



1st International LIFE REWAT Summer School

Digital water management and water-related agroecosystem services: geostatistics, hydroinformatics and groundwater flow numerical modelling



September 3rd—14th, 2018
Scuola Superiore Sant'Anna
Pisa, Italy

Programme of the Summer School - draft v.2

Module I

Innovation in water resource management: water-related agroecosystem services and nature based solutions

InnoWaM

Module II

Data management, spatial data analysis and geostatistics

HydroData

Module III

Hydroinformatics: introducing programming to water resource management

HydroInf

Module IV

Numerical modelling of groundwater flow in aquifers

GWMod



International workshop
Digital water and nature based solutions: innovative tools for sustainable water management

10th September
Scuola Superiore Sant'Anna



Field trip to LIFE
REWAT innovative demonstrators

11th September
Val di Cornia (Tuscany)

Day 1 - Monday, September 3rd

09:00—11:00	Welcome and course introduction. The LIFE REWAT project <i>Rudy Rossetto - Scuola Superiore Sant'Anna</i>
11:00—13:00	Nature Based Solution for Water and Sanitation: main typologies and applications <i>Fabio Masi - IRIDRA S.r.l.</i>
13:00—14:00	Lunch break
14:00—16:00	Green Infrastructures for Sustainable Urban Drainage <i>Fabio Masi - IRIDRA S.r.l.</i>
16:00—18:00	Data needs for effective coastal aquifer management - monitoring issues <i>Rudy Rossetto - Scuola Superiore Sant'Anna</i>

Day 2 - Tuesday, September 4th

09:00—11:00	Principles, advancements and standards in hydrogeological and environmental data management <i>Ezio Crestaz - Joint Research Centre/EC</i>
11:00—13:00	Design and Python development of simple tools to manage data workflow, from data cleaning to data uploading to spatio-temporal database <i>Ezio Crestaz - Joint Research Centre/EC</i>
13:00—14:00	Lunch break
14:00—16:00	The good and bad of agriculture: pharmaceutical removal from wastewaters and N losses through leaching <i>Laura Ercoli - Scuola Superiore Sant'Anna</i>
16:00—18:00	Managed Aquifer Recharge as a solution to drought and water scarcity <i>Rudy Rossetto - Scuola Superiore Sant'Anna</i>



Day 3 - Wednesday, September 5th

09:00—11:00	Statistics and geostatistics with R <i>Enrico Guastaldi - GeoExplorer Impresa Sociale S.r.l.</i>
11:00—13:00	Geostatistical Analysis of Spatial Data <i>Enrico Guastaldi - GeoExplorer Impresa Sociale S.r.l.</i>
13:00—14:00	Lunch break
14:00—16:00	Phytoremediation of inorganic and organic xenobiotics <i>Luca Sebastiani - Scuola Superiore Sant'Anna</i>
16:00—18:00	The FREEWAT platform for simulation of groundwater flow and solute transport in aquifers <i>Rudy Rossetto - Scuola Superiore Sant'Anna</i>

Day 4 - Thursday, September 6th

09:00—11:00	Multivariate Geostatistical Models <i>Enrico Guastaldi - GeoExplorer Impresa Sociale S.r.l.</i>
11:00—13:00	Developing hydrological modelling tools in QGIS <i>Iacopo Borsi - TEA SISTEMI S.p.A.</i>
13:00—14:00	Lunch break
14:00—16:00	Programming Tutorial Part 1: implementing the model example in Python language, and verification of its consistency <i>Iacopo Borsi - TEA SISTEMI S.p.A.</i>
16:00—18:00	Programming Tutorial Part 2: building a GUI to run the model directly in QGIS, using spatial data as input and output <i>Iacopo Borsi - TEA SISTEMI S.p.A.</i>





Day 5 - Friday, September 7th

09:00—11:00 Application of groundwater flow and solute transport models: implementing a real model part 1

Rudy Rossetto - Scuola Superiore Sant'Anna

11:00—13:00 Introduction to Open Science principles and JupyterLab, from open data to reproducible research

Massimiliano Cannata - Scuola universitaria professionale della Svizzera Italiana

14:00—16:00 Lunch break

13:00—14:00 Design and implementation of Python procedures for data quality assessment of time-series from in-situ sensors

Massimiliano Cannata - Scuola universitaria professionale della Svizzera Italiana

16:00—18:00 Production of graphical representations and reporting of time-series data with publication as Open Data

Massimiliano Cannata - Scuola universitaria professionale della Svizzera Italiana

Day 6 - Monday, September 10th

International workshop - *Digital water and nature based solutions: innovative tools for sustainable water management*

Aula Magna, Scuola Superiore Sant'Anna, h. 9:00 - 16:00

Dedicated programme on a separate sheet

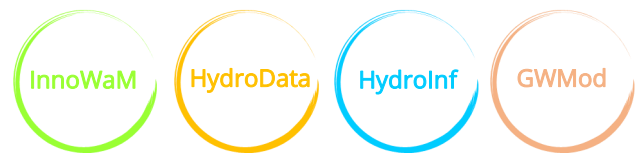
Day 7 - Tuesday, September 11th

Field trip to LIFE REWAT innovative demonstrators

Val di Cornia (Tuscany), whole day

Dedicated programme on a separate sheet





Day 8 - Wednesday, September 12th

09:00—11:00	Application of groundwater flow and solute transport models: implementing a real model part 2 <i>Rudy Rossetto - Scuola Superiore Sant'Anna</i>
11:00—13:00	Overview of MODFLOW-OWHM <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>
13:00—14:00	Lunch break
14:00—16:00	Theory and Features of the Farm Process (FMP) <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>
16:00—18:00	Introduction into FMP class exercises <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>

Day 9 - Thursday, September 13th

09:00—11:00	Build an FMP example model (definition of farms, crops, wells, climate) <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>
11:00—13:00	Build an FMP example model (definition of features changing through time, efficiencies, sw deliveries as non-routed deliveries) <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>
13:00—14:00	Lunch break
14:00—16:00	Advancements to the FMP example model (build and add in SFR, add diversion and semi-routed deliveries, change FMP-wells to MNW wells) <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>
16:00—18:00	Advancements to the FMP example model (add a MAR storage pond and recovery well field, add in unsaturated zone flow, add subsidence) <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>

09:00—11:00	Examples & Applications and other new OWHM features <i>Wolfgang Schmid - Commonwealth Scientific and Industrial Research Organisation</i>
11:00—13:00	Modelling seawater intrusion in coastal aquifers: physics and approaches <i>Giovanna De Filippis - Scuola Superiore Sant'Anna</i>
13:00—14:00	Lunch break
14:00—16:00	Exercise: seawater intrusion in the Cornia plain coastal aquifer <i>Giovanna De Filippis - Scuola Superiore Sant'Anna</i>
16:00—18:00	Course wrap up - final test <i>Rudy Rossetto - Scuola Superiore Sant'Anna</i>



SUMMER SCHOOL INSTRUCTORS

Module I

Innovation in water resource management: water-related agroecosystem services and nature based solutions

InnoWaM

Rudy Rossetto is Researcher at Scuola Superiore Sant'Anna and the Summer School Coordinator. Rudy deals with surface and subsurface hydrology and he holds a MSc in Earth Science from Uni. of Pisa (IT), a MSc in Geoenvironmental Engineering from Cardiff Uni. (UK), and a PhD in Engineering Geology from Uni. of Siena (IT). Main research fields are development and application of GIS integrated groundwater and solute transport numerical models to water management issues (special focus on the Mediterranean environment) and the analysis of functionalities of blue infrastructures (phyto-treatment plants and Managed Aquifer Recharge schemes) for the provision of water related agro-ecosystem services. Rudy coordinated the recently funded EU HORIZON 2020 FREEWAT project (FREE and open source software tools for WATER resource management www.freewat.eu) and WP8 leader in EU FP7 MARSOL (Managed Aquifer Recharge as a solution to drought and water scarcity www.marsol.eu) Sant'Alessio induced riverbank filtration case study. Coordinator of the Italian - Israeli bilater project PHARM-SWAP MED (removal of PHARMaceuticals from the Soil-WATER-Plant continuum in MEDiterranean Environment) and technical coordinator of the EU LIFE REWAT project (www.life-rewat.eu). Since 2012 he is Co-Editor in Chief of Acque Sotterranee-Italian Journal of Groundwater (<http://www.acquesotterranee.online/index.php/acque>). More info at https://www.researchgate.net/profile/Rudy_Rossetto



Fabio Masi is R&D Manager and Technical Director of the Italian engineering company IRIDRA Srl, since 1998 and Vice-President of Global Wetland Technology (companies association) since 2012. His background is a PhD in Environmental Sciences and a MSc in Environmental Chemistry. He's the former Chair of the IWA SG on Wetland Systems for Water Pollution Control. He is the project co-author for over 450 Designs of Constructed Wetlands worldwide and author of more than 90 scientific papers. He has been consulting for Sustainable Water Management projects in Europe, Asia, Africa and South America. He is involved in EC funded projects in the FP5, FP7, MEDA, ENPI-CBCMED, Horizon202, Interreg and Life+ programs.



Laura Ercoli is employed as Associate Professor of Agronomy and Field Crops and is Coordinator of the PhD Course in AgroBioSciences at the Scuola Superiore Sant'Anna, Pisa, Italy (<http://www.santannapisa.it/it/laura-ercoli>). During her career she carried out research focusing on the study of relationships between land use, cultural practices, climate, soil, and crop yield and quality, integrating knowledge from biology, chemistry, soil science, ecology and genetics. She has also studied the role of soil for the disposal of industrial, urban and agro-food industry wastes by focusing on heavy metals as well as, more recently, on emerging pollutants. In the latest years, she has broadened her interests on innovative practices of use of microorganisms in agriculture and on communication between plant and microorganisms. She has authored 175 national and international scientific papers, book chapters and editorships.



Luca Sebastiani is the Director of the Institute of Life Sciences at Scuola Superiore Sant'Anna Pisa. He is a professor in Arboriculture and Forest Systems and has published over 130 journal articles, reports, book chapters, and a books. He is studying since 30 years the physiology of plant under abiotic stresses such as drought, salinity, inorganic and organic xenobiotics. He serve as Associate Editor in Agricultural Water Management, and is also active in the Editorial Board of Plant Growth Regulation and South African Journal of Botany.



Ezio Crestaz is a geologist, holding also MSc in GIScience and Computer Science awarded by Manchester and Hertfordshire Universities, UK. He has been working as geophysicist, groundwater modeler and geospatial analyst at various ENI companies, since 1986. Operating in the geothermal, mining, water management, environmental protection and remediation fields, he contributed to both local and regional scale corporate and internationally funded (OLADE, UNDP, EC, World Bank) projects, in Italy and abroad. Following a one year Post-Doc position, he is currently working as Contract Agent at the JRC (Joint Research Centre) of the European Commission, mainly focusing on WEFE (Water-Energy-Agriculture-Ecosystems) nexus assessment in sub-saharian Africa (ACEWATER2 project). He has been contract professor in groundwater hydrology (Camerino Un., 2006-2007) and GIS (Urbino Un., 2016), and guest lecturer in GISc (Birkbeck College/UCL, London, 2010-2013). He (co)authored various scientific contributions in groundwater hydrology, spatial analysis, spatial databases and geospatial applications design and development.



Enrico Guastaldi is currently Project Manager at GeoExplorer Impresa Sociale Srl, an innovative start-up of CGT - Center for GeoTechnologies of University of Siena in San Giovanni Valdarno, Italy, and head the Geophysics and Hydrogeology sector at CGT. He received the PhD in Earth Sciences at University of Siena after his Master of Sciences in Mineral Resources and Environmental Geostatistics at the school of Process, Environmental and Materials Engineering, Department of Mining Engineering, University of Leeds (England), after his master degree in engineering geology at the university of Siena (Italy). He's working in several environmental project all around the world at both local and regional scale, funded by private and public bodies, concerning spatial data analysis, geostatistics, hydrogeology, geophysics, geology, that constitute his main fields of interest. Enrico has almost 20 years of experience of applied projects in Europe and Africa and Caribbean where he conducts various activity, such as fieldwork, data analysis and training and capacity building.



Iacopo Borsi is an applied mathematician with more than 16 years of experience on modeling industrial and environmental processes, with emphasis on physical modelling. Specific skill in flow in porous media description, single and multi-phase, with particular interest in hydrological/hydrogeological processes (groundwater flow and solute transport). Expertise in software tools, GIS modeling and programming languages. Teaching experience at national and international level. Author of one monograph and more than twenty-five papers in international journals. Reviewer for international journals on applied and industrial mathematics, environmental and chemical engineering. Since 2012, Co-editor in chief of Acque Sotteranee-Italian Journal of Groundwater. Since 2013, Member of Managing Board of SIMAI (Italian Society for Applied and Industrial Mathematics). Member of IAH and IAMGS (International Association for Mathematical Geosciences). Iacopo is currently employed as Senior Environmental Modeler at TEA Sistemi SpA, an Italian private company delivering research and consultancy services in energy and environment sector.



Massimiliano Cannata is professor in Geomatics at the University of Applied Sciences and Arts of Southern Switzerland (SUPSI) and head the division of geomatics within the Institute of Earth Sciences (IST-SUPSI). He received the PhD in Geodesy and Geomatics after his master degree in environmental engineering at the Politecnico di Milano. He's currently active in the Open Source community (OSGeo Charter Member, FREEWAT PSC, ZOO-project PSC, istSOS PSC) and his interests are mainly related to (i) monitoring systems and data managements; (ii) GIS embedded environmental modeling; (iii) geospatial Web services development; (iv) natural hazards assessment. Massimiliano has over 15 years of experience of projects in Europe, Asia and Caribbean where he conduct both applied research projects, mainly funded by Swiss National Science Foundation or European research programmes, and consultancy, mostly funded by Swiss Administration or World Bank.



Numerical modelling of groundwater flow in aquifers

Wolfgang Schmid is a Senior Research Scientist at the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO). During his time at CSIRO, Dr Schmid has worked on (a) Sustainable water management in Western Australia, (b) Integrated basin modelling projects in South Asia, (c) Bioregional Assessments of the impacts of Coal Seam Gas and coal mining development on water resources, (d) Direct, indirect and cumulative impacts of coal seam dewatering and related land subsidence, and (e) Groundwater pathway analysis to assess impact of fracking chemicals. Prior to joining CSIRO in 2012, Dr Schmid worked as Assistant Research Professor and Research Hydrologist at the University of Arizona mainly on computational solutions of water resources management in arid and semi-arid areas. He and Randy Hanson from the USGS are the original authors of 'The Farm Process' for MODFLOW now integrated by the USGS California Water Science Center into MODFLOW-OWHM (<http://water.usgs.gov/ogw/modflow-owhm>). Before that, Dr Schmid worked as Hydrogeologist in consultancies in Germany and the United Arab Emirates for the German companies GTZ (German Technical Cooperation) and Dornier-Consulting (subsidiary of EADS Germany) with emphasis on groundwater exploration, groundwater modelling, and contaminant hydrogeology.



Giovanna De Filippis is post-doctoral researcher at Institute of Life Science at Scuola Superiore Sant'Anna (Pisa, Italy). She holds an MSc degree in physics and a PhD in Earth Sciences from. Since 2012, she has been dealing with numerical modelling applied to groundwater flow and related processes (e.g., solute transport, conjunctive use of ground- and surface-water, crop growth modelling, density-dependent flow, sensitivity analysis and model calibration). She holds digital skills related to the application of ICT software tools for water resource management (GIS and programming languages). Since 2016, she has been collaborating to relevant EU-funded projects (e.g., FP7 MARSOL, H2020 FREEWAT, LIFE REWAT). Teaching experience at national and international level. Co-author of about ten indexed and peer-reviewed scientific papers and about forty national and international conference papers. Member of the IAH Association and co-chair of the ECHN-Italy group since 2017. National Representative for the YHS group. Associate Editor of *Acque Sotterranee-Italian Journal of Groundwater*.



CREDITS

LIFE REWAT project partners



LIFE REWAT project co-financers

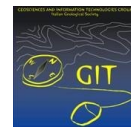


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This event is organised within the framework of the EU LIFE REWAT project. The REWAT project has received funding from the European Union's Life Programme LIFE 14 ENV/IT/001290.

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