2013	**Postdoctoral researcher** with Prof. Björn Hof at Max Planck Institute for Dynamics and Self-Organization (MPI-DS), Germany.
01/2012 – 01/2013	**Postdoctoral researcher** with Prof. Younghae Do at Department of Mathematics, Kyungpook National University (KNU), Korea.
10/2010 – 12/2010	**PhD student** with Prof. Gerd Pfister at Experimental and Applied Physics, Christian-Albrecht-Universität, Germany.
04/2008 – 08/2011	**PhD student** and teaching assistant with Dr. Klaus Schindler at Mathematics faculty of applied economics, Universität des Saarlandes (UdS), Germany.
08/2004 – 08/2011	**PhD student** and teaching assistant with Prof. Manfred Lücke at Department of Physics, Universität des Saarlandes (UdS), Germany.

Teaching Experience

09/2017 – present	**Material Science & Engineering**, Castelldefels School of Telecom and Aerospace Engineering (EETAC), Universitat Politècnica de Catalunya (UPC), 08860 Barcelona, Spain.
04/2015 – 07/2015	**Hydrodynamics, stability and the onset of turbulence** (Semester - Lecture course for PhD students), Institute of Science and Technology (IST), Austria.
04/2014 – 07/2014	**Introduction to Fluid Dynamics & Bio-fluidics** (Semester - Lecture course for PhD students), Institute of Science and Technology (IST), Austria.
03/2012 – 08/2012	**Rotating flows - instabilities in Taylor-Couette and Rayleigh-Bénard system** (Semester - Lecture course for PhD and Master students), Department of Mathematics, Kyungpook National University (KNU), Korea.
10/2010 – 03/2011	**Complex systems** (Semester - Lecture course for PhD and master students), Department of Physics, Universität des Saarlandes (UdS), Germany.
2009 – 2011	Semester-Course **Latex seminar** (Semester - Lecture course for Master students), Mathematics faculty of applied economics, Universität des Saarlandes (UdS), Germany.

2008 – 2011 Semester-Lecture accompanying practices for graduate and undergraduate students in **Mathematical Economics** (*Derivative finance instruments, Numerical Modeling and Optimization, Math for Economics (I & II)*), Mathematics faculty of applied economics, Universität des Saarlandes (UdS), Germany.

2007 – 2011 Semester-Lecture accompanying practices for graduate students in **Theoretical Physics** (Classical Mechanics, Electro- & Magnetodynamics, Quantenphysics (I & II), Thermodynamics & Statistics), Institute for Theoretical Physics, Universität des Saarlandes (UdS), Germany.

Co-supervised students and Theses

04/2015 – 06/2016 Chaitanya Paranjape: *Frontpropagation in plane Couette flow*, **PhD thesis**, Institute of Science and Technology (IST), Austria.

05/2014 – 08/2014 Martin Buchacek: *Edge-tracking in full space short pipe domains*, **Internship**, Institute of Science and Technology (IST), Austria.

01/2012 – 01/2013 Youngyong Park: *Slow passage through resonance and Early effect with multiple resonances* (in preparation), **PhD Thesis**, Kyungpook National University (KNU), Korea.

03/2011 – 09/2011 Philipp Bohr: *Viscoelastic Instabilities in straight and curvilinear channel flow* (in preparation), **PhD Student**, Universität des Saarlandes (UdS), Germany.

03/2010 – 02/2011 Philipp Bohr: *Flow structures in Taylor Couette Flow*, **Diploma Thesis**, Universität des Saarlandes (UdS), Germany.

Scientific Activities and Memberships

2011 – now Reviewer for Phys. Rev. Lett, Phys. Rev. E, Scientific Reports, J. Fluid Mech., New J. Phys., Fluid Dyn. Res., Europ. J. Mech., Europ. Phys. J.

2012 – now Member of American Physical Society (APS).

2006 – now Member of German Physical Society (DPG).

Prizes

2007 Award for best Diploma thesis. Universität des Saarlandes (UdS).

Software skills

Computer Programming:	Fortran, C, C++, Java, JavaScript, Pascal, Perl, UNIX shell scripting, awk, seed, GNU make, Matlab, Maple, Mathematica, PLP-plot and others
Numerical Methods:	- Linear algebra, Fourier transforms, nonlinear numerical methods, polynomials, statistics, N-dimensional filters, visualization - finite differences method, Galerkin methods, collocation methods, spectral methods - parallel computing, OpenMP, MPI - invariant solutions, steady states, periodic orbit solver
Operating Systems:	Linux, and other UNIX variants, Microsoft Windows family, Apple OS X, IBM OS/2

Personal skills

language skills	English (Fluent Professional level), French (Basic level), Spanish (Basic level), German (Native language).
personal interest	Biking, hiking, traveling

List of Publications

Peer Reviewed

1. **S. Altmeyer** and Richard M. Lueptow, *Wave propagation reversal for wavy vortices in wide-gap counter-rotating cylindrical Couette flow*, Phys. Rev. E, 95, 053103 (2017).

2. **S. Altmeyer**, Y. Do, and Ying-Cheng Lai; *Dynamics of ferrofluidic flow in the Taylor-Couette system with a small aspect ratio*, Scientific Reports, 7, 40012 (2017).

3. **S. Altmeyer**, Y. Do, and Ying-Cheng Lai, *Magnetic field induced flow reversal in a ferrofluidic Taylor-Couette system*, Scientific Reports, 5, 18589 (2015).

4. **S. Altmeyer**, Y. Do, and Ying-Cheng Lai, *Ring-bursting behavior en route to turbulence in narrow-gap Taylor-Couette flows*, Phys. Rev. E, 92, 053018 (2015).

5. **S. Altmeyer**, Y. Do, and Ying-Cheng Lai, *Transition to turbulence in ferrofluidic Taylor-Couette flow*, Scientific Reports, 5, 10781 (2015).

6. Y. Park, Y. Do, **S. Altmeyer**, Ying-Cheng Lai, and G. Lee, *Early effect in time-dependent, high-dimensional nonlinear dynamical systems with multiple resonances*, Phys. Rev. E, 91, 022906 (2015).

7. **S. Altmeyer**, *On secondary instabilities generating footbridges between spiral vortex flow*, Fluid Dyn. Res., 46, 025503 (2014).

8. Ch. Hoffmann, **S. Altmeyer**, M. Heise, J. Abshagen, and G. Pfister, *Axisymmetric propagating vortices in centrifugally stable Taylor-Couette flow*, J. Fluid Mech., 728, 458-470 (2013).

9. **S. Altmeyer**, Y. Do, and J. M. Lopez, *Effect of elongational flow on ferrofluids under a magnetic field*, Phys. Rev. E, 88, 013003 (2013).

10. **S. Altmeyer**, *Time-dependent Ferrofluid dynamics in symmetry breaking transverse magnetic field*, Open Journal of Fluid Dynamics, 3, 116-126 (2013).

11. **S. Altmeyer**, A. Leschhorn, Ch. Hoffmann, and M. Lücke, *Elongational flow effects on the vortex growth out of Couette flow in ferrofluids*, Phys. Rev. E, 87, 053010 (2013).

12. K. Deguchi, and **S. Altmeyer**, *On fully nonlinear mode competition of nearly bicritical spiral or Taylor vortices in Taylor-Couette flow*, Phys. Rev. E, 87, 043017 (2013).

13. M. Heise, Ch. Hoffmann, Ch. Will, **S. Altmeyer**, J. Abshagen, and G. Pfister, *Co-rotating Taylor-Couette flow enclosed by stationary disks*, J. Fluid. Mech., 716, R4 1-12 (2013).

14. **S. Altmeyer**, Y. Do, F. Marques, and J. M. Lopez, *Symmetry-breaking Hopf bifurcations to 1-, 2-, and 3-tori in small-aspect-ratio counter-rotating Taylor-Couette flow*, Phys. Rev. E, 86, 046316 (2012).

15. **S. Altmeyer**, Y. Do, and J. M. Lopez, *Influence of an inhomogeneous magnetic field on the dynamics of the flow of ferrofluid between differentially rotating cylinders*, Phys. Rev. E, 85, 066314 (2012).

16. **S. Altmeyer**, Ch. Hoffmann, and M. Lücke, *Islands of instability for growth of spiral vortices in the Taylor-Couette system with and without axial through flow*, Phys. Rev. E, 84, 046308 (2011).

17. **S. Altmeyer**, and Ch. Hoffmann, *Secondary bifurcation of mixed-cross-spirals connecting travelling wave solutions*, New J. Phys., 12, 113035 (2010).

18. **S. Altmeyer**, Ch. Hoffmann, A. Leschhorn, and M. Lücke, *Influence of homogeneous magnetic fields on the flow of a ferrofluid in the Taylor-Couette system*, Phys. Rev. E, 82, 016321 (2010).

19. **S. Altmeyer**, Ch. Hoffmann, M. Heise, J. Abshagen, A. Pinter, M. Lücke, and G. Pfister, *End wall effects on the transitions between Taylor vortices and spiral vortices*, Phys. Rev. E, 81, 066313 (2010).

20. Ch. Hoffmann, **S. Altmeyer**, A. Pinter, and M. Lücke, *Transitions between Taylor vortices and spirals via wavy Taylor vortices and wavy spirals*, New J. Phys., 11, 053002 (2009).

21. A. Leschhorn, M. Lücke, Ch. Hoffmann, and **S. Altmeyer**, *Stability of circular Couette flow of a ferrofluid in an axial magnetic field: Influence of polydispersity*, Phys. Rev. E, 79, 036308 (2009).

22. Ch. Hoffmann, M. Heise, **S. Altmeyer**, J. Abshagen, A. Pinter, G. Pfister, and M. Lücke, *Nonlinear defects separating spiral waves in Taylor-Couette flow*, Phys. Rev. E, 80, 066308 (2009).

Submitted and in Preparation

- S. Altmeyer, A. P. Willis, and B. Hof, *Unstable multi-frequency orbits in turbulent pipe flow*, under review (2017).
- B. Kim, S. Altmeyer, Y. Do, B. Jang and Ying-Cheng. Lai, *Hopping of earthquakes - universal algebraic scaling of mobility of extreme events*, under review (2017)
- S. Altmeyer, Y. Do and S. Ryu, *Transient behavior between multi-cell flow states in Ferrofluidic Taylor-Couette flow*, under review (2017)
- S. Altmeyer, *Non-linear dynamics and alternating "flip" solutions in Ferrofluidic Taylor-Couette flow*, under review (2017)
- L. van Veen, S. Altmeyer, and A. Hazel, *A practical guide to the computation of invariant solutions to the Navier-Stokes equation*, in preparation (2017).
- S. Altmeyer, F. Marques, J. M. Lopez, and B. Hof, *Global flow inversion in small-aspect-ratio highly counterrotating Taylor-Couette flow*, in preparation (2017).

Contributed Conferences: Talks (**T**) & Posters (**P**) (selected)

09/2016 EFMC11 - European Conference in Fluid Mechanics, Talk: *Invariant solutions in pipe flow - experiments and simulations*, Sevilla, Spain **T**

04/2016 FOR1182 meeting - Turbulence Spring School, Talk: *Invariant solutions in full space pipe flow*, Klosterneuburg, Austria **T**

11/2015 APS DFD 68th Annual Meeting of the APS Division of Fluid Dynamics, Talk: *Relative periodic orbits in full space pipe flow*, Boston, MA, US **T**, **chairmanship** of the session M6: Nonlinear Dynamics: Transition to Turbulence

09/2015 XXXV Dynamics Days Europe, Talk: *Streamwise-Localized Solutions*, Exeter, United Kingdom **T**

07/2015 Bifurcations and Instabilities in Fluid Dynamics, Talk: *Forced invariant solutions in pipe flow - experiments and simulations*, Paris, France **T**

06/2015 19th International Couette-Taylor Workshop, Talk: *Transition to turbulence in Taylor-Couette ferrofluidic flow*, Poster (1): *Localized invariant solutions in pipe flow.* Poster (2): *Flow inversion in small-aspect-ratio Taylor-Couette flow.* Cottbus, Germany **T, P**

05/2015 Euromech Colloquium 568 - Coherent structures in fully developed turbulence, Talk: *Forced invariant solutions in pipe flow - experiments and simulations*, Madrid, Spain **T**

03/2013 Mathematics Symposium - Nonlinear Dynamics and Complex Systems, **invited speaker**, Talk: Various routes to turbulence, Daegu, Korea **T**.

11/2014 APS DFD 67th Annual Meeting of the APS Division of Fluid Dynamics, Talk: *Streamwise-Localized Solutions with natural 1-fold symmetry*, San Francisco, CA, US **T**

10/2014 FOR1182 meeting Transport and structure formation in turbulent flows, Talk: *The role of periodic orbits and bubbles of chaos during the transition to turbulence*, Bad Staffelstein, Germany **T**

09/2014 EFMC10 - European Conference in Fluid Mechanics, Talk: *Relative periodic orbits forming 'chaotic bubble' turbulent in pipe flow*, Copenhagen, Denmark **T**

05/2014 Euromech Colloquium EC565 on subcritical transition to turbulence, Talk: *Relative periodic orbits on islands of chaos deep within turbulent sea in pipe flow*, Cargese, France **T**

03/2014 14th German Ferrofluid Workshop, Talk: *Can turbulence occur at low Reynolds numbers?*, Illmenau, Germany **T**

09/2013 13th German Ferrofluid Workshop, Talk: *Effect of elongational flow on ferrofluids under a magnetic field*, Benediktbeuren, Germany **T**

09/2013 ISMC - International Soft Matter Conference, Poster: *Elongational flow effects on the vortex growth out of Couette flow in ferrofluids*, Rom, Italy **P**

07/2013 STATPHYS25 - XXV IUPAP International Conference on Statistical Physics, Talk: *Symmetry-breaking Hopf bifurcations to 1-, 2-, and 3-tori in small-aspect-ratio counter-rotating Taylor-Couette flow*, Seoul, Republic of Korea **T**

06/2013 18th International Couette-Taylor Workshop, Talk: *Symmetry-breaking Hopf bifurcations to 1-, 2-, and 3-tori in small-aspect-ratio counter-rotating Taylor-Couette flow*, Poster: *Elongational flow effects on the vortex growth out of Couette flow in ferrofluids*, Enschede, Netherland **T,P**

01/2013 ICMF-13 XIII International Conference on Magnetic Fluids, Talk: *Effect of elongational flow on ferrofluids under a magnetic field*, New Delhi, India **T**

12/2012 ICCS 2012 The International Conference on Nonlinear Dynamics and Complex Systems, **invited speaker**, Talk: *Symmetry-breaking Hopf bifurcations to 1-, 2- and 3-tori in small-aspect-ratio counter-rotating Taylor-Couette flow*, Daejeon, Republic of Korea **T**

11/2012 APS DFD 65th Annual Meeting of the APS Division of Fluid Dynamics, Talk: *Symmetry-breaking Hopf bifurcations to 1-, 2-, and 3-tori in small-aspect-ratio counter-rotating Taylor-Couette flow*, San Diego, CA, US **T**

08/2012 ICTAM The XXIII International Congress of Theoretical and Applied Mechanics, Talk: *Mixed-Cross-Spirals generating footbridge solutions*, Beijing, China **T**, **chairmanship** of the session FM07: Flow instability and transition

05/2012 KSIAM Spring Conference, Talk: *Influence of an inhomogeneous magnetic field on the dynamics of the flow of ferrofluid between differentially rotating cylinders*, Seoul, Republic of Korea **T**

04/2012 KMS Spring Meeting, Talk: *Inhomogeneous magnetic field modifying flow dynamics of ferrofluid flow between differentially rotating cylinders*, Seoul, Republic of Korea **T**

09/2011 FOR1182 meeting - Transport and structure formation in turbulent flows, Poster: *Mixed-Cross-Spirales providing direct transition between helical flow states in Taylor-Couette system*, Bad Dürkheim, Germany **P**

07/2011 17th International Couette-Taylor Workshop, Talk: *Secondary bifurcation of mixed cross-spirals connecting different travelling wave solutions*, Poster: *End wall effects on the transitions between Taylor vortices and spiral vortices*, Poster: *Influence of homogeneous magnetic fields on the flow of a ferrofluid in the Taylor-Couette system* Leeds, United Kingdom **T,P**

07/2011 BIFD2011 4th International Symposium - Bifurcation and Instabilities in Fluid Dynamics, Poster: *Secondary bifurcation of mixed cross-spirals connecting different travelling wave solutions*, Barcelona, Spain **T**

10/2010 10th German Ferrofluid Workshop, Talk: *Influence of homogeneous magnetic fields on the flow of a ferrofluid in the Taylor-Couette system*, Benediktbeuren, Germany **T**

09/2009 16th International Couette-Taylor Workshop, Talk: *Transitions between Taylor vortices and spirals via wavy Taylor vortices and wavy spirals*, Poster: *End wall effects on the transitions between Taylor vortices and spiral vortices* Princeton, US **T,P**

08/2009 BIFD2009 3rd International Symposium - Bifurcation and Instabilities in Fluid Dynamics, Talk: *Transitions between Taylor vortices and spirals via wavy Taylor vortices and wavy spirals*, Nottingham, United Kingdom **T**