TORQUE 2016

Munich, Germany, 5-7 October 2016

Conference Booklet

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Welcome Message from the Conference Chair

Dear Colleagues,

On behalf of the TORQUE 2016 Organizing Committee, I am honored and delighted to welcome you to the 2016 edition of the Science of Making Torque from Wind Conference.

The European Academy of Wind Energy (EAWE) first organized TORQUE in 2004 in Delft. That initiative gave a fundamental stimulus to the birth of a new scientific community, highly focused and specifically dedicated to wind energy science. After the very successful events in Copenhagen (2007), Crete (2010), Oldenburg (2012) and Copenhagen again (2014), TORQUE has become the main scientific conference series in wind energy worldwide. A vibrant and very active international community comes to TORQUE to hear about new progress, to exchange ideas and ultimately to shape new directions where research will be going in the future. TORQUE is also a place where academia meets industry, creating that crucial collaboration that has allowed wind energy to become the leader among renewables and one of the key players in de-carbonization.

TORQUE 2016 has been organized by the Technical University of Munich (TUM) following in the footsteps of the previous editions. We have an extremely interesting technical program, with 142 oral presentations and 167 posters. All papers have been grouped in ten thematic sessions. The program is enriched by a plenary historical talk given by one of the pioneers of wind energy in the USA, and by a plenary roundtable where leaders from industry and academia will discuss the future needs of scientific research in wind energy. Social events have been organized to let you relax while enjoying Munich and the Bavarian hospitality, providing at the same time additional opportunities for networking with your fellow wind energy colleagues. We sincerely hope that you will enjoy the conference as much as we enjoyed organizing it.

TORQUE has been made possible only by the dedication of a large number of individuals. In particular, I wish to recognize the work of the Session Editors, who have lead the organization of the ten thematic sessions. In addition, over 150 reviewers helped ensure the quality of the papers. The Technical Organizing Committee has done a fantastic job and has worked hard on all organizational aspects of the conference. The TUM Local Organizing Committee and the whole TUM community have supported us with enthusiasm in the initiative of bringing TORQUE to Munich. Finally, GE Global Research, the German Research Foundation (DFG) and EAWE have supported the conference financially, helping us limit the registration fees. Thank you to all who have contributed to TORQUE 2016, the conference could not have been organized without you.

Welcome to Munich and enjoy TORQUE 2016!

Carlo L. Bottasso
Conference Chair of TORQUE 2016

Committees

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- C.L. Bottasso
- W. Lopens
- E. Matzner
- J. Schreiber
- R. Weber
- R. Wein

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- K.-U. Bletzinger
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- J.J. Melero (Spain)
- J. Meyers* (Belgium)
- M. Muskulus* (Norway)
- A. Natarajan* (Denmark)
- I. Paek (Korea)
- J. Peinke* (Germany)
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- J. Sørensen* (Denmark)
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- G. van Kuik* (The Netherlands)
- J.-W. van Wingerden* (The Netherlands)
- P. Veers (USA)
- S. Voutsinas (Greece)
- S. Watson (UK)

(*) Session Editors

Sessions

Topics	Session Editors
A. Aerodynamics and Noise	J. Sørensen (DTU) S. Ivanell (Uppsala University)
B. Wind, Wakes, Turbulence and Wind Farms	J. Meyers (KU Leuven) J. Peinke (IWES Fraunhofer)
C. Aeroservoelasticity, Loads, Structures and Materials	G. van Kuik (TU Delft) M.H. Hansen (DTU)
D. Control and Supporting Technologies	J.-W. van Wingerden (TU Delft) E. Bossanyi (DNV GL)
E. Design and Systems Engineering	K. Dykes (NREL) T. Chaviaropoulos (NTUA)
F. Measurement, Monitoring and Experimental Techniques	M. Kühn (ForWind-OL) J. Mann (DTU)
G. Modeling and Simulation Technology	F. Porté-Agel (EPFL) J. Jonkman (NREL)
H. Offshore Wind Energy	M. Muskulus (NTNU) P. Schaumann (ForWind-LUH)
I. New Concepts and Configurations	P.W. Cheng (Universität Stuttgart) D.T. Griffith (Sandia)
J. Drive Trains, Generator Technology and Grids	R. De Doncker (RWTH Aachen) A. Natarajan (DTU)

Sponsors

DFG

General Information

Wi-Fi

Wi-Fi connection is available everywhere at the venue.

- **Eduroam:** please use your eduroam username & password
- **Conference Wi-Fi:** SSID: mwn-events
  Username: TORQUE2016
  Password: windenergy

Scan this QR code to easily set up the conference Wi-Fi:
or visit https://www.lrz.de/wlan-en. Access to this site is available via the open network “lrz”.

Conference App

Access the program and all necessary conference information through your smartphone. Just scan the following QR code or go directly to http://m.torque2016.org.

You need the Conference App to vote for the Best Poster Awards!

Conference Website

The conference web site is available at this link:
http://www.torque2016.org.

Conference Proceedings

The conference proceedings are published by IOP in the open-access *Journal of Physics: Conference Series (JPCS)*. The proceedings can be accessed at this link: http://iopscience.iop.org/1742-6596/753.

Special Issue in *Wind Energy Science (WES)*. We plan a special issue with papers from TORQUE 2016, to be published in the new interactive open-access journal of EAWE. Prospective authors should prepare an expanded version of their TORQUE paper, indicatively containing 30-40% additional original material, and submit it by **30 November 2016** to submissions@torque2016.org. The journal Editors in consultation with the TORQUE 2016 Session Organizers will select a maximum of 15 papers, for which EAWE will cover the open-access publication costs. All submitted papers will be peer-reviewed according to standard WES policy (http://www.wind-energy-science.net). For inquiries, please write to submissions@torque2016.org.

Best Poster Awards

The most voted posters will be recognized with the "TORQUE 2016 Best Poster Award" during the conference banquet on Thursday. You can vote for your preferred posters with the Conference App. We need your votes!

How to vote: open the Conference App, choose a poster session, then choose a poster and click on "Assess contribution". The three top scoring posters will be selected for the award.

Certificate of Attendance

If you need a certificate of attendance, please email us at info@torque2016.org.

Terms and Conditions

Terms and conditions for the participation to the conference are available on the conference website.

Registration Hours & Fees

Registration desk opening hours:

- Tuesday, 4 October, 14:00 - 19:30
- Wednesday, 5 October, 07:30 - 18:00

Fees:

- Delegate 580 €
- Student 300 €
- Accompanying Person 220 €

Note: on-site payment by Visa or Mastercard only.
Your credit card should be enabled for online payments.

Please mute your phone during sessions!

Transportation

How do I reach TORQUE?

From the city center the easiest way to get to the Campus Garching is by metro. Take the U-Bahn U6 in direction “Garching Forschungszentrum” and get off at the last stop.
From the airport take the S-Bahn S1 to “Neufahrn”, and from there take bus 690 in direction Garching Forschungszentrum. Otherwise, take the S-Bahn S8 to “Ismaning” and then take bus 230. The estimated travel time is about 50 minutes for both routes.

Where do I get tickets and which one should I buy?

Tickets are available online or at ticket machines located at every metro station. As a general rule, day tickets and group tickets are the option to go for.

On a day when you travel to or from the airport, we recommend buying a day ticket for the whole network. You can buy either a single ticket (“Single-Tageskarte Gesamt -netz”), which costs 12,40 € for one person, or a group ticket (“Gruppen-Tageskarte Gesamtnetz”), which costs 23.20 € and is valid for up to 5 people.

On days when you do not travel to or from the airport, you should buy a day ticket with a smaller area of validity. This depends on where your accommodation is located, but if you stay in the city then you should buy the day ticket München XXL (“Tageskarte München XXL”) to reach the conference venue.

If you are staying for a few days and you will not travel to the airport, we recommend buying the “IsarCard-Woche”, which will cost 31,10 € for one person (not available online). Make sure to select “7 Ringe” on the area of validity. With this ticket you will be able to access the metro for one entire week, but you will not be able to reach the airport.

Check also the last pages of this booklet for more detailed maps of the metro, S-Bahn and campus area. There is also a handy smartphone app that gives you a detailed travel plan from your starting location in and around Munich and lets you buy tickets online. You can find it under “MVG Fahrinfo” or here: For any further doubt, please stop by the registration desk or visit the website www.mvg.de.

By taxi

A taxi ride from central Munich to Garching will cost about 40-50 € (depending on your exact location). A taxi ride from the airport will cost about 35 €.

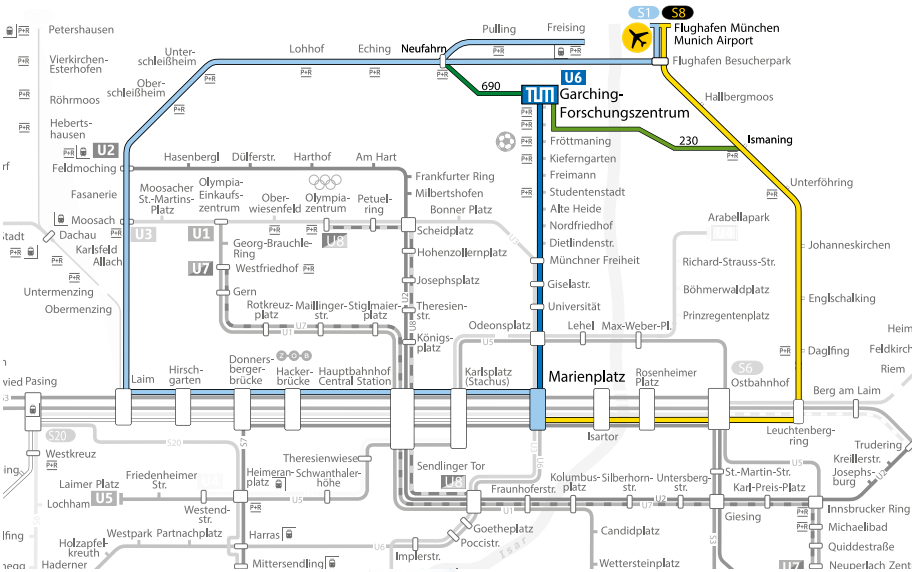
Taxi-Zentrale München: +49 (0) 89 21610
IsarFunk München: +49 (0) 89 450540
Taxi Garching: +49 (0) 89 3202885

By car

Drive along highway A9 and get out at Garching Nord. From there drive approximately 1 km following the road signs in direction Garching Forschungszentrum and park your car in the free large parking lot of the campus.

Munich is also equipped with several car sharing services such as DriveNow (available in the city, at the airport and on campus) or car2go (available in the city and at the airport, not on campus).

Schnellbahn (suburban and underground train) network



Instructions for Presenting Authors

Oral Presentations

- Please check when and where your presentation takes place. The detailed conference program is available in this booklet and at this link: https://www.events.tum.de/frontend/index.php?page_id=626.
- The time slot for each presentation is **15 minutes**, plus **5 minutes** for Q&A.
- Please adjust the length of your speech and the number of slides to stay within the allowed time limit. Session chairs will **strictly enforce** the respect of the schedule.
- A video projector and a PC are available in all conference rooms. The use of personal laptops **is not allowed**.
- Presentations must be loaded on the PC of the conference room **well before** the beginning of the session. Please avoid loading your slides just before your talk, because this will shorten the time available for your presentation (we will strictly enforce the length of the slots).
- Bring your presentations on a USB memory stick. Staff will be present in the rooms at all times during the conference to help you load and check your presentation.
- Please use your preferred formatting style, as no presentation template is provided. Slides must be written in the English language, and must include the title and a complete list of authors with their respective affiliations. The oral presentation must also be delivered in the English language.
- Presentations should be in PDF or PowerPoint format.
- The default format of the slides is 4:3, although also the 16:9 format is supported.
- The PCs provided in each conference room are equipped with the following software:
  - Operating System: MS Windows 10
  - MS Office 2016 Professional (Word, Excel, PowerPoint)
  - Adobe Acrobat Reader DC (Vers. 2015.017.20050)
  - MS Windows Media Player (Vers. 12.0.10011.16384)
  - VLC Media Player (Vers. 2.2.4)
  - Quick Time Player (Vers. 7.76.80.95)

  To avoid technical problems, please make sure that your presentation is compatible with this software configuration.

- Introduce yourself to the session chairperson **before the beginning of the session**. Please hand-in to the chairperson your **written bulleted bio (max 3-4 points)**. Please make sure that the chairperson knows how to pronounce your name.

Poster Presentations

- Please check when and where your poster presentation takes place. There are **two poster sessions**:
  - Wednesday 15:45-16:30: Sessions A, C, E, G, I.
  - Thursday 15:45-16:30: Sessions B, D, F, H, J.

  The detailed conference program is available in this booklet and at this link: https://www.events.tum.de/frontend/index.php?page_id=626.
- In the session, **note the tag assigned to your poster**, which is given by the session letter (A, B, C, etc.) followed by a number. You need this tag to find where to hang your poster. Maps are available on-site to help you identify the location of your poster. You should hang your poster **only in its assigned location**.
- You are responsible for mounting your own poster. Please mount your poster as soon as you arrive at the conference, and do not take it down before you leave. Posters left up after the conference will be discarded.
- Tape for mounting your poster is provided at the conference. If you have special requests, please come to the registration desk.
- Presenters should be available **next to their posters during the entire duration of their poster session**, to discuss their work with interested viewers.

Best Poster Awards. The most voted posters will be recognized with the "TORQUE 2016 Best Poster Award" during the conference banquet on Thursday. You can vote for your preferred posters with the Conference App (http://m.torque2016.org). **Please do not forget to vote**: we need your input to recognize the very best posters of the conference!

Plenary Sessions

Opening Ceremony

Diesel Hall

Wednesday 5 October 9:00-10:00

Welcome and introduction to the conference by:

- TUM President Prof. Dr. Wolfgang A. Herrmann
- Dean of the Department of Mechanical Engineering Prof. Dr. Nikolaus Adams
- TORQUE 2016 Chair Prof. Dr. Carlo L. Bottasso

Plenary Lecture by Dr. R. Thresher

Diesel Hall

Wednesday 5 October 18:30-19:30

“Some Tales of the Early R&D - An American Perspective on Wind Energy’s Path to Commercialization”

Robert W. Thresher, Ph.D.
NREL Research Fellow
National Renewable Energy Laboratory

Dr. Thresher has more than 40 years of research, development, engineering, and management experience in wind technology and ocean energy systems. As a professor at Oregon State University, he worked with DOE to develop early wind technologies. At NREL he has been a principal researcher developing early wind technology and an architect of the wind program at NREL and the creation of the National Wind Technology Center. Since Dr. Thresher was appointed to the position of NREL Wind Energy Research Fellow in 2008, he has served as a strategist and spokesperson for the initiation of a national research program to develop offshore renewable energy technologies. He is currently serving as mentor and team supervisor for NREL’s wave, river and tidal current research team.

Plenary Roundtable “The Future Needs of Wind Energy Scientific Research”

Diesel Hall

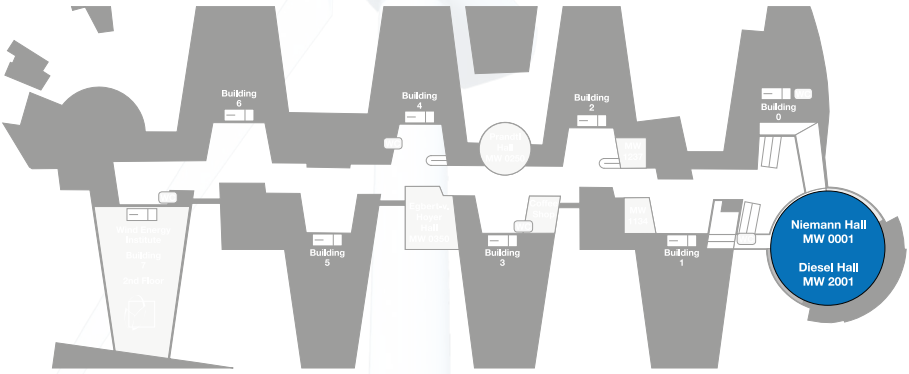
Thursday 6 October 9:00-10:00

Where is wind energy research going? Where should it go? What is the view of academia, and what are the needs of industry? Join the discussion, and help shape the future of wind energy research together with some of the top leaders in the field.

Moderator: Prof. Dr. Gijs van Kuik (TU Delft)

Panelists:

- Prof. Dr. Po Wen Cheng (University of Stuttgart)
- Dr. Jens Madsen (Suzlon)
- Prof. Dr. James F. Manwell (University of Massachusetts Amherst)
- Dr. James Maughan (GE Global Research)
- Dr. Matthias Schubert (Wyncon Consultants)



Plenary Sessions

Poster Session 1

Main Hall

Wednesday 5 October 15:45-16:30

Posters from the following topical areas will be presented:

- A. Aerodynamics and Noise
- C. Aeroservoelasticity, Loads, Structures and Materials
- E. Design and Systems Engineering
- G. Modeling and Simulation Technology
- I. New Concepts and Configurations

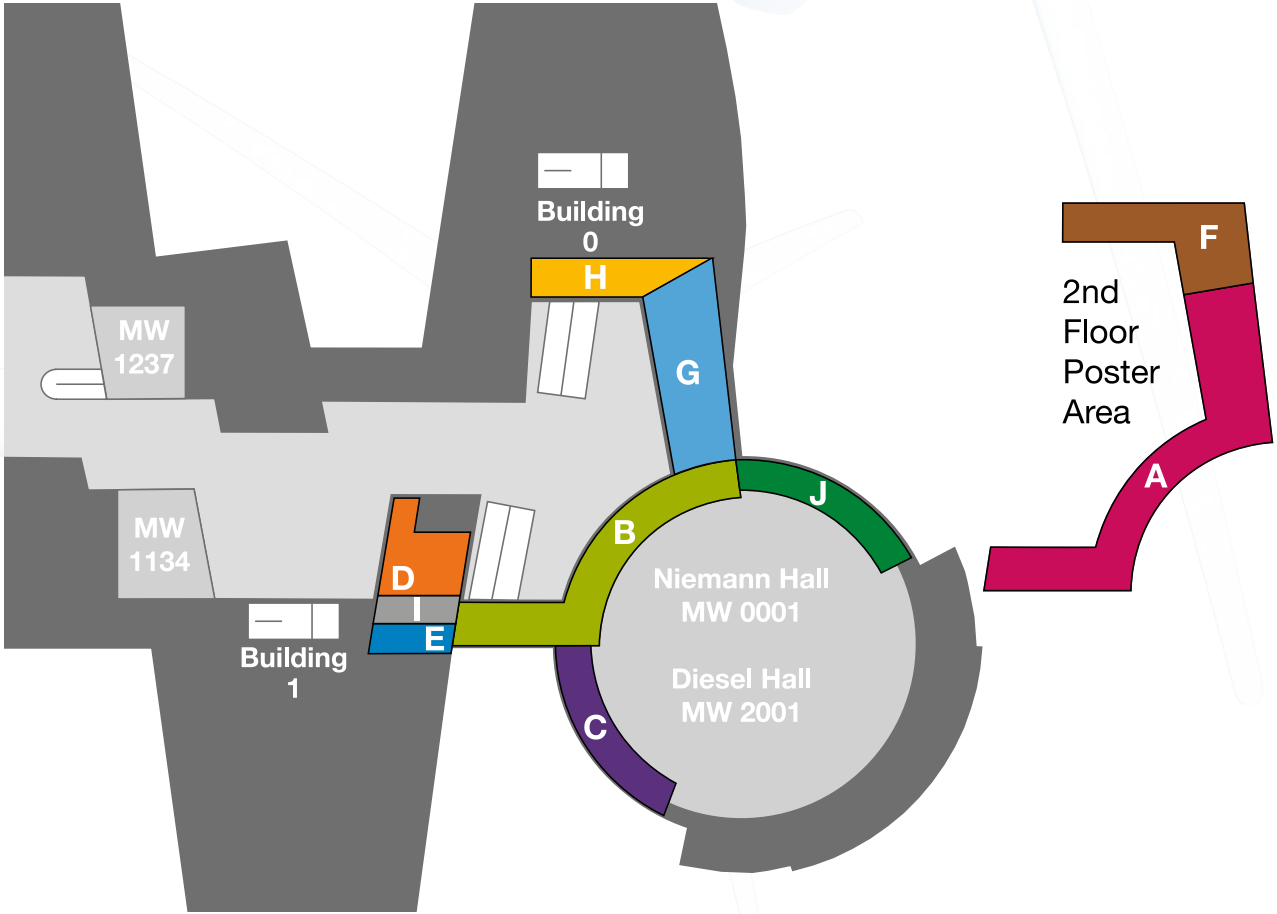
Poster Session 2

Main Hall

Thursday 6 October 15:45-16:30

Posters from the following topical areas will be presented:

- B. Wind, Wakes, Turbulence and Wind Farms
- D. Control and Supporting Technologies
- F. Measurement, Monitoring and Experimental Techniques
- H. Offshore Wind Energy
- J. Drive Trains, Generator Technology and Grids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Diesel Hall
MW 2001
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Poster
Area
A

Social Program

Welcome Cocktail at the Faculty Club of TUM IAS

Tuesday 4 October, 17:00 - 20:00

Gather your badge and conference material, and then meet your fellow conference attendees at this ice-breaking event. Drinks and hors d'oeuvres will be served.

See the map for the location of the Faculty Club of the TUM Institute of Advanced Studies.

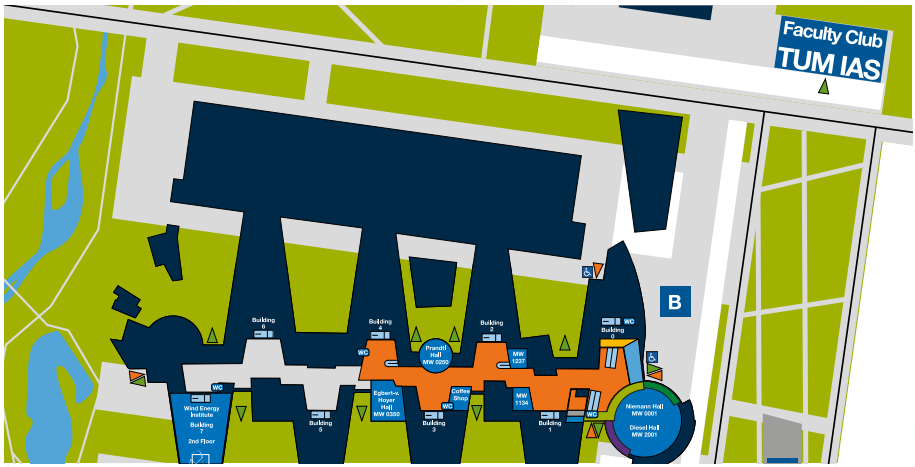
Historical Evening at Flugwerft Schleißheim Sponsored by GE Global Research

Wednesday 5 October, 20:00 - 22:30

A standing dinner will be served within the fantastic collection of airplanes and helicopters of the famous Deutsches Museum at Flugwerft Schleißheim. English-speaking guides will accompany small groups of visitors on tours of the collection during the event.

Note: this event is limited to 400 participants due to limited room capacity. Admission is first come first served, based on the time of registration. **Please let us know if you plan not to attend this event, so that we can accommodate somebody else**.

Transportation by private buses from the conference venue to Flugwerft Schleißheim and back will be provided. Buses will depart from the venue at 19:30 (point marked "B" in the map).



Dinner on Rails: A Private Tram Tour of Munich

Wednesday 5 October, 20:00 - 22:30

Enjoy a Mediterranean dinner and an exclusive tour through the city at the same time. Follow the rails in one of Munich old trams and see the city from a different viewpoint. Trams will stop at various points of interest, and English-speaking guides will take you for short walks around the stops. Then back to the tram for your dinner and drinks until the next stop!

Note: this event will only take place if we have more than 400 attendees at Flugwerft Schleißheim.

Transportation by private buses from the conference venue to the start of the tram tour (address: Max-Weber-Platz, company: SPUR-Wechsel) will be provided. Buses will depart from the venue at 19:30 (point marked "B" in the map). Self-travel back to your hotel from Max-Weber-Platz (U-Bahn lines U4 *and* U5 *).*

Bavarian Banquet at the Historical Hofbräuhaus München

Thursday 6 October, 19:30 - 22:30

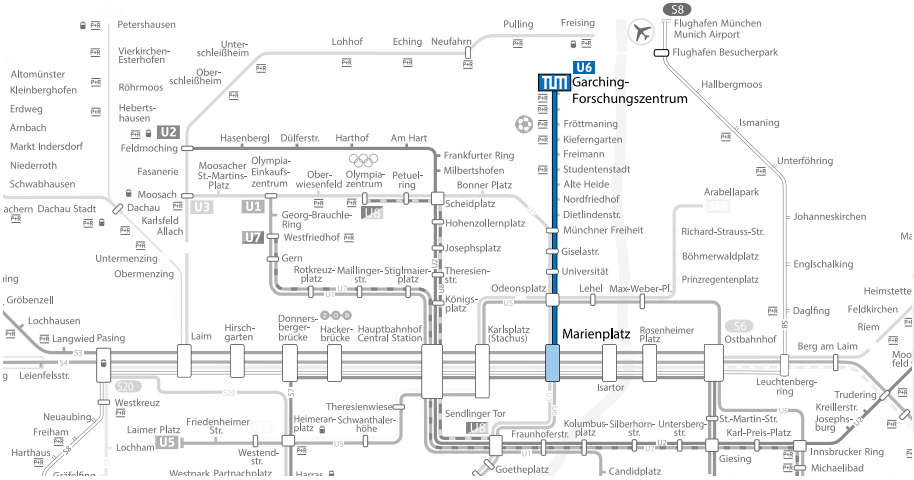
Get a feeling of traditional Bavarian culture and a hearty meal at this historical restaurant right in the center of Munich! Good food, plenty of famous German beer, music and more:

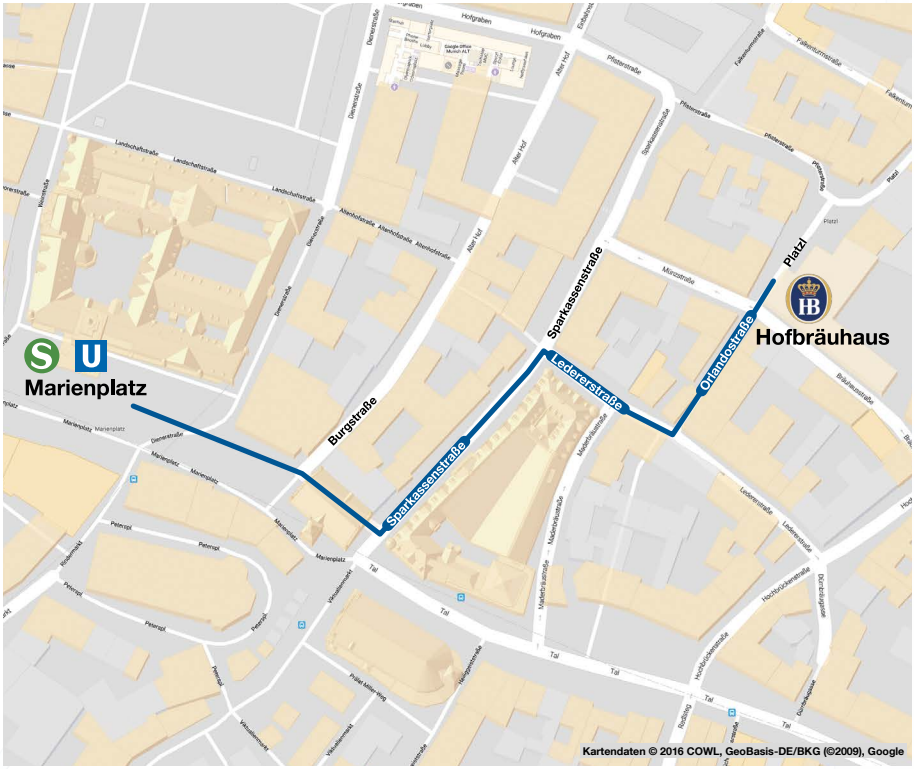
- EAWE Scientific Award, presented to Dr. Paul Veers
- EAWE Honorary Membership, presented to Prof. Dr. Gijs van Kuik and Prof. Dr. Peter Tavner
- EAWE Excellent Young Wind Doctor Award
- TORQUE 2016 Best Poster Awards

Travel to the Hofbräuhaus München by subway from the conference venue. Just follow the dark blue line in the map, or travel with one of the TORQUE staff members (meet us in the main hall next to the registration desk from 18:15; the last group will leave at 19:00). Self-travel back to your hotel. Detailed travel instructions:

- *Buy a 2-zone ticket (€ 5.40)*
- *Take the U-Bahn* U6 *and get off at Marienplatz*
- *Follow the map to get to the Hofbräuhaus (address: Platzl 9, 80331 München) (5 min, 450 meters)*

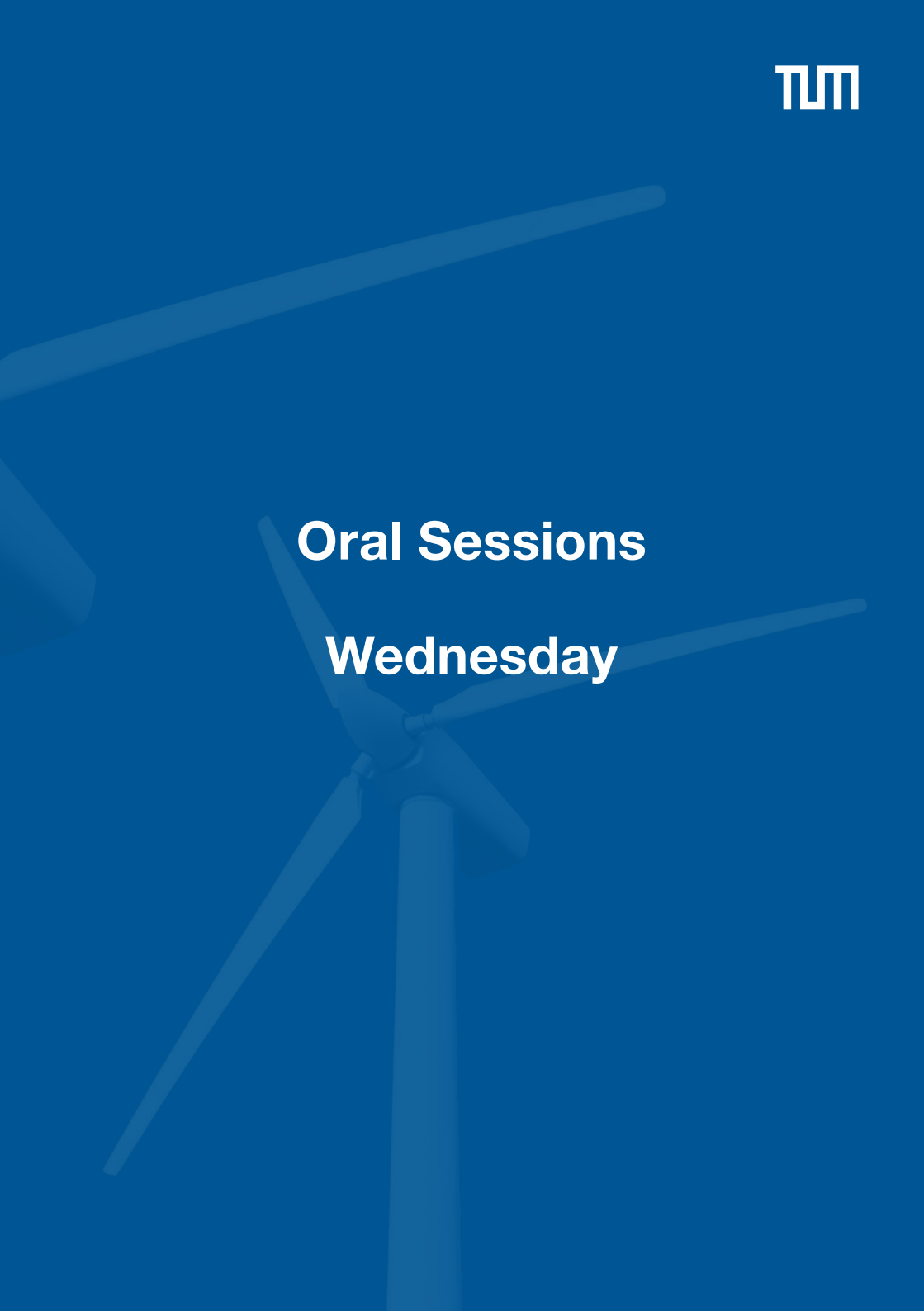
Schnellbahn (suburban and underground train) network





Oral Sessions

Wednesday



10:30 - 12:30

G. Modeling and Simulation Technology 1

Niemann Hall, Chaired by: F. Porté-Agel, J. Jonkmann

10:30 - 10:50 **A Highly Resolved Large-Eddy Simulation of a Wind Turbine using an Actuator Line Model with Optimal Body Force Projection**
Luis Martinez | *Johns Hopkins University*
Charles Meneveau, Matthew Churchfield

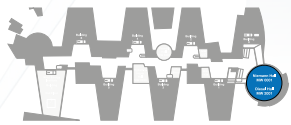
10:50 - 11:10 **Validation of the Actuator Line Model with coarse resolution in atmospheric sheared and turbulent inflow**
Martín Draper | *Universidad de la República*
Andrés Guggeri, Gabriel Usera

11:10 - 11:30 **Actuator line simulations of a Joukowsky and Tjæreborg rotor using spectral element and finite volume methods**
Elektra Kleusberg | *KTH Royal Institute of Technology, Stockholm*
Sasan Sarmast, Philipp Schlatter, Stefan Ivanell, Dan Henningson

11:30 - 11:50 **Multiscale aeroelastic simulations of large wind farms in the atmospheric boundary layer**
Athanasios Vitsas | *KU Leuven*
Johan Meyers

11:50 - 12:10 **Predictive wind turbine simulation with an adaptive lattice Boltzmann method for moving boundaries**
Ralf Deiterding | *University of Southampton*
Stephen Wood

12:10 - 12:30 **Contributions of the Stochastic Shape Wake Model to Predictions of Aerodynamic Loads and Power under Single Wake Conditions**
Paula Doubrawa | *Cornell University*
Rebecca Barthelmie, Matthew Churchfield, Hui Wang



B. Wind, Wakes, Turbulence and Wind Farms 1

Diesel Hall, Chaired by: J. Meyers, J. Peinke

10:30 - 10:50 **Wake effects between two neighbouring wind farms**
Nicolai Gayle Nygaard | *DONG Energy Wind Power*
Sidse Damgaard

10:50 - 11:10 **Long-wave instabilities in the wake of a two-bladed rotor**
Umberto Quaranta | *Airbus Helicopters*
Mattias Brynjell-Rahkola, Dan Henningson

11:10 - 11:30 **Why the Coriolis force turns a wind farm wake to the right in the Northern Hemisphere**
Paul van der Laan | *DTU*
Niels Sørensen

11:30 - 11:50 **Characterization of wind velocities in the wake of a full scale wind turbine using three ground-based synchronized WindScanners**
Hasan Yazicioglu | *DTU*
Nikolas Angelou, Torben Mikkelsen, Juan José Trujillo

11:50 - 12:10 **The effect of the number of blades on wind turbine wake – a comparison between 2-and 3-bladed rotors**
Franz Mühle | *NMBU Ås*
Muyiwa Samuel Adaramola, Lars Roar Sætran

10:30 - 12:30

I. New Concepts and Configurations

Egbert-von-Hoyer Hall, Chaired by: P.W. Cheng, D.T. Griffith

10:30 - 10:50 **Simulation of an offshore wind farm using fluid power for centralized electricity generation**
Antonio Jarquin Laguna | *TU Delft*

10:50 - 11:10 **Aerodynamic and inertial tuning of passive devices for load alleviation on wind turbines**
Pierluigi Montinari | *Politecnico di Milano*
Alessandro Croce, Carlo L. Bottasso, Federico Gualdoni, Carlo Emanuele Riboldi

11:10 - 11:30 **A Numerical Investigation to Identify Dimensionless Parameters for Dual-Rotor Horizontal Axis Wind Turbines**
Kenny Lee Slew | *Carleton University*
Michael Miller, Edgar Matida

11:30 - 11:50 **Downscaling of Airborne Wind Energy Systems**
Uwe Fechner | *TU Delft*
Roland Schmehl

11:50 - 12:10 **Numerical study on aerodynamic damping of floating vertical axis wind turbines**
Zhengshun Cheng | *NTNU*
Helge Aagaard Madsen, Zhen Gao, Torgeir Moan

12:10 - 12:30 **A study of rotor and platform design trade-offs for large-scale floating vertical axis wind turbines**
D. Todd Griffith | *Sandia National Laboratories*
Matthew Barone, Joshua Paquette, Brian Owens, Diana Bull

Room for notes ...

13:30 - 15:30

G. Modeling and Simulation Technology 2

Niemann Hall, Chaired by: F. Porté-Agel, J. Jonkmann

13:30 - 13:50 **Determination of Scaled Wind Turbine Rotor Characteristics from 3 Dimensional RANS Calculations**
Simon Burmester | *MARIN (Maritime Research Institute Netherlands)*
Sebastien Gueydon, Michel Make

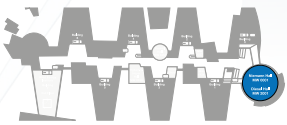
13:50 - 14:10 **Accurate load prediction by BEM with airfoil data from 3D RANS simulations**
Marc Sebastian Schneider | *German Aerospace Center DLR*
Jens Nitzsche, Holger Hennings

14:10 - 14:30 **A stochastic aerodynamic model for stationary blades in unsteady 3D wind fields**
Manuel Fluck | *University of Victoria*
Curran Crawford

14:30 - 14:50 **Development of an engineering code for the implementation of aerodynamic control devices in BEM**
Maria Aparicio | *CENER*
Ãlvaro González, Sugoi Gomez-Iradi, Xabier Munduate

14:50 - 15:10 **Investigation of the current yaw engineering models for simulation of wind turbines in BEM and comparison with CFD and experiment**
Hamid Rahimi | *ForWind - University of Oldenburg*
Bastian Dose, Joachim Peinke, Gerard Schepers

15:10 - 15:30 **Wind speed and direction prediction by WRF and WindSim coupling**
Muhammad Bilal | *The Arctic University of Norway*
Kine Solbakken, Yngve Birkelund



B. Wind, Wakes, Turbulence and Wind Farms 2

Diesel Hall, Chaired by: J. Meyers, J. Peinke

13:30 - 13:50 **Multi-Objective Random Search Algorithm for Simultaneously Optimizing Wind Farm Layout and Number of Turbines**
Ju Feng | *DTU*
Wen Zhong Shen, Chang Xu

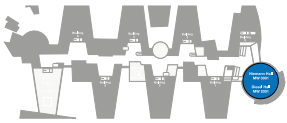
13:50 - 14:10 **Wind shear estimation and wake detection by rotor loads - First wind tunnel verification**
Johannes Schreiber | *TUM*
Stefano Cacciola, Filippo Campagnolo, Vlaho Petrovic, Delphine Mourembles, Carlo L. Bottasso

14:10 - 14:30 **Wind tunnel testing of a closed-loop wake deflection controller for wind farm power maximization**
Filippo Campagnolo | *TUM*
Carlo L. Bottasso, Vlaho Petrovic, Alessandro Croce, Johannes Schreiber, Emmanouil Marios Nanos

14:30 - 14:50 **A Control-Oriented Dynamic Flow Model: 'WFSim'**
Sjoerd Boersma | *TU Delft*
Pieter Gebraad, Mehdi Vali, Bart Doekemeijer, Jan-Willem van Wingerden

14:50 - 15:10 **A study on the active induction control of upstream wind turbines for total power increases**
Hyungyu Kim | *Kangwon National University*
Insu Paek, Carlo L. Bottasso, Kwansu Kim, Filippo Campagnolo

15:10 - 15:30 **Lidar configurations for wind turbine control**
Mahmood Mirzaei | *DTU*
Jakob Mann



H. Offshore Wind Energy 1

Egbert-von-Hoyer Hall, Chaired by: M. Muskulus, P. Schaumann

13:30 - 13:50 **Analytical fatigue reassessment for lifetime extension of offshore wind monopile foundations**
Lisa Ziegler | *Ramboll*
Michael Muskulus

13:50 - 14:10 **A Comparison Study of Offshore Wind Support Structures with Monopiles and Jackets for U.S. Waters**
Katherine Dykes | *NREL*
Rick Damiani, George Scott

14:10 - 14:30 **Breaking phase focused wave group loads on offshore wind turbine monopiles**
Amin Ghadirian | *DTU*
Henrik Bredmose, Martin Dixen

14:30 - 14:50 **A model for Quick Load Analysis for monopile-type offshore wind turbine substructures**
Signe Schløer | *DTU*
Laura Garcia Castillo, Morten Fejerskov, Emanuel Stroescu, Henrik Bredmose

14:50 - 15:10 **Value of information of repair times for offshore wind farm maintenance planning**
Helene Seyr | *NTNU*
Michael Muskulus

15:10 - 15:30 **Surrogate based wind farm layout optimization using manifold mapping**
Kaja Kamaludeen Shaafi Mohamed | *TU Delft*
Sander van Zuijlen, Hester Bijl

Room for notes ...

16:30 - 18:00

G. Modeling and Simulation Technology 3

Niemann Hall, Chaired by: F. Porté-Agel, J. Jonkmann

16:30 - 16:50 **Comparison of Different Measurement Techniques and CFD Simulation in Complex Terrain**

Christoph Schulz | *University of Stuttgart*

Martin Hofsäß, Jan Anger, Alexander Rautenberg, Thorsten Lutz, Po-Wen Cheng, Jens Bange

16:50 - 17:10 **Wind Power Forecasting techniques in complex terrain: ANN vs. ANN-CFD hybrid approach**

Davide Astolfi | *University of Perugia*

Francesco Castellani, Matteo Mana, Massimiliano Burlando, Catherine Meissner, Emanuele Piccioni

17:10 - 17:30 **Intercomparison of terrain-following coordinate transformation and immersed boundary methods in large-eddy simulation of wind fields over complex terrain**

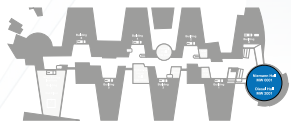
Jiannong Fang | *EPFL*

Fernando Porté-Agel

17:30 - 17:50 **The fence experiment - a first evaluation of shelter models**

Jakob Mann | *DTU*

Alfredo Peña, Andreas Bechmann, Davide Conti, Nikolas Angelou



B. Wind, Wakes, Turbulence and Wind Farms 3

Diesel Hall, Chaired by: J. Meyers, J. Peinke

16:30 - 16:50 **Wind turbine wake measurement in complex terrain**
Kurt S. Hansen | *DTU*
Gunner Chr. Larsen, Robert Menke, Nikola Vasiljevic, Nikolas Angelou, Ju Feng, Andrea Vignaroli, Chang Xu, Wei Liu, Wen Zhong Shen

16:50 - 17:10 **Investigations into the Interaction of a Wind Turbine with Atmospheric Turbulence in Complex Terrain**
Thorsten Lutz | *University of Stuttgart*
Levin Klein, Pascal Weihing, Christoph Schulz

17:10 - 17:30 **Study of the wind flow over a double-ridge site with numerical simulations using a coupling approach and multi-lidar field measurements**
Carlos Veiga Rodrigues | *University of Porto, Faculty of Engineering*
José Palma, Nikola Vasiljevic, Michael Courtney, Jacob Mann

17:30 - 17:50 **The effects of the canopy created velocity inflection in the wakes development of a large wind turbine array**
Oxana Agafonova | *Lappeenranta University of Technology*
Anna Avramenko, Ashvinkumar Chaudhari, Antti Hellsten

		16:30 - 18:00

H. Offshore Wind Energy 2

Egbert-von-Hoyer Hall, Chaired by: M. Muskulus, P. Schaumann

16:30 - 16:50 **Design study and full scale MBS-CFD simulation of the IDEOL floating offshore wind turbine foundation**
Friedemann Borisade | *University of Stuttgart*
Thomas Choisnet, Po Wen Cheng

16:50 - 17:10 **Wind tunnel validation of AeroDyn, within LIFES50+ project: imposed Surge and Pitch tests**
Ilmas Bayati | *Politecnico di Milano*
Marco Belloli, Luca Bernini, Alberto Zasso

17:10 - 17:30 **Control design methods for floating wind turbines for optimal disturbance rejection**
Frank Lemmer | *University of Stuttgart*

17:30 - 17:50 **Experimental and numerical study of a 10MW TLP wind turbine in waves and wind**
Antonio Pegalajar-Jurado | *DTU*
Anders Mandrup Hansen, Robert Laugesen, Robert Flemming Mikkelsen, Michael Borg, Taeseong Kim, Nicolai Francis Heilskov, Henrik Bredmose

17:50 - 18:10 **Load extrapolations based on measurements from an offshore wind turbine at alpha ventus**
Po Wen Cheng | *University of Stuttgart*

Oral Sessions

Thursday

G. Modeling and Simulation Technology 4

Niemann Hall, Chaired by: F. Porté-Agel, J. Jonkmann

10:30 - 10:50 **Modern methods to investigate the stability of a pitching floating platform wind turbine**
Matthew Lennie | *TU Berlin*
David Marten, George Pechlivanoglou, Christian Navid Nayeri, Christian Oliver Paschereit

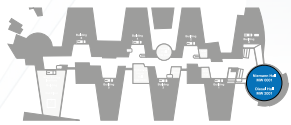
10:50 - 11:10 **Periodic stability assessment of a exible hub connection for load reduction on two-bladed wind turbines**
Birger Luhmann | *University of Stuttgart*
Po Wen Cheng

11:10 - 11:30 **Comparison of linear and non-linear blade model predictions in Bladed to measurement data from GE 6MW wind turbine**
William Collier | *DNV GL*
Jose-Maria Milian Sanz

11:30 - 11:50 **FAST modularization framework for wind turbine simulation: full-system linearization**
Jason Jonkman | *NREL*
Bonnie Jonkman, Michael Sprague

11:50 - 12:10 **Aeroelastic Simulation of Multi-MW Wind Turbines using a Free Vortex Model Coupled to a Geometrically Exact Beam Model**
Joseph Saverin | *TU Berlin*
Juliane Peukert, David Marten, Christian Navid Nayeri, Georgios Pechlivanoglou, Christian Oliver Paschereit

12:10 - 12:30 **Real-time hybrid simulation technique for performance evaluation of full-scale sloshing dampers in wind turbines**
Zili Zhang | *Aarhus University*
Biswajit Basu, Søren R.K. Nielsen



B. Wind, Wakes, Turbulence and Wind Farms 4

Diesel Hall, Chaired by: J. Meyers, J. Peinke

10:30 - 10:50 **Shear layer approximation of Navier-Stokes steady equations for non-axisymmetric wind turbine wakes: Description and preliminary verification**
Davide Trabucchi | *ForWind - University of Oldenburg*
Lukas Vollmer, Martin Kühn

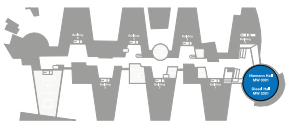
10:50 - 11:10 **3D Lagrangian VPM: simulations of the near-wake of an actuator disc and Horizontal Axis Wind Turbine**
Tom Berdowski | *TU Delft*
Carlos Ferreira, Jens Walther

11:10 - 11:30 **Vortex Particle-Mesh simulations of Vertical Axis Wind Turbine flows: from the blade aerodynamics to the very far wake**
Philippe Chatelain | *Université catholique de Louvain*
Matthieu Duponcheel, Denis-Gabriel Caprace, Yves Marichal, Grégoire Winckelmans, Thierry Maeder

11:30 - 11:50 **Validation of actuator disc approach using model scaled wind turbines**
Nikolaos Simisiroglou | *Uppsala University*
Sasan Sarmast, Simon Philippe Breton, Stefan Ivanell

11:50 - 12:10 **Validation of actuator line and disc techniques using the New MEXICO measurements**
Sasan Sarmast | *Uppsala University Campus Gotland*
Wen Zhong Shen, Stefan Ivanell, Robert Flemming Mikkelsen, Simon-Philippe Breton

12:10 - 12:30 **Using High-Fidelity Computational Fluid Dynamics to Help Design a Wind Turbine Wake Measurement Experiment**
Matthew Churchfield | *NREL*
Andrew Scholbrock, Thomas Herges, Torben Mikkelsen, Mikael Sjöholm



10:30 - 12:30

D. Control and Supporting Technologies 1

Egbert-von-Hoyer Hall, Chaired by: J.-W. van Wingerden, E. Bossanyi

10:30 - 10:50 **Simultaneous observation of wind shears and misalignments from rotor loads**
Marta Bertelè | *TUM*
Carlo L. Bottasso, Stefano Cacciola

10:50 - 11:10 **Gusts detection in a horizontal wind turbine by monitoring of innovations error of an extended Kalman filter**
Luis Recalde | *University of Strathclyde*
Sung-ho Hur, William Leithead

11:10 - 11:30 **Statistical Evaluation of the Identified Structural Parameters of an idling Offshore Wind Turbine**
Paul van der Valk | *TU Delft*
Hendrik Kramers, Jan-Willem van Wingerden

11:30 - 11:50 **Diagnostics for Electrically Operated Pitch Systems in Offshore Wind Turbines**
Surya Teja Kandukuri | *University of Agder*
Hamid Reza Karimi, Kjell Gunnar Robbersmyr

11:50 - 12:10 **Circulation active flow control on a rounded trailing-edge wind turbine airfoil using plasma actuators**
Sophie Baleriola | *University of Orléans*
Annie Leroy, Stéphane Loyer, Philippe Devinant, Sandrine Aubrun

12:10 - 12:30 **On the effects of basic platform design characteristics on floating offshore wind turbine control and their mitigation**
Joannes Olondriz | *Ikerlan*
Aron Pujana, Joseba Landaluze, Igancio Trojaola, Iker Elorza

F. Measurement, Monitoring and Experimental Techniques 1

Prandtl Hall, Chaired by: M. Kühn, J. Mann

10:30 - 10:50 **Comparison of different modelling approaches of drive train temperature for the purposes of wind turbine failure detection**
Jannis Tautz-Weinert | *Loughborough University*
Simon Watson

10:50 - 11:10 **Feasibility of large-scale calorimetric efficiency measurement for wind turbine generator drivetrains**
Michael Pagitsch | *RWTH Aachen*
Ralf Schelenz, Christian Liewen, Sebastian Reisch, Dennis Bosse, Georg Jacobs, Matthias Deicke

11:10 - 11:30 **Investigations for Improvement of Energy Yield of Rotor-blades from the 1.5 MW Class**
Reichstein Torben | *Kiel University of Applied Sciences*
Alois Peter Schaffarczyk, Nicolas Balaresque, Sven Bicker, Christoph Dollinger, A. Fandrich, Michael Hoelling, Kai Irschick, Cornelia von Zengen

11:30 - 11:50 **In-blade wind turbine blade angle of attack measurements and comparison with yaw models**
David Johnson | *University of Waterloo*
Tyler Gallant

11:50 - 12:10 **Detection of rotor imbalance, including root cause, severity and location**
Stefano Cacciola | *Politecnico di Milano*
Carlo L. Bottasso, Irene Munduate Agud

12:10 - 12:30 **Thermographic Stall Detection**
Christoph Dollinger | *University of Bremen*
Nicholas Balaresque, Alois Peter Schaffarczyk, Andreas Fischer

A. Aerodynamics and Noise 1

Niemann Hall, Chaired by: J. Sørensen, S. Ivanell

13:30 - 13:50 **Momentum theory of Joukowsky actuator discs with swirl**
Gijs van Kuik | *TU Delft*

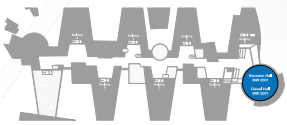
13:50 - 14:10 **How does the presence of a body affect the performance of an actuator disk**
Gael de Oliveira | *TU Delft*
Ricardo Balbino Pereira, Danielle Ragni, Francesco Avallone, Gerard van Bussel

14:10 - 14:30 **Extension of Goldstein's circulation function for optimal rotors with hub**
Wen Zhong Shen | *DTU*
Jens N. Sørensen, Okulov Valery

14:30 - 14:50 **Comparison of classical methods for blade design and the influence of tip correction on rotor performance**
Jens Nørkær Sørensen | *DTU Wind Energy*
Valery Okulov, Robert Mikkelsen, Igor Naumov, Ivan Litvinov

14:50 - 15:10 **Towards an Engineering Model for the Aerodynamic Forces Acting on Wind Turbine Blades in Quasisteady Standstill and Blade Installation Situations**
Mac Gaunaa | *DTU*
Joachim Heinz, Witold Skrzypinski

15:10 - 15:30 **Impact of flow inclination on downwind turbine loads and power**
Christian Kress | *ETH Zürich*
Ndaona Chokani, Reza S. Abhari, Takashi Hashimoto, Masatoshi Watanabe, Takahiko Sano, Mitsuru Saeki



B. Wind, Wakes, Turbulence and Wind Farms 5

Diesel Hall, Chaired by: J. Meyers, J. Peinke

13:30 - 13:50 **Polynomial chaos for the computation of annual energy production in wind farm layout optimization**
A. Santiago Padron | *Stanford University*
Andrew Stanley, Jared Thomas, Juan Alonso, Andrew Ning

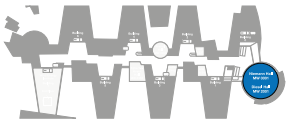
13:50 - 14:10 **Mapping Wind Farm Load and Power Production – A Case Study on Horns Rev 1**
Nikolay Dimitrov | *DTU*
Christos Galinos, Torben J. Larsen, Anand Natarajan, Kurt S. Hansen

14:10 - 14:30 **Statistics of LES Simulations of Large Wind Farms.**
Søren Andersen | *DTU*
Jens Nørkær Sørensen, Robert Flemming Mikkelsen, Stefan Ivanell

14:30 - 14:50 **A Simple Model for the Turbulence Intensity Distribution in Atmospheric Boundary Layers**
Lawrence Cheung | *GE Global Research*
Sachin Premasuthan, Samuel Davoust, Dominic von Terzi

14:50 - 15:10 **In search for a canonical design ABL stability class for wind farm turbines**
Gunner Chr. Larsen | *DTU*
Franck Bertagnolio, David Verelst, Abhijit Chougule

15:10 - 15:30 **A wind energy benchmark for ABL modelling of a diurnal cycle with a nocturnal low-level jet**
Javier Sanz Rodrigo | *CENER*
Matthew Churchfield, Branko Kosovicì



D. Control and Supporting Technologies 2

Egbert-von-Hoyer Hall, Chaired by: J.-W. van Wingerden, E. Bossanyi

13:30 - 13:50 **Effect of wind turbine response time on optimal dynamic induction control of wind farms**
Wim Munters | *KU Leuven*
Johan Meyers

13:50 - 14:10 **Lidar-based wake tracking for closed-loop wind farm control**
Steffen Raach | *University of Stuttgart*
David Schlipf, Po Wen Cheng

14:10 - 14:30 **Incorporating Atmospheric Stability Effects into the FLORIS Engineering Model of Wakes in Wind Farms**
Pieter Gebraad | *Siemens Wind Power*
Matthew Churchfield, Paul Fleming

14:30 - 14:50 **Detailed field-test of yaw-based wake steering**
Paul Fleming | *NREL*
Matthew Churchfield, Andrew Scholbrock, Andrew Clifton, Scott Schreck, Alan Wright, Pieter Gebraad, Jennifer Annoni, Brian Naughton, Tommy Herges, Jon Berg, Jon White, Torben Mikkelsen

14:50 - 15:10 **A predictive control framework for optimal energy extraction of wind farms**
Mehdi Vali | *ForWind - University of Oldenburg*
Jan-Willem van Wingerden, Sjoerd Boersma, Vlaho Petrovic, Martin Kühn

15:10 - 15:30 **Receding horizon control of wind farms for secondary frequency regulation**
Carl Shapiro | *Johns Hopkins University*
Johan Meyers, Charles Meneveau, Dennice Gayme

F. Measurement, Monitoring and Experimental Techniques 2

Prandtl Hall, Chaired by: M. Kühn, J. Mann

13:30 - 13:50 **Improving lidar turbulence estimates for wind energy**
Jennifer Newman | *NREL*
Andrew Clifton, Matthew Churchfield, Petra Klein

13:50 - 14:10 **Analysis of wind coherency in the longitudinal direction using turbine mounted lidar**
Samuel Davoust | *GE Global Research*
Dominic von Terzi

14:10 - 14:30 **Demonstration of synchronised scanning lidar measurements of 2D velocity fields in a boundary-layer wind tunnel**
Marijn van Dooren | *ForWind - University of Oldenburg*
Martin Kühn, Vlaho Petrovíc, Marc Bromm, Carlo L. Bottasso, Filippo Campagnolo, Mikael Sjöholm, Nikolas Angelou, Torben Mikkelsen, Alessandro Croce, Alberto Zasso

14:30 - 14:50 **Open Access Wind Tunnel Measurements of a Downwind Free Yawing Wind Turbine**
David Verelst | *DTU Wind Energy*
Torben Larsen, Jan-Willem van Wingerden

14:50 - 15:10 **Wind tunnel study of the power output spectrum in a micro-wind farm**
Juliaan Bossuyt | *KU Leuven*
Michael F. Howland, Charles Meneveau, Johan Meyers

15:10 - 15:30 **Momentum considerations on the New MEXICO experiment**
Herman Snel | *ECN*
Parra Edgar Andres, Koen Boorsma, Gerard Schepers

A. Aerodynamics and Noise 2

Niemann Hall, Chaired by: J. Sørensen, S. Ivanell

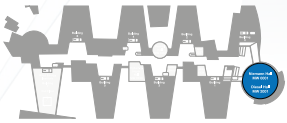
16:30 - 16:50 **Wind Turbine Noise Propagation Modelling: An Unsteady Approach**
Emre Barlas | *DTU*
Wei Jun Zhu, Wen Zhong Shen, Søren Juhl Andersen

16:50 - 17:10 **Maturing of Serration Design Methodology for Wind Turbine Noise Reduction**
Ashish Singh | *LM Wind Power*
Jesper Madsen, Carlos Arce

17:10 - 17:30 **Ice accretion prediction on wind turbines and consequent power losses**
Ismail H. Tuncer | *METU*
Ozcan Yirtici, Serkan Ozgen

17:30 - 17:50 **Rotor experiments in controlled conditions continued: New Mexico**
Koen Boorsma | *ECN*
Gerard Schepers

17:50 - 18:10 **Design of advanced airfoil for stall-regulated wind turbines**
Francesco Grasso | *University of Naples Federico II*
Domenico Coiro, Nadia Bizzarini, G. Calise



B. Wind, Wakes, Turbulence and Wind Farms 6

Diesel Hall, Chaired by: J. Meyers, J. Peinke

16:30 - 16:50 **Wind turbine wake tracking and its correlations with wind turbine monitoring sensors**
Sandrine Aubrun | *University of Orléans*
Matthieu Boquet, Eulalio Torres Garcia, Nicolas Girard, Olivier Coupiac

16:50 - 17:10 **Wind Shear, Gust, and Yaw-Induced Dynamic Stall on Wind-Turbine Blades**
David Rival | *Queen's University*
Benen la Bastide, Jaime Wong

17:10 - 17:30 **Wind-tunnel simulation of stably stratified atmospheric boundary layers for the assessment of effects on wind turbines and wakes**
Philip Hancock | *University of Surrey*
Paul Hayden

17:30 - 17:50 **Model Wind Turbines Tested at Full-Scale Similarity**
Mark Miller | *Princeton University*
Janik Kiefer, Carsten Westergaard, Marcus Hultmark

D. Control and Supporting Technologies 3

Egbert-von-Hoyer Hall, Chaired by: J.-W. van Wingerden, E. Bossanyi

16:30 - 16:50 **Lidar-Assisted Feedforward Individual Pitch Control to Compensate Wind Shear and Yawed Inflow**
Svenja Wortmann | *TU Darmstadt*
Jens Geisler, Ulrich Konigorski

16:50 - 17:10 **Turbulent Extreme Event Simulations for Lidar-Assisted Wind Turbine Control**
David Schlipf | *University of Stuttgart*
Steffen Raach

17:10 - 17:30 **Nacelle LiDAR online wind field reconstruction applied to feedforward pitch control**
Fabrice Guillemin | *IFP Energies nouvelles*

J. Drive Trains, Generator Technology and Grids

Prandtl Hall, Chaired by: R. De Doncker, A. Natarajan

16:30 - 16:50 **New Drive Train Concept with Multiple High Speed Generators**
Friederike Barenhorst | *RWTH Aachen*
Simon Serowy, Cristian Andrei, Ralf Schelenz, Georg Jacobs, Kay Hameyer

16:50 - 17:10 **Detailed Pseudo-Static Drive Train Modelling with Generator Short Circuit**
Christopher Warnock | *University of Strathclyde*
David Infield

17:10 - 17:30 **Converter Lifetime Assessment for Doubly-Fed Induction Generators Considering Derating Conrol Strategies at Low Rotor Frequenzies**
Marcel Morisse | *Leibniz Universität Hannover*
Arne Bartschat, Jan Wenske, Axel Mertens

17:30 - 17:50 **Investigation on pitch system loads by means of an integral multi body simulation approach**
Joerg Berroth | *RWTH Aachen*
Tobias Kroll, Ralf Schelenz, Georg Jacobs

Room for notes ...

Oral Sessions

Friday

A. Aerodynamics and Noise 3

Niemann Hall, Chaired by: J. Sørensen, S. Ivanell

09:00 - 09:20 **Experimental Study on the Effects of Winglets on the Performance of Two Interacting Horizontal Axis Model Wind Turbines**
Yasar Ostovan | *METUWIND*
Oguz Uzol

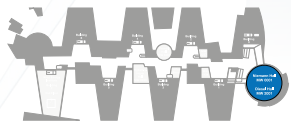
09:20 - 09:40 **An investigation of unsteady 3D effects on trailing edge flaps**
Eva Jost | *University of Stuttgart*
Annette Fischer, Thorsten Lutz, Ewald Krämer

09:40 - 10:00 **Full scale wind turbine test of vortex generators mounted on the entire blade**
Christian Bak | *DTU Wind Energy*
Witold Skrzypinski, Mac Gaunaa, Hector Villanueva, Niels Brønnum, Emil Olsen

10:00 - 10:20 **Experimental Measurement and CFD Model Development of Thick Wind Turbine Airfoils with Leading Edge Erosion**
David Maniaci | *Sandia National Laboratories*
Edward White, Benjamin Wilcox, Case van Dam, Christopher Langel, Joshua Paquette

10:20 - 10:40 **Comparison of flow modification induced by plasma and fluidic jet actuators dedicated to circulation control around wind turbine airfoils**
Annie Leroy | *University of Orléans*
Caroline Braud, Sophie Baleriola, Stéphane Loyer, Philippe Devinant, Sandrine Aubrun

10:40 - 11:00 **CFD simulation of a 2 bladed multi megawatt wind turbine with flexible rotor connection**
Levin Klein | *University of Stuttgart*
Birger Luhmann, Karl-Naik Rösch, Thorsten Lutz, Po-Wen Cheng, Ewald Krämer



C. Aeroservoelasticity, Loads, Structures and Materials 1

Diesel Hall, Chaired by: G. van Kuik, M.H. Hansen

09:00 - 09:20 **Structural integrity of wind turbines impacted by tropical cyclones: A case study from China**
Xiao Chen | *Chinese Academy of Sciences*
Chuanfeng Li, Jing Tang

09:20 - 09:40 **Gust response of aeroelastically tailored wind turbines**
Alberto Pirrera | *University of Bristol*
Paul M. Weaver, Marco Capuzzi, Samuel Scott, David Langston, Ervin Bossanyi, Graeme McCann

09:40 - 10:00 **Developing a passive load reduction blade for the DTU 10 MW reference turbine**
Jacobus de Vaal | *Institute for Energy Technology*
Tor Anders Nygaard, Roy Stenbro

10:00 - 10:20 **Effect of linear and non-linear blade modelling techniques on simulated fatigue and extreme loads using Bladed**
Alec Beardsell | *DNV GL*
William Collier, Tao Han

10:20 - 10:40 **Extreme load alleviation using industrial implementation of active trailing edge flaps in a full design load basis**
Athanasios Barlas | *DTU*
Vasilis Pettas, Drew Gertz, Helge Madsen

10:40 - 11:00 **Aeroelastic Design and LPV Modelling of an Experimental Wind Turbine Blade equipped with Free-floating flaps**
Jan-Willem van Wingerden | *TU Delft*
Lars Bernhammer, Jurij Sodja, Kees Slinkman, Gijs van Kuik, Sachin Navalkar

E. Design and Systems Engineering 1

Egbert-von-Hoyer Hall, Chaired by: K. Dykes, T. Chaviaropoulos

09:00 - 09:20 **Design of an Aeroelastically Tailored 10 MW Wind Turbine Rotor**
Frederik Zahle | *DTU*
Carlo Tibaldi, Christian Pavese, Michael K. McWilliam, José P. A. A. Blasques, Morten Hartvig Hansen

09:20 - 09:40 **Lightweight rotor design by optimal spar cap offset**
Alessandro Croce | *Politecnico di Milano*
Luca Sartori, Marco Stefano Lunghini, Luca Clozza, Carlo L. Bottasso, Pietro Bortolotti

09:40 - 10:00 **Reduced Design Load Basis for Ultimate Blade Loads Estimation in Multidisciplinary Design Optimization Frameworks**
Christian Pavese | *DTU*
Carlo Tibaldi, Torben J. Larsen, Taeseong Kim, Kenneth Thomsen

10:00 - 10:20 **A methodology to guide the selection of composite materials in a wind turbine rotor blade design process**
Pietro Bortolotti | *TUM*
Carlo L. Bottasso, Georg Adolphs

10:20 - 10:40 **On the Improvement of Convergence Performance for Integrated Design of Wind Turbine Blade Using a Vector Dominating Multi-objective Evolution Algorithm**
Long Wang | *Nanjing University of Aeronautics and Astronautics*
Tongguang Wang

10:40 - 11:00 **Integration of prebend optimization in a holistic wind turbine design tool**
Luca Sartori | *Politecnico di Milano*
Pietro Bortolotti, Alessandro Croce, Carlo L. Bottasso

Room for notes ...

A. Aerodynamics and Noise 4 - Special AVATAR Session

Niemann Hall, Chaired by: J. Sørensen, S. Ivanell

11:30 - 11:50 **Latest results from the EU project AVATAR: Aerodynamic modelling of 10 MW wind turbines**

Gerard Schepers | *ECN*

Ozlem Ceyhan, Koen Boorsma, Martin Stettner, Giorgos Sieros, Carlos Ferreirs, Niels Sorensen, Hendrik Heisselmann, Fanzhong Meng, Thorsten Lutz, Alvaro Gonzales, Xabier Munduate, George Barakos, S. Calonia, Spyros Voutsinas, Alessandro Croce, Jesper Madsen

11:50 - 12:10 **Experimental benchmark and code validation for airfoils equipped with passive vortex generators**

Daniel Baldacchino | *TU Delft*

Marinos Manolesos, Carlos Ferreira, Alvaro Gonzalez Salcedo, Maria Aparicio, Takis Chaviaropoulos, Kostas Diakakis, Liesbeth Florentie, Nestor Ramos Garcia, Giorgos Papadakis, Niels Normark Sorensen, Weinand A. Timmer, Niels Troldborg, Spyros Voutsinas, Alexander van Zuijlen

12:10 - 12:30 **Results of the AVATAR project for the validation of 2D aerodynamic models with experimental data of the DU95W180 airfoil with unsteady flap**

Carlos Simao Ferreira | *TU Delft*

Alvaro Gonzalez, Daniel Baldacchino, Maria Aparicio, Sugoi Gomez, Xavier Munduate, Nestor Garcia, Jens Sorensen, Eva Jost, Simon Knecht, Thorsten Lutz, Petros Chassapogiannis, Konstantinos Diakakis, John Prospathopoulos, Spyros Voutsinas, Thijs Gillebaar, Alexander van Zuijlen, Giorgos Papadakis, Marion Reijerkerk

12:30 - 12:50 **CFD code comparison for 2D airfoil flows**

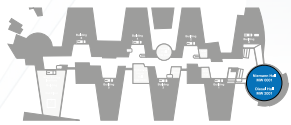
Niels Nørmark Sørensen | *DTU*

Beatriz Méndez, A. Muñoz, Giorgos Sieros, Eva Jost, Thorsten Lutz, Giorgos Papadakis, Spyros Voutsinas, George N. Barakos, Simone Colonia, Daniel Baldacchino, Carlos Baptista, Carlos S. Ferreira

12:50 - 13:10 **Computing the flow past Vortex Generators: Comparison between RANS Simulations and Experiments**

Marinos Manolesos | *NTUA*

Niels Sørensen, Niels Troldborg, Liesbeth Florentie, Giorgos Papadakis, Spyros Voutsinas



C. Aeroservoelasticity, Loads, Structures and Materials 2

Diesel Hall, Chaired by: G. van Kuik, M.H. Hansen

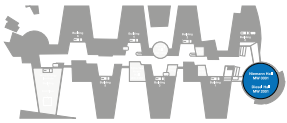
11:30 - 11:50 **Aeroelastic Stability of Idling Wind Turbines**
Vasilis Riziotis | *NTUA*
Spyros Voutsinas, Kai Wang

11:50 - 12:10 **Field Validation of the Stability Limit of a Multi MW Turbine**
Knud Abildgaard Kragh | *Siemens Wind Power*
Bjarne S. Kallesøe

12:10 - 12:30 **Experimental and operational modal analysis of the laboratory scale model of the tripod support structure.**
Marcin Luczak | *Polish Academy of Sciences*
Emiliano Mucchi, Janusz Telega

12:30 - 12:50 **Trailed vorticity modeling for aeroelastic wind turbine simulations in standstill**
Georg Pirrung | *DTU*
Helge Madsen, Scott Schreck

12:50 - 13:10 **High fidelity CFD-CSD aeroelastic analysis of slender bladed horizontal-axis wind turbine**
Mohamed Sayed | *University of Stuttgart*
Thorsten Lutz, Ewald Kraemer, Shahrokh Shayegan, Aditya Ghantasala, Roland Wüchner, Kai-Uwe Bletzinger



E. Design and Systems Engineering 2

Egbert-von-Hoyer Hall, Chaired by: K. Dykes, T. Chaviaropoulos

11:30 - 11:50 **Wind Farm Turbine Type and Placement Optimization**

Pierre-Elouan Réthoré | *NREL*

Katherine Dykes, George Scott, Jason Fields, Monte Lunacek, Julian Quick, Peter Graf

11:50 - 12:10 **On the impact of multi-axial stress states on trailing edge bondlines in wind turbine rotor blades**

Pablo Noever Castelos | *Leibniz Universität Hannover*

Claudio Balzani

Poster Session 1

Wednesday

A. Aerodynamics and Noise

A1 Effect of the number of blades and solidity on the performance of a vertical axis wind turbine

Pierre-Luc Delafin | *Cranfield University*
Takafumi Nishino, Lin Wang, Athanasios Kolios

A2 Scale Adaptive Simulation Model for the Darrieus Wind Turbine

Krzysztof Rogowski | *Warsaw University of Technology*
Martin Hansen, Ryszard Maroński, Piotr Lichota

A3 Forced pitch motion of wind turbines

Vladimir Leble | *University of Glasgow*

A4 Comparison of two vortex models of wind turbines using a free vortex wake scheme

Bofeng Xu | *Hohai University*
Yue Yuan, Tongguang Wang, Zhenzhou Zhao

A5 A numerical analysis to evaluate Betz' Law for vertical axis wind turbines

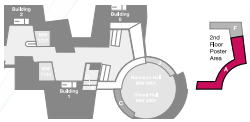
Frederik Thönnißen | *RWTH Aachen*
Markus Marnett, Benedikt Roidl, Wolfgang Schröder

A6 Comparison of upwind and downwind operation of the NREL Phase VI Experiment

Scott Larwood | *University of the Pacific*
Raymond Chow

A7 Simulation and Optimization of an Airfoil with Leading Edge Slat

Matthias Schramm | *ForWind - University of Oldenburg*
Bernhard Stoevesandt, Joachim Peinke



A. Aerodynamics and Noise

A8 The Effect of Aerodynamic Evaluators on the Multi-Objective Optimization of Flatback Airfoils

Michael Miller | *Carleton University*
Kenny Lee Slew, Edgar Matida

A9 Validation of engineering dynamic inflow models by experimental and numerical approaches

Daniel Baldacchino | *TU Delft*
Vincent Hong, Carlos Ferreira, G.A.M. van Kuik, Wei Yu

A10 Simulations of wind turbine rotor with vortex generators

Niels Troldborg | *DTU*
Frederik Zahle, Niels Sørensen

A11 Investigations of the inflow turbulence effect on rotational augmentation by means of CFD

Galih Bangga | *University of Stuttgart*
Yusik Kim, Thorsten Lutz, Pascal Weihing, Ewald Krämer

A12 LES tests on airfoil trailing edge serration

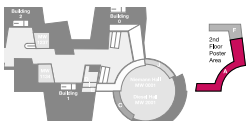
Wei Jun Zhu | *Yangzhou University*
Wen Zhong Shen

A13 Validation and comparison of aerodynamic modelling approaches for floating offshore wind turbines

Frédéric Blondel | *IFPEN*
Ronan Boisard, Malika Milekovic, Gilles Ferrer, David Teixeira, Caroline Lienard

A14 Effects of finite aspect ratio on wind turbine airfoil measurements

Janik Kiefer | *Princeton University*
Mark Miller, Marcus Hultmark, Martin Hansen



A. Aerodynamics and Noise

A15 Thick root airfoil design for the 10MW INNWIND.EU wind turbine
Xabier Munduate | *CENER*
Beatriz Méndez, Arturo Muñoz

A16 Aerodynamic analysis of clustered, diffuser-augmented wind turbines
Uli Goeltenbott | *Kyushu University*
Yuji Ohya, Shigeo Yoshida, Peter Jamieson

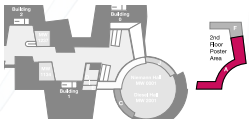
A17 Predictions of the cycle-to-cycle aerodynamic loads on a yawed wind turbine blade under stalled conditions using a 3D empirical stochastic model
Tonio Sant | *University of Malta*
Moutaz Elgammi

A18 Application of the lifting line vortex wake method to dynamic load case simulations
Koen Boorsma | *ECN*
L.M. Orsi, M. Hartvelt

A19 The influence of a cubic building on a roof mounted wind turbine
Daniel Micallef | *University of Malta*
Tonio Sant, Carlos Simao Ferreira

A20 Numerical and experimental investigation of an airfoil with load control in the wake of an active grid
Annette Fischer | *University of Stuttgart*
Thorsten Lutz, Ewald Krämer, Ulrike Cordes, Klaus Hufnagel, Cameron Tropea, Gerrit Kampers, Michael Hölling, Joachim Peinke

A21 Extended Glauert Tip Correction to Include Vortex Rollup Effects
Sven Schmitz | *The Pennsylvania State University*
David Maniaci



A. Aerodynamics and Noise

A22 Aeroacoustic calculations of a full scale Nordtank 500kW wind turbine

Harald Debertshaeuser | *DTU*
Wen Zhong Shen, Wei Jun Zhu

A23 Validation of an Actuator Line Model Coupled to a Dynamic Stall Model for Pitching Motions Characteristic to Vertical Axis Turbines

Victor Mendoza | *Uppsala University*
Anders Goude, Peter Bachant, Martin Wosnik

A24 Investigation of wavy blade section

Martin O. L. Hansen | *DTU*
Cecilia M. Kobæk

A25 CFD computations of the second round of MEXICO rotor measurements

Niels Nørmark Sørensen | *DTU*
Frederik Zahle, Koen Boorsma, Gerard Schepers

A26 CFD simulations on a rotor operating in pitch fault conditions and comparison with experiments

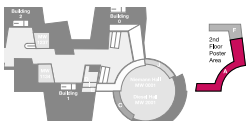
Luca Oggiano | *IFE*
Koen Boorsma, Menno Kloosterman

A27 Benchmarking aerodynamic prediction of unsteady rotor aerodynamics of active flaps on wind turbine blades using ranging fidelity tools

Athanasios Barlas | *DTU*
Eva Jost, Georg Pirrung, Theofanis Tsiantas, Vasilis Riziotis, Sachin Navalkar, Thorsten Lutz, Jan-Willem van Wingerden

A28 Jet flow control at the blade scale to alleviate loads

Caroline Braud | *LHEEA laboratory*
Emmanuel Guilmineau



A. Aerodynamics and Noise

A29 Analysis of high Reynolds numbers effects on a wind turbine airfoil using 2D wind tunnel test data

Xabier Munduate | *CENER*
Oscar Pires, Ozlem Ceyhan, Markus Jacobs, Herman Snel

A30 Discontinuous Galerkin methodology for Large-Eddy Simulations of wind turbine airfoils

Ariane Frère | *Cenaero - Université catholique de Louvain*
Niels N. Sørensen, Koen Hillewaert, Philippe Chatelain, Grégoire Winckelmans

A31 Effect of Wavy Trailing Edge on 100-meter Flatback Wind Turbine Blade

Seung Joon Yang | *University of Maryland*

A32 On the influence of airfoil deviations on the aerodynamic performance of wind turbine rotors

Jan Winstroth | *ForWind - Leibniz Universität Hannover*
Joerg R. Seume

A33 On the aero-elastic design of the DTU 10MW wind turbine blade for the LIFES50+ wind tunnel scale model

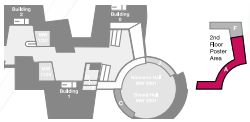
Luca Bernini | *Politecnico di Milano*
Ilmas Bayati, Marco Belloli, Robert Mikkelsen, Alberto Zasso

A34 Noise model for serrated trailing edges compared to wind tunnel measurements

Wen Zhong Shen | *DTU*
Frank Bertagnolio, Jesper Madsen, Andreas Fischer

A35 Fluid-structure coupled computations of the NREL 5MW wind turbine blade during standstill

Bastian Dose | *ForWind - University of Oldenburg*
Hamid Rahimi, Iván Herráez, Joachim Peinke, Bernhard Stoevesandt



A. Aerodynamics and Noise

A36 Point vortex modelling of the wake dynamics behind asymmetric vortex generator arrays

Daniel Baldacchino | *TU Delft*
Daniele Ragni, Carlos Ferreira, Gerard van Bussel

A37 Wind Turbine Blade Design for Subscale Testing

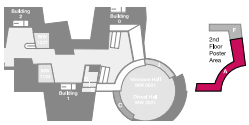
Jonathan Naughton | *University of Wyoming*
Arash Hassanzadeh, Chris Kelley, David Maniaci

A39 What is the critical height of leading edge roughness for aerodynamics?

Christian Bak | *DTU Wind Energy*
Mac Gaunaa, Anders Olsen, Niels Sørensen, Emil Olsen

A40 Numerical Study of Aerodynamic Characteristics of a Symmetric NACA Section with Simulated Ice Shapes

Narges Tabatabaei | *Luleå tekniska universitet*
Michel Cervantes, Chirag Trivedi, Jan-Olov Aidanpaa



C. Aeroservoelasticity, Loads, Structures and Materials

C1 Large Wind Turbine Rotor Design using an Aero-Elastic / Free-Wake Panel Coupling Code

Matias Sessarego | *DTU*
Nestor Ramos-Garcia, Wen Zhong Shen, Jens Norkaer Sorensen

C2 Reduction of fatigue loads on jacket substructure through blade design optimization for multi-megawatt wind turbines at 50 m water depths

Wilfried Njomo Wandji | *DTU*
Christian Pavese, Anand Natarajan, Frederik Zahle

C3 Aeroelastic measurements and simulations of a small wind turbine operating in the built environment

Samuel Evans | *The University of Newcastle, Australia*
David Bradney, Philip Clausen

C4 A method to find the 50-year extreme load during production

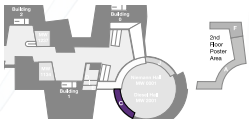
René Bos | *TU Delft*
Dick Veldkamp

C5 Stall-Induced Vibrations of the AVATAR Rotor Blade

Martin Stettner | *GE Global Research Europe*
Marianne Jacoba Reijerkerk, Alexander Lünenschloß, Vasilis Riziotis, Alessandro Croce, Luca Sartori, Riccardo Riva, Johan M. Peeringa

C6 Frequency analysis of tangential force measurements on a vertical axis wind turbine

Morgan Rossander | *Ångströmlaboratoriet*
Anders Goude, Sandra Eriksson



C. Aeroservoelasticity, Loads, Structures and Materials

C7 A MIMO Periodic ARX identification algorithm for the Floquet stability analysis of wind turbines

Riccardo Riva | *Politecnico di Milano*
Stefano Cacciola, Carlo L. Bottasso

C8 A novel method of strain - bending moment calibration for blade testing

Peter Greaves | *ORE Catapult*
Raul Prieto, Paul McKeever, Cornelis van Beveren, Robert Dominy, Grant Ingram

C9 Assessment of fatigue load alleviation potential through blade trailing edge morphing

Dimitris Manolas | *NTUA*
Theofanis Tsiantas, Theodore Machairas, Anargyros Karakalas, Vasilis A. Riziotis, Dimitrios Saravanos, Spyros Voutsinas

C10 Assessment of synthetic winds through spectral modelling and validation using FAST

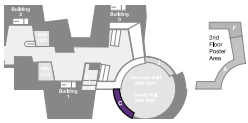
Abhijit Chougule | *University of Agder*
Surya Kandukuri, Hans Georg Beyer

C11 Effect of Turbulence on Power for Bend-Twist Coupled Blades

Alexander Stäblein | *DTU*
Morten H. Hansen

C12 Simulating the dynamic behavior of a vertical axis wind turbine operating in unsteady conditions

Enrico Benini | *University of Trento*
Lorenzo Battisti, Marco Raciti Castelli, Alessandra Brighenti, Giuseppe Soraperra



E. Design and Systems Engineering

E1 Yawing characteristics during slippage of the nacelle of a multi MW wind turbine

Moo-Gyn Manuel Kim | *Hamburg University of Applied Sciences*
Peter Dalhoff, Peter Gust

E2 Impact of Wind Turbine Yaw misalignment on the Loads and Wind Farm Levelized Cost of Energy

Mike van Dijk | *TU Delft*
Jan-Willem van Wingerden, Turaj Ashuri, Yaoyu Li, Mario Rotea

E3 Roadmap to the multidisciplinary design, analysis and optimisation of wind energy systems

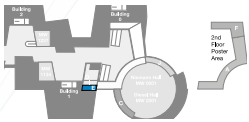
Sebastian Sanchez Perez-Moreno | *TU Delft*
Michiel Bastiaan Zaayer, Carlo L. Bottasso, Frederik Zahle, Gerardus Joseph Wilhelmus van Bussel, Katherine Dykes, Karl Otto Merz, Pierre-Elouan Réthoré, Sebastian Sanchez Perez-Moreno

E4 Optimization under Uncertainty of Site-Specific Turbine Configurations

Katherine Dykes | *NREL*
Julian Quick, Fredrik Zahle, Peter Grad

E5 Analysis of different blade architectures on VAWT performance

Lorenzo Battisti | *University of Trento*
Marco Raciti Castelli, Enrico Benini, Alessandra Brighenti



G. Modeling and Simulation Technology

G2 Determining Diffuser Augmented Wind Turbine performance using a combined CFD/BEM method

Joss Kesby | *The University of Newcastle, Australia*
Philip Clausen, David Bradney, Mu Chu

G3 Analysis of Dynamic Interactions between Different Drivetrain Components in a Detailed Wind Turbine Model

Arne Bartschat | *Fraunhofer IWES*
Marcel Morisse, Axel Mertens, Jan Wenske

G4 Comparison of computational modelling and field testing of a small wind turbine operating in unsteady flows

Samuel Evans | *The University of Newcastle, Australia*
David Bradney, Philip Clausen, Mariana Salles Pereira Da Costa

G5 Derivation and analysis of the analytical velocity and vortex stretching expressions for an O(N logN)-FMM

Tom Berdowski | *TU Delft*
Jens Walther, Carlos Ferreira, Fanzhong Meng

G6 CFD modeling of a large dimension WF cluster using precursor inlet condition

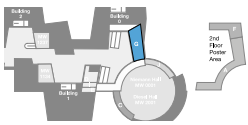
José M.L.M. Palma | *University of Porto, Faculty of Engineering*
Vitor Gomes

G7 Calibration of the γ–Equation Transition Model for High Reynolds Flows at Low Mach

Simone Colonia | *University of Glasgow*
Vladimir Leble, Rene Steijl, George Barakos

G8 Wake modeling in complex terrain using a hybrid Eulerian-Lagrangian approach

Franz Georg Fuchs | *SINTEF*
Mandar Tabib, Adil Rasheed, Eivind Fonn



G. Modeling and Simulation Technology

G9 Coupling of electromagnetic and structural dynamics for a wind turbine generator

Daniel Matzke | *RWTH Aachen*
Sebastian Hollas, Ralf Schelenz, Georg Jacobs, Sebastian Rick, Kay Hameyer

G10 Floating substructure flexibility of large-volume 10MW offshore wind turbine platforms

Michael Borg | *DTU*
Anders Melchior Hansen, Henrik Bredmose

G11 Modelling of Vortex-Induced Loading on a Single-Blade Installation Setup

Witold Skrzypiński | *DTU*
Mac Gaunaa, Joachim Christian Heinz

G12 Numerical simulations of the NREL s826 airfoil

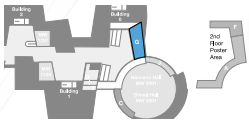
Kristian Sagmo | *NTNU*
Lars Roar Sætran, Jan Michael Simon Bartl

G13 Modeling the transient aerodynamic effects during the motion of a flexible trailing edge

Torben Wolff | *ForWind - Leibniz Universität Hannover*
Joerg R. Seume

G15 Modelling Horns Rev wind farm with the Actuator Line Model with coarse resolution

Martín Draper | *Universidad de la República*
Andrés Guggeri, Gabriel Usera



G. Modeling and Simulation Technology

G17 Modelling flows within forested areas using the k-epsilon RaNS model

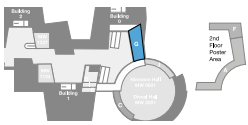
José M.L.M. Palma | *University of Porto, Faculty of Engineering*
Joao Viana Lopes, Alexandre Silva Lopes

G18 Reliability of numerical wind tunnels for VAWT simulation

Marco Raciti Castelli | *University of Padova*
Massimo Masi, Lorenzo Battisti, Enrico Benini, Alessandra Brighenti, Vincenzo Dossena, Giacomo Persico

G19 Enhanced method for multi-scale wind simulations over complex terrain for wind resource assessment

Alex Flores-Maradiaga | *Technical University Federico Santa Maria*
Robert Benoit, Christian Masson



I. New Concepts and Configurations

I1 Fluid-Structure interaction analysis and performance evaluation of a membrane blade

Mehran Saeedi | *TUM*
Roland Wüchner, Kai-Uwe Bletzinger

I2 CFD Analysis of a Finite Linear Array of Savonius Wind Turbines

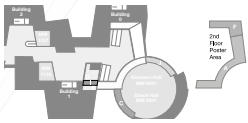
Marius Paraschivoiu | *Concordia University*
Belabes Belkacem

I3 Numerical Study on the Effect of Swept Blade on the Aerodynamic Performance of Wind Turbine at High Tip Speed Ratio

Hua Yang | *Yangzhou University*
Feng Wang, Hongmei Zuo, Chao Liu

I4 Evaluation of an Integrated Roof Wind Energy System for urban environments

Diana Kiss | *IBIS Power*
Balkrishna Patankar, Ramavtar Tyagi, Alexander B. Suma



Poster Session 2

Thursday

B. Wind, Wakes, Turbulence and Wind Farms

B1 Wind-tunnel modeling of the tip speed ratio influence on the near wake evolution

Victor Stein | *TUM*
Hans-Jakob Kaltenbach

B2 Large Eddy Simulation for Atmospheric Boundary Layer Flows over Flat and Complex Terrains

Jonathan Naughton | *University of Wyoming*
Yi Han, Michael Stoellinger

B3 Analysis of Turbulent Coherent Structures in a Flow Over an Escarpment using Proper Orthogonal Decomposition

Horia Hangan | *Western University*
Ryan Kilpatrick, Kamran Siddiqui

B4 Investigating Coherent Structures in the Standard Turbulence Models using Proper Orthogonal Decomposition

Lene Eliassen | *NTNU*
Søren Andersen

B5 CFD modelling approaches against single wind turbine wake measurements using RANS

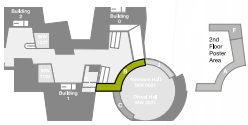
Nikolaos Stergiannis | *Vrije Universiteit Brussel*
Chris Lacor, Jeroen van Beeck, Rory Donnelly

B6 Turbulence Impact on Wind Turbines: Experimental investigations on a wind turbine model

Youjin Kim | *SGB*
Ali Al-Abadi, Özgür Ertunç, Antonio Delgado

B7 An analysis of offshore wind farm SCADA measurements to identify key parameters influencing the magnitude of wake effects

Niko Mittelmeier | *Senvion*
Tomas Blodau, Gerald Steinfeld, Andreas Rott, Martin Kühn



B. Wind, Wakes, Turbulence and Wind Farms

B8 PIV measurements in a real time controlled wind turbine wake simulator

Suhas Pol | *Texas Tech Univeristy*
Yeqin Wang, Travis Monk, Stephanie Vasquez, Andy Swift, Fazle Hussain, Casrten Westergaard, Beibei Ren

B10 Calculating the sensitivity of wind turbine loads to wind inputs using response surfaces

Jennifer Rinker | *DTU*

B11 Probability density function selection based on the characteristics of wind speed data

Nurseda Yildirim Yurusen | *CIRCE - University of Zaragoza*
Julio J. Melero

B12 Wind turbine wake structure in forest and neutral plane wall boundary layer large-eddy simulations

Josef Schröttle | *German Aerospace Center DLR*
Zbigniew Piotrowski, Antonia Englberger, Andreas Dörnbrack, Thomas Gerz

B13 Transient growth of perturbations in a vortex ring

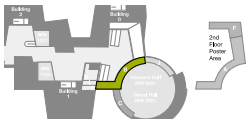
Fei Chen | *GoldWind*
Daniel Wacks, Daniel Cabezon, Xuerui Mao, Bofu Wang

B14 IEA Wind Task 36 Forecasting

Gregor Giebel | *DTU*
Joel Cline, Helmut Frank, William Shaw, Pierre Pinson, Bri-Mathias Hodge, George Kariniotakis, Jens Madsen

B15 The Collection of The Main Issues for Wind Farm Optimisation in Complex Terrain

Chang Xu | *Hohai University*
Wenzhong Shen



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B16 Turbulence influence on optimum tip speed ratio for a 200 kW vertical axis wind turbine

Erik Möllerström | *Halmstad University*
Sandra Eriksson, Anders Goude, Fredric Ottermo, Jonny Hylander

B17 Two-scale momentum theory for very large wind farms

Takafumi Nishino | *Cranfield University*

B18 Effects of ambient turbulence on the near wake of a wind turbine

Yusik Kim | *University of Stuttgart*
Eva Jost, Galih Bangga, Pascal Weihing, Thorsten Lutz

B19 Validation of buoyancy driven spectral tensor model using HATS data

Abhijit Chougule | *University of Agder*
Jakob Mann, Mark Kelly, Gunner Larsen

B20 Wake redirection: comparison of analytical, numerical and experimental models

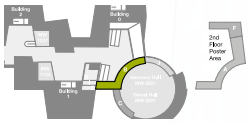
Jiangang Wang | *TUM*
Carlo L. Bottasso, Filippo Campagnolo

B21 Wake center position tracking using downstream wind turbine hub loads

Stefano Cacciola | *Politecnico di Milano*
Marta Bertelè, Johannes Schreiber, Carlo L. Bottasso

B22 Identification and quantification of vortical structures in wind turbine wakes for operational wake modeling

Yves Marichal | *WaPT - Wake Prediction Technologies*
Ivan De Visscher, Philippe Chatelain, Grégoire Winckelmans



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Robert Mikkelsen | *DTU*
Ivan Kabardin, Valery Okulov, Jens Sørensen, Igor Naumov

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Yimei Wang | *North China Electric Power University*
Pierre-Elouan Réthoré, Paul van der Laan, Juan Pablo Murcia Leon, Yongqian Liu, Li Li

B25 Defining wake characteristics from scanning and vertically pointing full-scale lidar measurements

Rebecca J. Barthelmie | *Cornell University*
Paula Doubrawa, Hui Wang, SC Pryor

B26 A numerical study on the flow upstream of a wind turbine in complex terrain

Alexander Raul Meyer Forsting | *DTU Wind Energy*
Andreas Bechmann, Niels Troldborg

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Mandar Tabib | *SINTEF*
Adil Rasheed, Franz Fuchs

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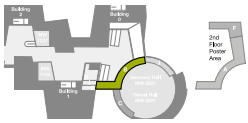
John Prospathopoulos | *NTUA*
Michail Tzimas

B29 Experimental testing of axial induction based control strategies for wake control and wind farm optimization

Jan Bartl | *NTNU*
Lars Sætran



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Pablo Olmos, Hannah Ferchland, Aidan Keane, Daniel Gallacher

B31 LES of wind farm response to transient scenarios using a high fidelity actuator disk model
Maud Moens | *Université catholique de Louvain*
Matthieu Duponcheel, Grégoire Winckelmans, Philippe Chatelain

B32 Spatial correlation of atmospheric wind at scales relevant for large scale wind turbines
Lars Morten Bardal | *NTNU*
Lars Roar Sætran

B33 Comparison of the far wake behind dual rotor and dual disk configurations
Jens Nørkær Sørensen | *DTU Wind Energy*
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Adil Rasheed, Mandar Tabib, Trond Kvamsdal

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Ashvinkumar Chaudhari | *Lappeenranta University of Technology*
Boris Conan, Sandrine Aubrun, Antti Hellsten

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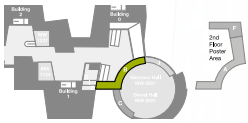
Seonghyeon Hahn | *Vestas Wind Systems A/S*
Ewan Machefaux, Yavor Hristov, Marco Albano, Robert Threadgill



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D1 Fatigue minimising power reference control of a de-rated wind farm

Tom Nørgaard Jensen | *Aalborg University*
Torben Knudsen, Thomas Bak

D2 Computationally Efficient Kalman Filtering for the Medium-Fidelity Flow Model 'WindFarmSimulator'

Bart Doekemeijer | *TU Delft*
Jan-Willem van Wingerden, Sjoerd Boersma, Lucy Pao

D3 Model Predictive Wind Turbine Control for Load Alleviation and Power Leveling

Uwe Jassmann | *RWTH Aachen University*
Sebastian Dickler, János Zierath, Mathias Hakenberg, Dirk Abel

D4 Balancing rotor speed regulation and drive train loads of floating wind turbines

Boris Fischer | *Fraunhofer IWES*
Peter Loepelmann

D5 Stability Analysis of a Single-Input/Two-Output, Variable Loop Transmission System for Wind Turbine Control

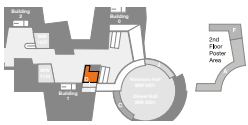
Yelena O'Brien | *University of Wyoming*
John O'Brien

D6 Multi-objective Extremum Seeking Control for Enhancement of Wind Power Capture with Load Reduction

Yaoyu Li | *University of Texas at Dallas*
Yan Xiao, Mario Rotea

D7 Statistical fault diagnosis of wind turbine drivetrain applied to a 5MW floating wind turbine

Mahdi Ghane | *NTNU*
Amir Rasekhi Nejad, Mogens Blanke, Torgeir Moan, Zhen Gao



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Axel Schild, Matthias Feldt, Ulrich Konigorski

D9 Controller design for wind turbine load reduction via Multi Objective Parameter Synthesis (MOPS)

Arndt Hoffmann | *German Aerospace Centre DLR*
Felix Weiß

D10 Direct Torque Control of a Small Wind Turbine with a Sliding-mode Speed Controller

Jagath Senanayaka | *University of Agder*
Hamid Reza Karimi, Kjell Gunnar Robbersmyr

D11 Design of Linear Control System for Wind Turbine Blade Fatigue Testing

Torben Knudsen | *Aalborg University*
Anders Toft, Bjarke Roe-Poulsen, Rasmus Christiansen

D12 PI Controller Design of a Wind Turbine using Constrained Optimization

Mahmood Mirzaei | *DTU*
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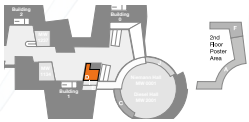
D13 Iterative tuning of feedforward IPC for two-bladed wind turbines

Sebastiaan Mulders | *TU Delft*

D14 Uncertainty Quantification for Robust Control of Wind Turbines using Sliding-Mode Observer

Horst Schulte | *University of Applied Sciences Berlin*



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Elham Tofighi | *University of Newcastle, Australia*
Amin Mahdizadeh

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Marco Belloli | *Politecnico di Milano*
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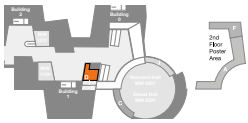
Binita Shrestha | *ForWind - University of Oldenburg*
Rasoul Shirzadeh, Martin Kühn



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Frank Scheurich | *Siemens Wind Power*
Peder B. Enevoldsen, Henrik N. Paulsen, Kristoffer K. Dickow, Moritz Fiedel, Alex Loeven, Ioannis Antoniou

F2 Design and implementation of a controllable model wind turbine for experimental studies

Jannik Schottler | *ForWind - University of Oldenburg*
Agnieszka Hölling, Joachim Peinke, Michael Hölling

F3 Fast Ice Detection for wind turbine blades via the Langevin equation

Haijun Fang | *Envision Energy*
Linpeng Wang

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Atsushi Yamaguchi | *The University of Tokyo*
Takeshi Ishihara

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Nurhan Rizqy Averous | *RWTH Aachen*
Anica Berthold, Alexander Schneider, Franz Schwimmbeck, Rik W. De Doncker, Antonello Monti

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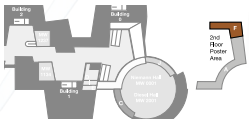
Laura Valldecabres Sanmartin | *ForWind - University of Oldenburg*
Martin Kühn, Lüder von Bremen, Wilm Friedrichs



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Ashim Giyanani | *TU Delft*
Feike Savenije, Wim Bierbooms, Gerard van Bussel

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Jenni Herrmann | *Hamburg University of Applied Sciences*
Thes Rauert, Peter Dalhoff, Manuela Sander

F9 Optimal Sensor Placement for Modal Testing on Wind Turbines

Andreas Schulze | *Universität Rostock*
János Zierath, Sven-Erik Rosenow, Reik Bockhahn, Roman Rachholz, Christoph Woernle

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Thes Rauert | *Hamburg University of Applied Sciences*
Jenni Herrmann, Peter Dalhoff, Manuela Sander

F11 SCADA alarms processing for wind turbine component failure detection

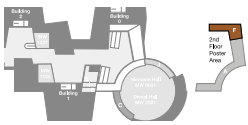
Elena Gonzalez | *CIRCE - University of Zaragoza*
Maik D. Reder, Julio Javier Melero

F12 Wind Turbine Failures - Tackling current Problems in Failure Data Analysis

Maik D. Reder | *CIRCE - University of Zaragoza*
Elena Gonzalez, Julio Javier Melero

F13 Experimental airfoil characterization under tailored turbulent conditions

Hendrik Heißelmann | *ForWind - University of Oldenburg*
Joachim Peinke, Michael Hölling



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Bernhard Wondra | *TUM*
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Sarah Karlina-Barber | *Fraunhofer IWES*
Sebastian Mechler, Marco Lutz

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Alexander Raul Meyer Forsting | *DTU Wind Energy*
Niels Troldborg

F17 Full load estimation of an offshore wind turbine based on SCADA and accelerometer data

Nymfa Noppe | *Vrije Universiteit Brussel*
Alexandros Iliopoulos, Wout Weijtjens, Christof Devriendt

F18 Dynamics of the interaction between the rotor and the induction zone

Mahmood Mirzaei | *DTU*
Alexander R. Meyer Forsting, Niels Troldborg

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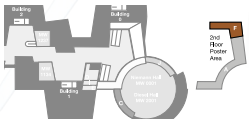
Christophe Loraux | *EPFL*
Eugen Brühwiler



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Stefan Emeis | *Karlsruhe Institute of Technology*
Astrid Lampert, Jens Bange, Johannes Schulz-Stellenfleth, Thomas Neumann

H2 Model-based fault diagnosis of blade pitch system in floating wind turbines

Seongpil Cho | *NTNU*
Zhen Gao, Torgeir Moan

H3 Offshore wind turbine foundation monitoring, extrapolating fatigue measurements from fleet leaders to the entire wind farm

Wout Weijtjens | *Vrije Universiteit Brussel*
Nymfa Noppe, Tim Verbelen, Alexandros Iliopoulos, Christof Devriendt

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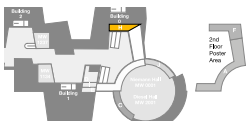
Yuka Kikuchi | *The University of Tokyo*
Takeshi Ishihara

H5 Integrated Layout and Support Structure Optimization for Offshore Wind Farm Design

Turaj Ashuri | *The University of Texas at Dallas*
Chandra Varma Ponnurangam, Jie Zhang, Mario Rotea

H6 Dynamic Effects of Anchor Positional Tolerance on Tension Moored Floating Wind Turbine

Christopher Wright | *UCC*
Vikram Pakrashi, Jimmy Murphy



H. Offshore Wind Energy

H7 Design and performance analysis of control algorithm for a floating wind turbine on a large semi-submersible platform

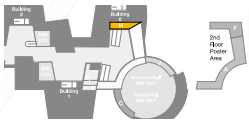
Kwansu Kim | *Kangwon National University*
Hyun-Gyu Kim, Joong-Hyeok Lee, Seock-Hyun Kim, Byeong-Hee Kim, Insu Paek

H8 An Experimental Study on the Effects of Base Motions on the Aeromechanic Performance of Floating Wind Turbines

Hui Hu | *Iowa State University*
Morteza Khosravi

H9 Description of an 8 MW reference wind turbine

Christopher Wright | *University College Cork*
Cian Desmond, Jimmy Murphy, Lindert Blonk, Wouter Haans



J. Drive Trains, Generator Technology and Grids

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Henk Polinder | *TU Delft*
Udai Shipurkar, Jan Ferreira

J2 Non-ideal feedforward torque control of wind turbines: Impacts on annual energy production and gross earnings

Korbinian Schechner | *TUM*
Christoph Hackl

J3 Encoderless Model Predictive Control of Doubly-Fed Induction Generators in Variable-Speed Wind Turbine Systems

Mohamed Abdelrahem | *TUM*
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J4 Analyzing wind turbine flow interaction through vibration and SCADA data.

Francesco Castellani | *University of Perugia*
Gianluca D'Elia, Davide Astolfi, Emiliano Mucchi, Giorgio Dalpiaz, Ludovico Terzi

J5 Comparison of Life Calculations for Oscillating Bearings Considering Individual Pitch Control in Wind Turbines

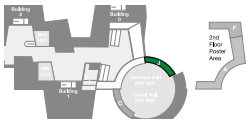
Fabian Schwack | *Leibniz Universität Hannover*
Matthias Stammler, Gerhard Poll, Andreas Reuter

J6 Drivetrain load effects in a 5 MW bottom-fixed wind turbine under blade-pitch fault condition and emergency shutdown

Amir R. Nejad | *NTNU*
Zhiyu Jiang, Zhen Gao, Torgeir Moan

J7 Statistical study of the effect of wind characteristics on wind turbine main shaft loadings

Sho Oh | *ClassNK*



J. Drive Trains, Generator Technology and Grids

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Michael Argent | *University of Strathclyde*
Alasdair McDonald, Bill Leithead, Alexander Giles

J9 Efficient operation of anisotropic synchronous machines for wind energy systems

Julian Kullick | *TUM*
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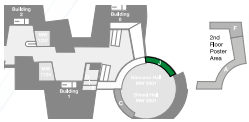
J10 Variation of Extreme and Fatigue Design Loads on the Main Bearing of a Front Mounted Direct Drive System

Asger Bech Abrahamsen | *DTU*
Anand Natarajan



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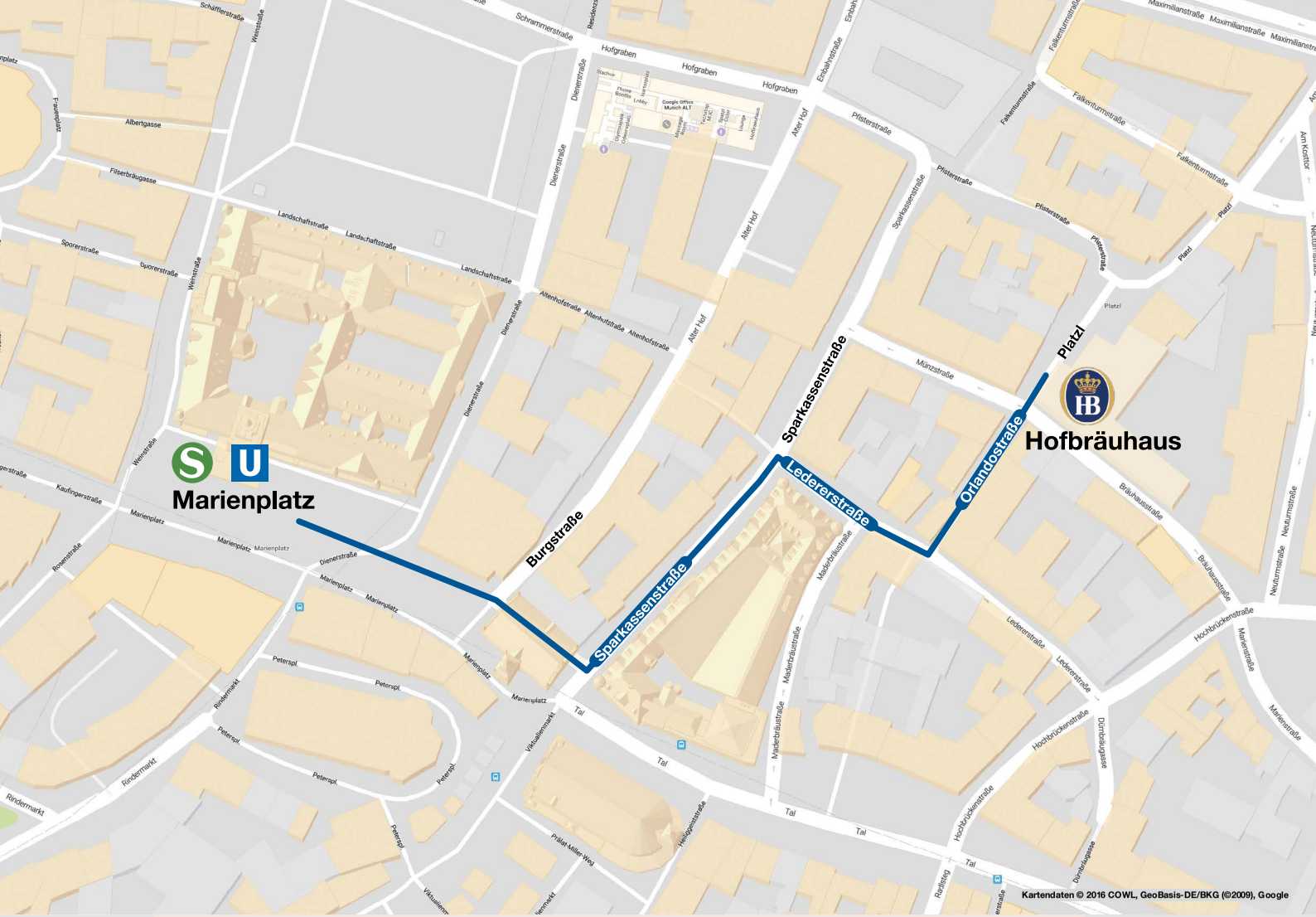
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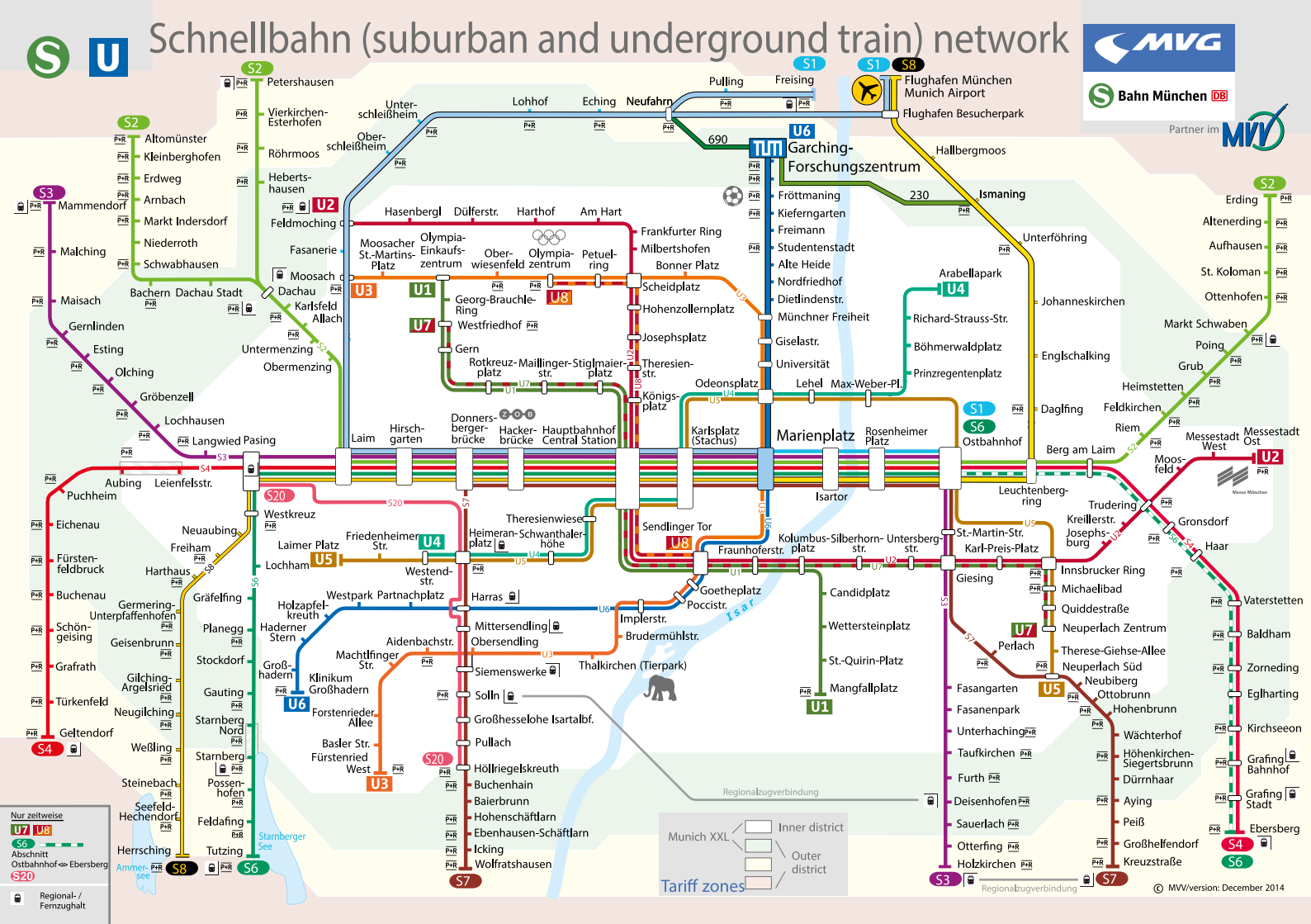
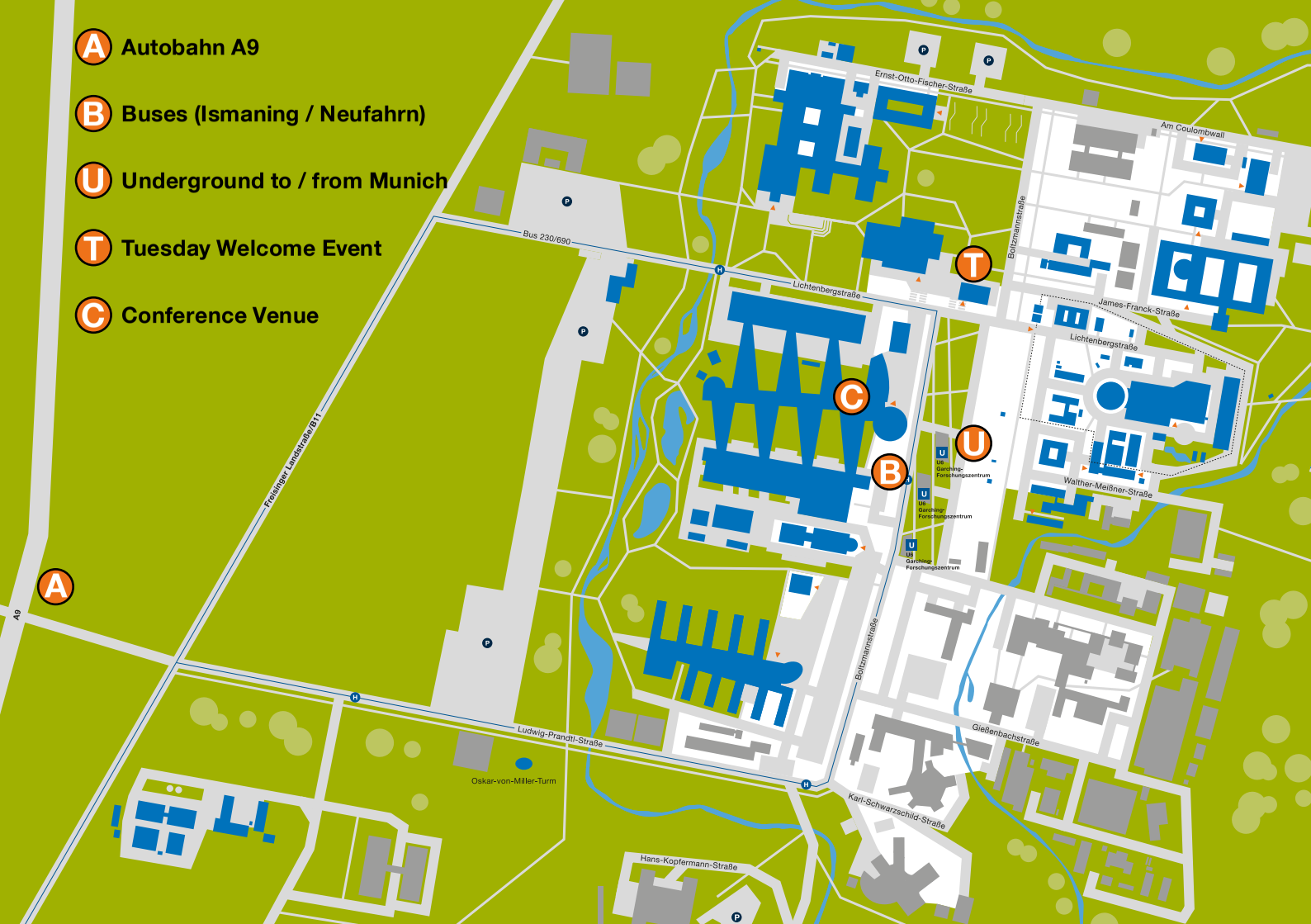
Schnellbahn (suburban and underground train) network

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