Minutes of 41st ISSMGE TC304 Meeting (ISGSR2022)

Date: 15/12/2022
Time: 17:30 – 19:00 (UTC +11)

Location: Room X301, NUSpace, Newcastle Australia
Zoom Link: https://us02web.zoom.us/j/84802710754 **Password: 200092**

1. **Approval of the 40th TC304 minutes (Email meeting)**

2. **Announcements**

2.1 Succession of TC304

- Prof. Michael Hicks has been elected as the Chair of TC304, ISSMGE. Prof. Jie Zhang and Dr. Cormac Reale have been nominated as the vice chair and secretary of TC304, respectively.

2.2 ISSMGE Outstanding Technical Committee Award

- TC304 recently won the ISSMGE Outstanding Technical Committee Award for the last presidential term (2017-2022). This is the second time TC304 has won this rare honor since its inauguration in 2013 (the first time was the term during 2009-2013). Prof. Armin Stuedlein attended the award ceremony to receive the award on behalf of TC304.

2.3 Election of 7th Suzanne Lacasse Lecturer

- Prof. Jianye Ching has been selected as the 7th Suzanne Lacasse lecturer. He will present his lecture at Geo-Risk 2023 in Arlington, USA.

2.4 Obituary

- Committee member Prof. Waldemar Coelho Hachich from Brazil has sadly passed away since our last meeting–https://www.issmge.org/news/waldemar-coelho-hachich-1950-2022.

3. **Activities in the <u>past six months</u> (conferences, short courses, awards, keynotes, and special issue).**

3.1 Highlighted activities

- ISSMGE launched the Time Capsule Project (TCP). Each TC is responsible to produce a historical document that describes its past https://www.issmge.org/the-society/time-capsule

- TC304 has prepared the following two Time Capsule Project (TCP) documents:
  - Time capsule for geotechnical risk and reliability (Marcin Chwała, KK Phoon, Marco Uzielli, Jie Zhang, LM Zhang & J Ching):
    - PDF file https://www.dropbox.com/s/g28v3lwmgzopige/TCP_geotech_risk_reliability.pdf?dl=0

        - Summarizing PPTs https://www.dropbox.com/s/4rmciwdunvzxogd/PPT_geotech_risk_reliability.pptx?dl=0
        - Paper published in Georisk: Marcin Chwała, Kok-Kwang Phoon, Marco Uzielli, Jie Zhang, Limin Zhang & Jianye Ching (2022) Time capsule for geotechnical risk and reliability, Georisk, DOI: 10.1080/17499518.2022.2136717
    - Time capsule for landslide risk assessment (Lei Yu, J Huang, Yifei Cui, Shui-Hua Jiang, Shengnan Wu & J Ching):
        - PDF file https://www.dropbox.com/s/plnsg7rrk9zcpdo/TCP_landslide_risk_assessment.pdf?dl=0
        - Summarizing PPTs https://www.dropbox.com/s/ltgc5uo6og5crle/PPT_landslide_risk_assessment.pptx?dl=0
        - Paper currently in review

- Review papers/reports related to TC304 have been published in journals:
    - Challenges in Data-driven Site Characterization(Phoon, K. K., Ching, J. & Shuku, T), Georisk: Assessment & Management of Risk for Engineered Systems & Geohazards, Mar 2022, 16(1), 114-126.
    - The story of statistics in geotechnical engineering (KK Phoon):
        - https://www.tandfonline.com/doi/abs/10.1080/17499518.2019.1700423?journalCode=ngrk20
    - Challenges in geotechnical design revealed by reliability assessment: Review and future perspectives (Yu Otake & Yusuke Honjo)
        - https://www.sciencedirect.com/science/article/pii/S0038080622000373
    - State-of-the-art review of inherent variability and uncertainty in geotechnical properties and models (J Ching & Timo Schweckendiek)
        - http://140.112.12.21/issmge/2021/SOA_Review_on_geotechnical_property_variablity_and_model_uncertainty.pdf
    - Unpacking data-centric geotechnics (Phoon, K. K., Ching, J. and Cao, Z. 2022b) Underground Space, 7(6), 967-989.
    - Geotechnical uncertainty, modeling, and decision making. (Phoon, K. K., Cao, Z., Ji, J., Leung, Y. F., Najjar, S., Shuku, T., Tang, C., Yin, Z. Y., Ikumasa, Y., and Ching, J. 2022a.) Soils and Foundations, 62(5), 101189.
    - Future of machine learning in geotechnics (Phoon, K. K. and Zhang, W. 2023.) Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards. https://doi.org/10.1080/17499518.2022.2087884
    - What geotechnical engineers want to know about reliability.(Phoon, K. K. 2023) ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering, in press.

- Massive Open Online Courses (MOOC) on “Probability Analysis in Civil Engineering” in ISSMGE virtual University (Jie Zhang)
    - https://www.issmge.org/news/new-tc304-course-on-probability-analysis-in-civil-engineering-by-dr-jie-zhang

3.2 Special Issues and ISSMGE Virtual University

- Special Issue of Underground Space on “Digital Geology & Machine Learning in Tunneling” (WG Zhang, Chu Jian)

- Special Issue of Acta Geotechnica on "Machine Learning in Geotechnics" (WG Zhang, Liu Zhongqiang)
- Special Issue of Journal of Rock Mechanics and Geotechnical Engineering on "Advances and applications of deep learning & soft computing in geotechnical underground engineering" ((WG Zhang, KK Phoon)
- TC304 contributions to ISSMGE Virtual University
    - TC304 Young Group has set seven topics for short videos (about 15 min each) introducing different aspects of geotechnical risk and reliability. Target audience would be practicing engineers and students.
        - SV1: Overview and significance of geotechnical uncertainty (TBA)
        - SV2: How to characterize site/model uncertainty (Zijun Cao)
            - http://virtualuniversity.issmge.org/courses/course-v1:ISSMGE+TC304-103+2020/course
        - SV3: How to estimate characteristic values for design (Yu Wang)
            - http://virtualuniversity.issmge.org/courses/course-v1:ISSMGE+TC304-101+2019/about
            - Examples added by Zijun
        - SV4: How does geotechnical uncertainty impact the system response (TBA)
        - SV5: How to perform reliability analyses on a spreadsheet (Lei Wang)
            - http://virtualuniversity.issmge.org/courses/course-v1:ISSMGE+TC304-104+2021/about
        - SV6: Insights from geotechnical reliability-based design (BK Low)
            - http://virtualuniversity.issmge.org/courses/course-v1:ISSMGE+TC304-102+2020/about
        - SV7: Deterministic and probabilistic case analyses of slopes (Bak Kong Low)
            - http://virtualuniversity.issmge.org/courses/course-v1:ISSMGE+LM101+2021/course/ (under "Landslides and Mitigations")
        - SV8: Case studies for reliability-based design and risk assessment (TBA)

3.3 Conferences

- 13th International Conference on Structural Safety & Reliability (ICOSSAR 2021), Jun 22-24 2022, Tongji University, Shanghai, China
    - http://www.icossar2021.org/
    - TC304 Sessions
        - Bayesian analysis of structural and geotechnical models (Iason Papaioannou, Costas Papadimitriou, Daniel Straub, Jie Zhang) (6 paper submitted)
        - Hazard and risk assessment of earthquake-induced landslides (Cong Xu & Qing Lü) (2 paper submitted)
        - Machine learning and data analytics in geotechnical site investigation (Yu Wang & Hui Wang) (8 papers submitted)
        - Multi-source and multi-methodological data fusion to improve the reliability of geo-engineering and environmental characterization, urban planning, and geotechnical designing (Di Curzio Diego, Castrignanò Annamaria, Pula Wojciech & Vessia Giovanna) (4 paper submitted)
        - Uncertainty characterization of the geological model and its influences (Wenping Gong & Lei Wang) (2 paper submitted)
- 4th International Conference on Information Technology in Geo-engineering (4ICITG), July 2022, Singapore

    - TC304 keynotes:
        - Jianye Ching "Hierarchical Bayesian model for geotechnical transfer learning – A framework for transferring experiences in geotechnical database to site-specific design"
        - Zhongqiang Liu "Calibration of Axial Pile Capacity Calculation Models Using Least Squares and Bayesian Regression Approaches"
        - Limin Zhang "Transfer Learning Empowers Landslide Susceptibility Assessment"
    - TC304 Session
        - Data analytics in geotechnical and geological engineering (Y Wang, WG Zhang, XH Qi & J Ching) 10 papers submitted

- 8th International Symposium on Reliability Engineering and Risk Management (ISRERM), Sep 4 - 7 2022, Leibniz University Hannover, Hannover, Germany (Michael Beer, Enrico Zio, Kok Kwang Phoon & Bilal M. Ayyub)
    - TC304 Geotechnical related session (Timo Schweckendiek & J Ching)
        - 14 submissions

- 17th International School on "LAndslide Risk Assessment and Mitigation" LARAM 2022, 5-16 September, Salerno, Italy (Michele Calvello)
    - hybrid mode, with some students and teachers connected online
    - https://www.laram.unisa.it/school/2022hybrid/2022hybrid

3.4 Keynotes

- Armin W. Stuedlein, theme lecture on “On the In-Situ Seismic Response of Medium Dense Sand and Comparison to Cyclic Stress- and Strain-based Laboratory Behavior,” 4th International Conference on Performance-based Design in Earthquake. Geotechnical Engineering (PBD-IV), July 15 -17, 2022, Beijing, China
- Hongwei Huang, keynote lecture on "Why and How Shield Tunnel can be Resilient: From Componential to Systematic Perspective", 8th International Symposium on Reliability Engineering and Risk Management (ISRERM), Sep 4 - 7 2022, Leibniz University Hannover, Hannover, Germany
- Hongwei Huang, invited lecture on "Machine-Vision-Based (MVB) Safety Risk Assessment on Rock Tunnel", International Symposium on Intelligent Geotechnics , June 10-11, 2022, Hong Kong, China.
- Iason Papaioannou, invited lecture on “Reliability sensitivity analysis with dependent inputs”, MASCOT-NUM Conference, June 7-9, 2022, Clermont Ferrand, France
- Michael Hicks, invited lecture on “Numerical modelling of spatial variability and geotechnical uncertainty”, Workshop on Numerical Methods in Geotechnics 2022, Sep 12-13 2022, Hamburg, Germany

3.5 Short courses

Vaughan Griffiths & Jinsong Huang, 2-day industry short course on “Probabilistic Methods in Geotechnical Engineering” to Douglas Partners in Newcastle, NSW, June/July 2022

- Vaughan Griffiths, a course module (16 hours) on “Risk Assessment in Geotechnical Engineering” offered to graduate students at the SKLGP, Chengdu University of Technology, China, August 2022
- Vaughan Griffiths, 1-day short course on “Risk Assessment in Geotechnical Engineering” offered to the Pittsburgh, PA Chapter of the Geo-Institute, USA, October 2022

3.6 Books

- Textbook “Soil Mechanics and Foundation Engineering (2nd edition)” (2022).Wang JH, Zhang LL, Chen JJ, Ye GL, Li MG. China Architecture & Building Press. 375pages. In Chinese. ISBN：9787112276172
- Textbook” Bayesian Compressive Sensing for Site Characterization” by Yu Wang, Tengyuan Zhao, Yue Hu, Zheng Guan and Kok-Kwang Phoon
- Book chapter on "Limit State Design" that will be appearing in the 5th edition of the Canadian Foundation Engineering Manual by Gordon Fenton

3.7 Design codes

- CHBDC (Canadian Highway Bridge Design Code) Section 6 Technical Subcommittee on "Foundations and Geotechnical Systems", Part of the ongoing work on the geotechnical design provisions to appear in the next edition of CHBDC (2025), Chaired by Gordon Fenton
- NBCC (National Building Code of Canada) Task Group on Geotechnical Design, Chaired by Gordon Fenton
- Greg Baecher and Bob Gilbert are involved with the development of a primer and direction-setting document on reliability-based methods for ASCE-7 (the structural code guidance by ASCE) under the sponsorship of Jean-Louis Briaud, who is now President of the overall ASCE organization. The target is to have a draft ready for review by the G-I by the end of the year.

3.9 Awards

- Jie Zhang and Iason Papaioannou received the Early Achievement Award from IASSAR during the ICOSSAR 2021-2022 conference (Sep 13 – 17, 2022)

3.10 Popular science book

- Zhang, J., and Huang, H.W. 2022. Guide for traveling in an uncertain world: what is the risk? Shanghai: Tongji University Press. (In Chinese) (Picture book for kids)

4. Future Activities

Please email updates to Cormac Reale (cr760@bath.ac.uk **) for compilation**

4.1 Conferences & workshops

- ISGSR2022, Dec 14-16 2022, University of Newcastle, Newcastle, Australia (Jinsong Huang)
    - Host conference: December 14-16, 2022
        - Dec 14 2022: Short course & registration
        - Dec 15-16 2022: conference
    - TC304 keynotes:
        - Vaughan Griffiths "Geotechnical Probability: From FOSM to RFEM" (Wilson Tang Lecture)
        - Mark Jaksa "Applications of Artificial Intelligence in Geotechnical Engineering"
        - Jianye Ching "Global, Regional, or Municipal Database? Which is Better?"
        - Timo Schweckendiek "Reliability Assessment of Existing Geotechnical Structures"

        - Dianqing Li "Slope Reliability Analysis and Risk Assessment: A Modern Computational Perspective"
- UNCECOMP 2023, June 12-14 2023, Athens, Greece
    - Session on "Bayesian computation methods for inference in science and engineering" (co-chaired by Iason Papaioannou)
    - Session on "Reliability analysis and rare event estimation" (co-chaired by Iason Papaioannou)
- ICASP14, 9th-13th July 2023, Trinity College Dublin, Ireland
    - Session on "Uncertainty in Geotechnical Engineering"(co-chaired by Cormac Reale)
    - Session on "Recent advances in geotechnical risk and reliability" (co-chaired by Michael Hicks, Jianye Ching)
    - Session on "Bayesian analysis of structural and geotechnical models "(co-chaired by Iason Papaioannou, Jie Zhang)
    - Session on "Optimal decision making under uncertainty" (co-chaired by Iason Papaioannou)
        - Full paper submission due Jan 30th

- Geo-Risk 2023, July 23-26 2023, Arlington, Virginia, USA (Geo-Institute RAM) (Chaired by Shadi Najjar, LM Zhang, R.B. Gilbert)
    - http://www.geo-risk.org/
    - Abstract due May 20 2022
    - Conference begins July 23 2023
    - At Geo-Risk "Fourth Machine Learning in Geotechnics Dialogue (4MLIGD) on "Machine Learning Supremacy Projects" (chaired by Kok-Kwang Phoon, Jianye Ching, and Takayuki Shuku)
        - Contact Takayuki (shuku@cc.okayama-u.ac.jp) if you are keen to submit a contribution
        - Currently 5 contributions

- The 5th National Young Scientist Symposium on Engineering Risk and Control, Apr 21-23 2023, Chongqing, China (Chaired by Wengang Zhang)

- The 7th National Symposium on Engineering Risk and Insurance Research, Aug 18-21 2023, Nanchang, China (Chaired by Hongwei Huang, Fuqing Zhang)
    - 7th TC304 Student Contest

4.2 Special issues

- Special Issue of Underground Space on "Machine Learning and AI for Underground Metaverse" (KK Phoon, Qiujing Pan, Chong Tang)
    - Contact qiujing.pan@csu.edu.cn
    - Timelines
        - Call for Abstracts: 31 Oct 2022
        - Decision of abstracts: 31 Dec 2022
        - Deadline of full submission: 30 June 2023
        - Decision of papers: 31 December 2023

- Special Collection of the ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems: Part A on "Benchmarking Data-Driven Site Characterization Methods" (KK Phoon, Takayuki Shuku, Jianye Ching and Ikumasa)
    - Contact Takayuki (shuku@cc.okayama-u.ac.jp) if you are keen to submit a paper

    - 7 contributions
    - Timelines
        - Deadline of submission: 1 Aug 2022
        - Decision of all papers: 1 Feb 2023

- Special Issue of Gondwana Research on "Advances in Data-Driven Models in Geosciences" (WG Zhang)
    - 12 contributions

- Special Issue of Probabilistic Engineering Mechanics on "Data-Centric Foundation Engineering Using Statistics" (KK Phoon and Chong Tang)
    - 10 – 14 contributions
    - Deadline: May 2022
    - https://www.journals.elsevier.com/probabilistic-engineering-mechanics/call-for-papers/special-issue-on-data-centric-foundation-engineering-using-statistics

- Special issue of Georisk on "Risk and reliability in offshore geotechnics" (Farrokh Nadim, Hendrik Sturm, Jie Zhang, Jinhui Li)
    - Contact Jie Zhang (cezhangjie@tongji.edu.cn) if you are keen to submit a paper
    - Timelines
        - Deadline for submissions: 31 October 2022
        - Decision of all papers: 30 April 2023

- Special Issue on "Geological Uncertainty and Its Impact on Geohazards and Water Resources Assessments and Infrastructure Design" in Engineering Geology (Chuen-Fa Ni, Chih-Chung Chung, Limin Zhang, Yu Wang, Jia-Jyun Dong)
    - Deadline of submissions: February 2022
    - 22 submissions

- Special Issue on "Machine Learning and AI in Geotechnics" in Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards (KK Phoon and LM Zhang)
    - Deadline of submissions: 1 December 2022
    - 14 submissions

4.3 Keynotes & short courses

- Vaughan Griffiths, 7th Wilson Tang Lecture to be delivered at the 8th ISGSR conference, December 2022, Newcastle, NSW, Australia
- Vaughan Griffiths to deliver a 1 day course on "Quantitative Risk Assessment in Geotechnical Engineering" at the 8th ISGSR conference, December 2022, Newcastle, NSW, Australia
- Timo Schweckendijk to deliver a 2-day short course (professional education) on "Reliability and risk in geotechnical engineering practice"; Deltares, Delft, Netherlands; 14-15 September 2023; https://www.deltares.nl/en/academy/reliability-and-risk-in-geotechnical-engineering-practice/

4.4 Books

- Monograph "Big Data in Geotechnics" by KK Phoon, Chong Tang & J Ching, in preparation

- Book Series: Challenges in Geotechnical and Rock Engineering Series – Leading Authors for ongoing books: 1) Jianye Ching; 2) Zhenyu Yin; 3) Yu Wang; 4) Kok-Kwang Phoon and Chong Tang; 5) Luqi Wang and Wengang Zhang. 200-300 pages per book
- Book "Uncertainty, Modelling, and Decision Making in Geotechnics" Editors: Kok-Kwang Phoon, Jianye Ching, and Takayuki Shuku
    - Deadline of submissions: March 2023
    - Contact Takayuki (shuku@cc.okayama-u.ac.jp) if you are keen to submit a chapter

5. Other businesses

- 304dB database (http://140.112.12.21/issmge/tc304.htm?=6)
    - Expansion of 304dB
        - Six sets of new load test databases (Tang Chong & KK Phoon)

Database/Reference	Limit state	Soil type	N	Pile geometry	
				B (m)	D/B
NUS/ShalFound/950	Bearing	Clay	56	0.3–5	0–5.7
		Sand	427	0.25–7	0–6.1
	Tension	Clay	123	0.31–3.05	0.8–13.2
		Sand	313	0.1–2.5	0.5–14.5
	Punch-through	Sand-over-clay	31	0.8–3	0.5–3
NUS/Spudcan//212	Punch-through	Multi-layer clays with sand	140	3–20	0.16–1.17
		Multi-layer clays with stiff layer	72	3–12	
NUS/DrilledShaft/542	Bearing	Clay	64	0.32–1.52	1.6–56
		Sand	44	0.35–2	5.1–59
		Grave;	41	0.59–1.5	6.2–30
	Tension	Clay	32	0.36–1.8	3.4–55
		Sand	30	0.3–1.31	2.5–43
		Gravel	109	0.43–2.26	1.77–17.3
NUS/DrivenPile/1243	Bearing	Clay	47	0.28–0.41	16–95
		Sand	52	0.28–0.42	22–110
		Mixed	50	0.28–0.42	17–85
	Bearing	Clay	175	0.1–0.81	7.9–200
	Tension		64	0.1–0.81	12–110
	Bearing	Sand	134	0.14–0.76	13–251
	Tension		28	0.25–0.76	19–84
NUS/RockSocket/721	End bearing	Rock	270	0.1–2.5	1–31.3
	Shaft shearing	Rock	544	0.2–3.2	0–19.5
NUS/HelicalPile/1113	Bearing	Clay	270	0.21–1.02	6–74
		Sand	181	0.21–1.02	6–110
	Tension	Clay	165	0.21–0.91	12–48
		Sand	121	0.21–0.91	10–62

- Review of ASTM standards on Geostatistics (Armin)
    - OVERVIEW: Gerald Verbeek, Chair of ASTM Committee D18.01, Committee for Surface and Subsurface Characterization has engaged TC304 to assist with the review of standards related to geostatistics

- The four standards (available on request) to be reviewed include:
  - D5924 – 18: Selection of Simulation Approaches in Geostatistical Site Investigations
  - D5549 – 19: Contents of Geostatistical Site Investigation Report
  - D5922 – 18: Analysis, Interpretation, and Modeling of Spatial Variation in Geostatistical Site Investigations
  - D5923 – 18: Selection of Kriging Methods in Geostatistical Site Investigations
- The main phase of standard review by four review groups has been completed:
  - D5549-19 (Group Leader Mark Jaksa)
  - D5922-18 (Group Leader Yu Wang)
  - D5923-18 (Group Leader Giovanna Vessia)
  - D5924-18 (Group Leader Lulu Zhang)

- TC250/SC7/TG-C3 Reliability-based methods (Timo)
  - guideline document for reliability-based verification of limit states in geotechnical design and assessment
  - to be published as JRC Technical Report (EU Joint Research Centre)
  - task group with 28 members from 14 European countries (TG leader: Timo Schweckendiek)
  - planning milestone: draft report ready by September 2022

- Working group on the application of reliability-based design methods for geotechnical engineering within the German Geotechnical Society (DGGT). (Patrick Arnold)
  - The group started working in May 2022
  - Lead by Kerstin Lesny (member of TC 205) and joined by Iason Papaioannou, Timo Schweckendiek, Axel Möllmann and Patrick Arnold of TC 304. 16 Members in total.
  - Mission: As RBD-methods will become an integral part of the new EC 7, the main aim of the working group is to bridge the gap between the available theoretical methodologies and tools and the engineering practice, as RBD-methods never made it into the geotechnical engineering practice nor the national design guidelines and standards in Germany. The working group will try to raise the awareness of the possibilities and limitations of RBD-methods by compiling new guideline documents, organizing workshops and developing education platforms for both students and practicing engineers.
  - Planned session on statistics and probabilistity in Soil Mechanics during "Fachsektionstage Geotechnik" in September
  - Planning milestone: Progress report Dec 2023

Figure 1: Photograph of on-site meeting attendees

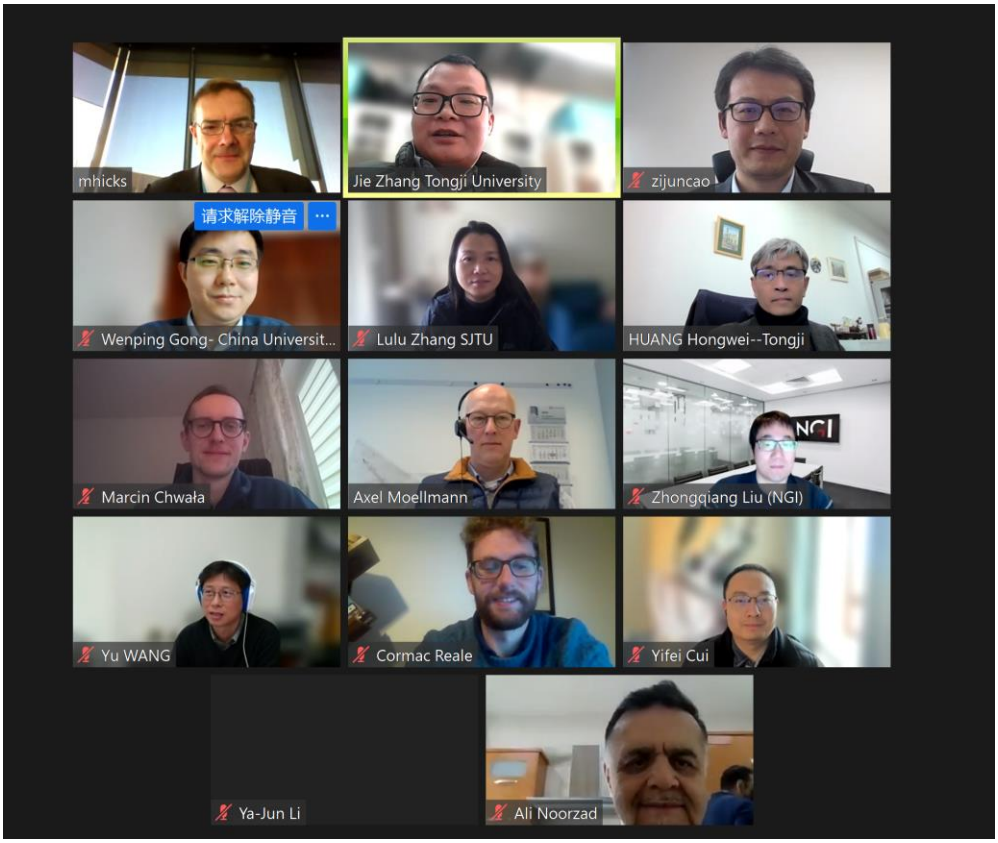

Figure 2: Photograph of online meeting attendees