

Report on the 11th International German Summer School on Hydrology 06– 20 September 2017, Bochum

11th "International German Summer School on Hydrology (IGSH 2017) – Groundwater and Energy"

The eleventh "International German Summer School on Hydrology (IGSH)" was held at Ruhr-Universität Bochum (RUB) from 06th to 20th September 2017 with this year's focus on "Groundwater and Energy". The aim of IGSH is to enhance the knowledge and technical capabilities of early career professionals and academics on hydrology-related environmental issues.

The International German Summer School on Hydrology focuses on training international junior scientists and early professionals from the fields of water and the environment, engineering sciences, as well as from geography, hydrology, chemistry, etc. IGSH provides a program of hydrological training courses which vary each year. In 2017, 18 participants from 12 different countries were selected out of over 200 applicants (list of participants annexed). Most participants were from Africa, Asia and South America. The number of applicants is increasing year after year and participants are selected on a competitive basis. The selection criteria include: the quality of a statement of motivation, relevance of the course to the applicant's present career or research activities, and qualification of the applicants. Also age and gender aspects are taken into account.

Since its inception in 2007, the International German Summer School on Hydrology is held annually with the support of UNESCO. Starting in 2015, IGSH has additionally been sponsored by the German Academic Exchange Service (DAAD) as serial summer school on sustainable water management. The newly implemented DAAD full scholarships have increased the attractiveness of the Summer School course resulting in record numbers of applications.

The lecturers of the International German Summer School on Hydrology are from the Department of Applied Geology of Ruhr-Universität Bochum, invited high-level professionals from the private sector in Germany and international and national partner universities. The lectures included theoretical as well as practical lessons with field excursions. The field excursions and locations differ from year to year depending on the type of the respective course. It also was supplemented by cultural trips and social events.

The courses of the IGSH 2017 covered the following topics:

- Hydrogeology and groundwater monitoring
- Development of the Ruhr Area (environment, economy, demography)
- Geothermal energy
- Subsurface energy storage
- Applications of isotopes in hydrogeology
- GIS applications in hydrogeology
- Hydrogeochemical modelling
- Groundwater and Agriculture (costs and energy)
- Mining and acid mine drainage
- Energy and climate change

The following lecturers were involved this year: Prof. Dr. Stefan Wohnlich, Dr. Andreas Englert, Dr. Andre Banning, Dr. Andrea Niedermayr, Dr. Marion Stemke, Thorsten Gökpinar, Sascha Frank (Ruhr-Universität Bochum, Hydrogeology); Prof. Dr. Harald Zepp (Ruhr-Universität Bochum, Applied Physical Geography); Prof. Dr. Michael Alber (Ruhr-Universität Bochum, Engineering Geology); Prof. Dr. Steffen Bender (Climate Service Center, Hamburg), Prof. Dr. Frank Eulenstein (Leibniz – Centre for Agricultural Landscape Research, Müncheberg); Prof. Dr. Christian Wolkersdorfer (Tshwane University of Technology, South Africa), Dr. Ali Mahdavi Mazdeh (Iman Khomeini International University Qazvin, Iran).

During the course, the participants also worked in small groups on questions relevant to their own projects with the help of the methods learned during IGSH. At the end of the course, the participants were given the opportunity to evaluate and comment on the different aspects of the Summer School course (such as their expectations from the course, scientific competence of the lecturers and the organization of the course). We consider a suchlike quality control very

important for successive optimization of the IGSH goals. Those who wanted to gain 4 Credit Points to use in their study and doctoral programs were tested by means of a successful written final examination. Finally, participants were awarded with a certificate by Prof. Dr. Stefan Wohnlich and Dr. Andre Banning.

The course was held in a very friendly, cooperative and productive atmosphere, which allowed the participants to establish close contact to each other and to the lecturers as well. This opened opportunities for future collaboration to establish scientific cooperation and social networks, and to extend the IGSH scientific community. Generally, the Summer School course provided knowledge transfer and exchange on hydro(geo)logical processes relevant in energy production and management.

The IGSH organizers would like to thank the DAAD and the German IHP/HWRP National Committee of UNESCO for the financial and ideal support of IGSH. The next IGSH "Groundwater and Urbanization" will take place in September 2018.

Lecturers, field-work directors and field assistants:

Prof. Dr. Stefan Wohnlich

Ruhr University Bochum, Applied Geology, Hydrogeologist

Prof. Dr. Harald Zepp

Ruhr University Bochum, Applied Physical Geography, Geographer

Prof. Dr. Frank Eulenstein

Leibniz Centre for Agricultural Landscape Research, Müncheberg, Agricultural Engineer

Prof. Dr. Michael Alber

Ruhr University Bochum, Applied Geology, Engineering Geologist

Prof. Dr. Christian Wolkersdorfer

Tshwane University of Technology, South Africa, Hydrogeochemist

Dr. Andreas Englert

Ruhr University Bochum, Applied Geology, Hydrogeologist

Prof. Dr. Steffen Bender

Climate Service Center, Natural Resources Department, Science officer, Hamburg

Dr. Andre Banning

Ruhr University Bochum, Applied Geology, Hydrogeochemist

Dr. Ali Mahdavi Mazdeh

Imam Khomeini International University, Qazvin, Iran, Hydrogeologist

Dr. Andrea Niedermayr

Ruhr University Bochum, Applied Geology, Geochemist

Dr. Marion Stemke

Ruhr University Bochum, Applied Geology, Hydrogeologist

M.Sc. Sascha Frank

Ruhr University Bochum, Applied Geology, Hydrogeologist

Thorsten Gökpinar

Ruhr University Bochum, Applied Geology, Laboratory and Field Technician

Annexes:

1. Course Program
2. Statistics of Participants

Annex-1: IGSB 2017 Course Program - Groundwater and Energy: September 06 – 20, 2017

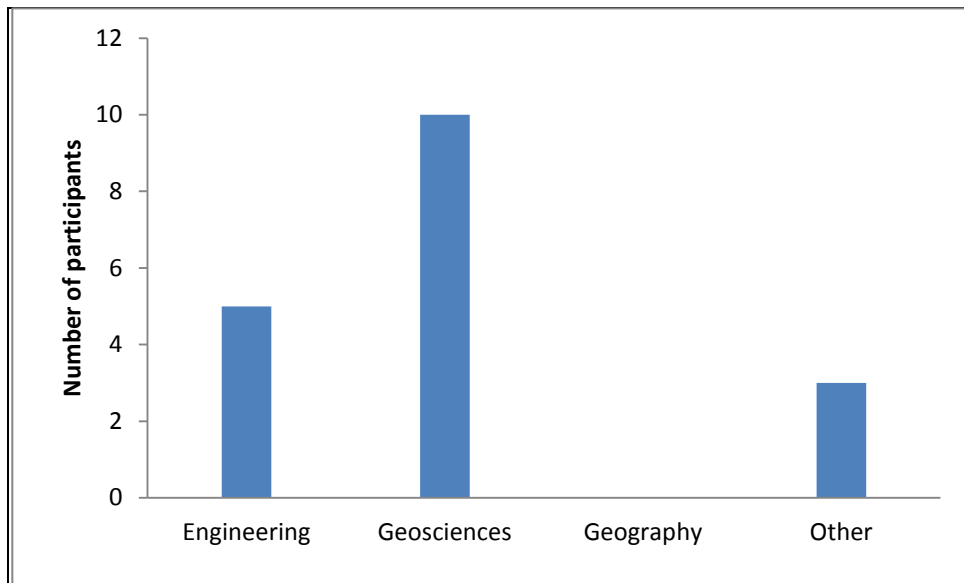
Week -1

Date	Time	Activities	Speakers/Lead
Wednesday, 06-09-2017		Arrival of Participants	
	17:00	Campus Tour and Welcome Dinner (meeting place: NA building, main entrance)	Dr. Andre Banning, Applied Geology, RUB
Thursday, 07-09-2017	08:30 – 09:30	Welcome lecture (room NABF 04/492): Brief introduction to the course, organizational affairs and the Ruhr Area	Dr. Andre Banning, Applied Geology, RUB
	09:30 – 10:15	Welcome lecture (room NABF 04/492): The multiple transformations of the urban landscape Ruhr - Introducing its physical environment, economy and demography	Prof. Dr. Harald Zepp, Applied Physical Geography, RUB Dean of the Faculty of Geosciences
	10:30 – 12:00	Workshop (room NABF 04/492): Introduction of participants and short presentations by participants	All participants and lecturers
	13:15 - 16:45	Workshop (room NABF 04/492): Introduction of participants and short presentations by participants	All participants and lecturers
	17:00	City tour: Visit to the city of Bochum (meeting place: NA building, main entrance)	Ilka Hinzer, Johannes Brzeszniak, Applied Geology, RUB
Friday, 08-09-2017	08:30 – 12:00	Lecture/Exercise (room NABF 04/492): Basics of Hydrogeology and Monitoring I	Dr. Andreas Englert, Applied Geology, RUB; Hydrogeology, University of Cologne
	13:15 – 14:45	Lecture/Exercise (room NABF 04/492): Basics of Hydrogeology and Monitoring II	Dr. Andreas Englert, Applied Geology, RUB; Hydrogeology, University of Cologne
	15:00	Workshop (room NABF 04/492): Group forming and project discussion	All participants and group leaders
Saturday, 09-09-2017	09:00 – 13:00	Field trip: Mining heritage in the Ruhr Area: Zeche Zollverein	Guided tour in former mine; Applied Geology, RUB
	Afternoon/ Evening	Free	
Sunday, 10-09-2017		Free day	
Monday, 11-09-2017	08:30 – 12:00	Lecture/Exercise (room NABF 04/492): Introduction to Hydrogeochemical Modelling in mining environments	Dr. Andre Banning, Applied Geology, RUB
	13:15 – 16:30	Lecture/Exercise (room NABF 04/492): Geothermal energy I: exploration and production in shallow/low enthalpy geothermal systems	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
	17:00	Barbecue around Lake Kemnade, Bochum	All participants and lecturers
Tuesday, 12-09-2017	08:30 – 11:00	Lecture/Exercise (room NABF 04/492): Regional Geology	Prof. Dr. Michael Alber Applied Geology, RUB
	11:00- 12:00	Lecture/Exercise (room NABF 04/492): GIS applications	Sascha Frank Applied Geology, RUB
	13:15 – 16:30	Lecture/Exercise (room NABF 04/492): Hydropower and pumped storage plants	Dr. Marion Stemke, Applied Geology, RUB

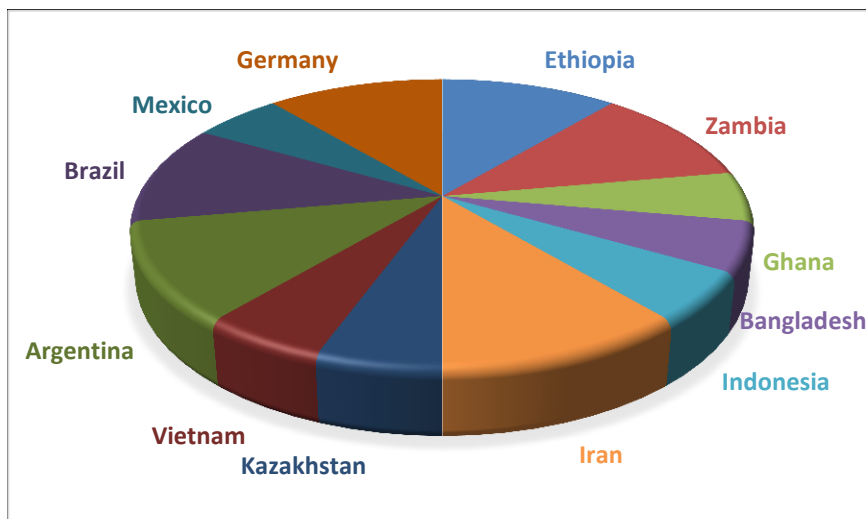
Week - 2			
Date	Time	Description	Speakers/Lead
Wednesday, 13-09-2017	08:30 – 12:00	Lecture/Exercise (room NABF 04/492): Nuclear power, isotopes and groundwater	Dr. Andrea Niedermayr, Applied Geology, RUB
	13:15 – 16:45	Lecture/Exercise (room NABF 04/492): Energy costs and ground water use in agriculture	Dr. Ali Mahdavi Mazdeh, Imam Khomeini International University, Qazvin, Iran
	17:00	Workshop (room NABF 04/492): Discussions in working groups and evaluation of first results	All participants and group leaders
Thursday, 14-09-2017	08:30 – 12:00	Field exercises: Groundwater monitoring and sampling techniques Lake Kemnade well field, Bochum	Dr. A. Niedermayr, T. Gökpınar Applied Geology, RUB
	13:15 – 17:00	Institute and lab visit: International Geothermal Centre (GZB), Bochum (meeting place: NA building, main entrance)	International Geothermal Centre Applied Geology, RUB
Friday, 15-09-2017	08:30 – 12:00	Lecture/Exercise (room NABF 04/492): Energy plants, biogas and groundwater quality	Prof. Dr. Frank Eulenstein, Leibniz-Zentrum für Agrarlandschafts- forschung, Müncheberg
	13:15 – 16:45	Lecture/Exercise (room NABF 04/492): The energy sector under climate change	Prof. Dr. Steffen Bender, Climate Service Center Germany, Hamburg
Saturday, 16-09-2017		Free day	
Sunday, 17-09-2017	10:00 – 14:00	Cultural field trip (together with an international group from Essen University): History and art in the city of Münster	Petra Dückershoff, Applied Geology, RUB
	Afternoon/ Evening	Free	
Monday, 18-09-2017	08:30 – 12:00	Lecture/Exercise (room NABF 04/492): Mining and acid mine drainage – a global challenge	Prof. Dr. Christian Wolkersdorfer, Tshwane University of Technology, South Africa
	13:15 – 15:45	Lecture/Exercise (room NABF 04/492): Geothermal energy II: exploration and production in deep/high enthalpy geothermal systems	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
	16:00	Workshop (room NABF 04/492): Discussion in working groups: open questions and presentation of concepts	All participants and group leaders
Tuesday, 19-09-2017	08:30 – 12:30	Written examination (8.30-9.30); Participants present their group project (10-12), final discussion, course evaluation by participants (room NABF 04/492)	All participants and lecturers
	13:00 – 15:00	Award of certificates, Departure ceremony (room NABF 04/492), Farewell lunch	
Wednesday, 20-09-2017		Departure of participants	

Annex-2: Statistics of Participants

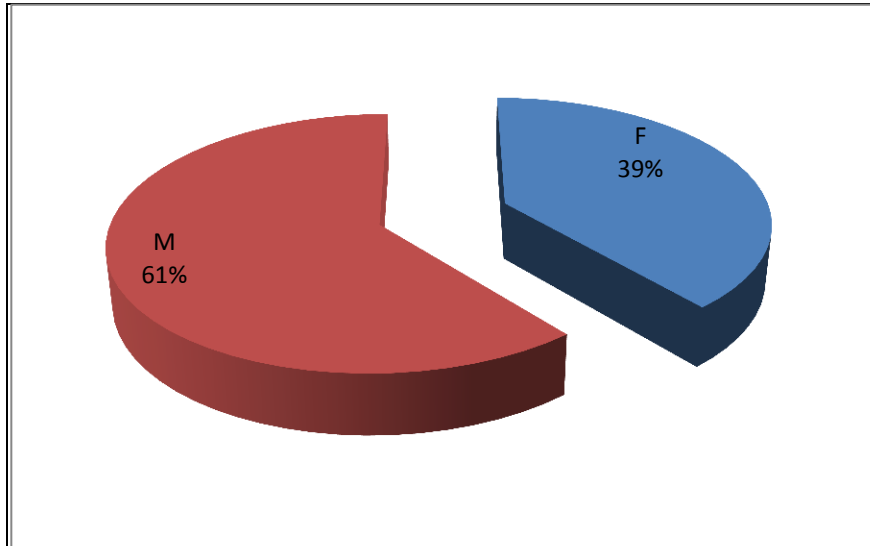
Professional background



Country



Gender Distribution



Selection of participants

Priority applications

- 1 – Self sponsored applicants (with relevance of academic background to the course to be given, and submission of complete application documents)
 - 2 – Course scholarship applicants (with a relevant background and complete application document)
 - 3 – Partial scholarship applicants with relevant background, motivation letter, experience
 - 4 – Full scholarship applicants with very relevant background and experience, very strong motivation letter, mainly from Sub-Saharan Africa, South America and Asian countries
- One from each country (no two applicants from the same country is given a full scholarship unless special cases are considered)

Excluded applications

- 1 - Professors and Doctors with over 12 years experience
- 2 - Applicants with over 20 years of experience
- 3 - Applicants older than 50 and younger than 23
- 4 - Applicants with BSc and very limited experience
- 5 - Applicants with farthest academic and industry background from the course
- 6 - Applicants who participated in the same course in the previous years organized by IGSH
- 7 - Applicants who participated three or more times in the past may not be given a chance to take part in this course
- 8 - Applicants who failed to submit their CV and addresses of their referees (incomplete application)
- 9 - No two persons from the same country are allowed to take part in the course unless special conditions govern the situation

10 - Full scholarships for applicants from Europe, USA, Canada, Australia etc. should not be given unless special conditions govern the situation

11 - Applicants who failed to meet the application deadline (applications may be considered based on the type of scholarship they are applying for and their academic background)