Fall School 2015: Introduction to HydroGeoSphere

In the first week of October 2015, ten IRTG PhD-students and seven IRTG-related professors and researchers (of whom are some in the picture) traveled to the University of Waterloo, Canada, to attend the 2015 IRTG Fall School "Coupled Surface and Subsurface Fluid Flow and Solute Transport Modeling with HydroGeoSphere".

Course objectives

The first part of the visit was an introduction to the integrated HydroGeoSphere (HGS) model, which is designed to simulate fluid flow, mass and heat transport in subsurface and surface domains. The second part consisted of individual meetings of each student with their Canadian supervisors. The course content included:

- Governing equations on which HGS is based, e.g.: Richard's equation for porous medium (3D) for subsurface flow or Diffusive wave (2D) for surface flow
- Numerical methods behind HGS: Control volume finite element methods (CVFE)
- Practical examples and results from real-world applications
- Outlining future research collaboration.

Short summary

On Monday, Edward Sudicky started his introduction to HGS by presenting the underlying theoretical concept of the integrated modelling software. Later that day, he continued to give applied examples of how HGS can be used at various scales and for different types of problems, e.g. model of Grand River in southern Ontario or continental scale model of Canada. The second day, Hyoun-Tae Hwang and Young-Jin Park from Aquanty Inc. (the company that develops HGS) outlined the advanced numerical methods in integrated modeling within HGS. On Wednesday, the CEO of Aquanty Inc., Steven Berg, demonstrated the use of HGS by showing how to use the command files with the programming language ('grok') of HGS, as well as options for setting up model meshes and visualizing results. Thursday was reserved for all IRTG students to present their work to the group and the Canadian supervisors. Further, the Canadian researchers Dave Rudolph, Nadita Basu and Fereidoun Rezanezhad gave presentations about their working groups and current research. On Friday, the students had the opportunity to meet with their individual supervisors. In these meetings ideas concerning the future research collaboration were discussed.

Besides the presentations and meetings there was also time during the week for all the participants to explore the university and city of Waterloo, Toronto and the Niagara Falls.

The short course gave a great overview of HydroGeoSphere's capabilities. The theory behind numerical implementation, application examples and future developments were presented in a very comprehensive and comprehensible way. The individual meetings were all successful and helped the students and their Canadian supervisors to outline their future work and research stays.