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Opponent's review of the Doctoral Thesis

Candidate   Jaroslav Pastorek

Title of the doctoral thesis   Experimental evaluation of precipitation estimates from commercial microwave links for rainfall-runoff modelling in a small urban catchment

Study Programme Civil Engineering

Tutor   Ing. Vojtěch Bareš, Ph.D.

Opponent   Dr. Christian Chwala

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Topicality of the doctoral thesis theme
Commentary: This thesis tackles two important challenges. First, it investigates the potential of commercial microwave (CML) link rainfall estimates in urban hydrology, where high resolution rainfall data are required. To my knowledge, this is the first time that real CML data is applied in a long-term urban hydrology study and with different CML processing methods. Second, this thesis identifies wet antenna attenuation (WAA) as a major source of bias, in particular for short CMLs which are common in urban areas. Consequently, an intercomparison of different existing and new WAA methods is carried out, which provides important new insights regarding the choice and transferability of WAA methods. Hence, the main theme of the thesis is very timely and topical.

☒ excellent	☐ above average	☐ average	☐ below average	☐ poor

Fulfilment of the doctoral thesis objectives
Commentary: As far as I can tell, the doctoral thesis topics have been fulfilled completely.

☒ excellent	☐ above average	☐ average	☐ below average	☐ poor

Research methods and procedures
Commentary: The research methods and procedures that are applied in this thesis are well chosen and innovative. The CML processing methods that are employed, present the state of the art, which is then advanced by the introduction and evaluation of a new WAA estimation method. Not being an urban hydrologist, I cannot fully judge the hydrologic part of this thesis. But, as far as I can tell, the usage of a stochastic error model for uncertainty quantification is an innovative aspect. All evaluations are carried out following best scientific practices, using a separation of calibration and validation periods and carefully interpreting different performance metrics.

☒ excellent	☐ above average	☐ average	☐ below average	☐ poor

Results of the doctoral thesis – dissertant's concrete achievements
Commentary: The concrete achievements of this thesis are: 1. It clearly shows, based on a long-term analysis, the potential and the requirements for using CML rainfall estimation in urban hydrology, indicating that adequately processed CML data can outperform data from typical

municipal rain gauge networks. 2. Based on a long-term intercomparison study, it clearly shows the deficits of several existing WAA models and introduces a new improved WAA model.

| ⊠ excellent | ☐ above average | ☐ average | ☐ below average | ☐ poor |

Importance for practice and for development within a branch of science

Commentary: The aforementioned achievements of this thesis have advanced the state of the art in the community of CML rainfall estimation and in the community of urban hydrology.

| ⊠ excellent | ☐ above average | ☐ average | ☐ below average | ☐ poor |

Formal layout of the doctoral thesis and the level of language used

Commentary: The thesis layout is very good. All figures are well done. Many of the figures clearly show that a lot of care has been taken to optimize the layout, the usage of colours and different plotting types. This way a lot if information is condensed into only little space. The structuring of the four publications, on which the main scientific part is based, into one storyline is also very good. My only criticism concerns the writing in chapter 1 and 2. Sentences are sometimes too long and hard to understand. Some paragraphs in chapter 1 and 2 are almost identical. That results in a somehow diminished impression of the writing when starting to read the thesis. Later chapters are much better, though.

| ☐ excellent | ⊠ above average | ☐ average | ☐ below average | ☐ poor |

Statement on compliance with citation ethics

References are used correctly and in an appropriate manner throughout the manuscript.

Remarks

I find it hard to do the grading since I lack the knowledge of what "average" is. Furthermore, it is hard to judge, just based on the thesis, what the own contributions of the PhD candidate were and what was set as workplan or individual steps by the advisor. Since I know the CML-related work of the advisor, my impression is that the PhD candidate brought in his own ideas and advanced the state of the art within the research group of the advisor.

Final assessment of the doctoral thesis

This is a very good thesis which provides considerable scientific advances in the field of CML rainfall estimation and urban hydrology.

Following a successful defence of the doctoral thesis I recommend the granting of the Ph.D. degree

yes ⊠ *no* ☐

Date: 12.06.2022

Opponent's signature:...   .....