

**Sustainable Water Management  
Doctoral Programme (Water4All)**



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<b>Title of the PhD Project</b>	Long-term Earth System Modeling for sustainable water management
<b>Acronym</b>	ESMSWM
<b>Research Fields of the Project</b>	Atmospheric science, hydrometeorology, hydrology
<b>Keywords</b>	WRF, WRF-Hydro, seasonal forecast, Earth system modeling
<b>Host Institution, Department and Campus Location</b>	Middle East Technical University, Civil Engineering Department, Ankara
<b>PhD Awarding Institution and Graduate Programme</b>	Middle East Technical University, Engineering Faculty/Graduate School of Applied and Natural Sciences
<b>Name and Affiliation of Main Supervisor</b>	Prof. Dr. İsmail Yücel, Civil Engineering Department, Middle East Technical University
<b>Name and Affiliation of Co-Supervisors</b>	Prof. Dr. Orhan Gündüz, Environmental Engineering, Izmir Institute of Technology Prof. Dr. M. Tuğrul Yılmaz, Civil Engineering Department, Middle East Technical University
<b>Research Environment and Infrastructure</b>	PhD candidate will have access to the research infrastructure available at Middle East Technical University and Water Resources Laboratory. When a specific high computing system is needed, other national high computing system (e.g. Ulakbim) will also be contacted.
<b>Scientific Context of the Project</b>	Dams and reservoirs play a crucial role in regulating the flow of streams and storing water to meet demand. They have significant impacts on the hydrologic cycle at both regional and global levels by redistributing water resources in both space and time. It is essential to accurately represent these processes for predicting hydrologic

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	<p>patterns, modeling the Earth's system, and evaluating the effects of seasonal change based on changing on water resources.</p> <p>The plan is to develop a water management model that incorporates seasonal forecasts for a basin containing a reservoir used for various purposes. This model will be linked with a physically-based, distributed hydrological/hydraulic model and a reservoir operating model that allows for flexible operating rules.</p>
<b>Brief Workplan</b>	<p>Detailed and up to date literature review in the use seasonal forecasts, reservoir operating models and their integration within Earth System Model.</p> <p>Evaluation of seasonal forecasts (up to 8 months) for hydro meteorological variables (precipitation, temperature) issued by ECMWF.</p> <p>Incorporating seasonal forecasts to WRF-Hydro model to forecast streamflow entering a reservoir system.</p> <p>Investigate reservoir operational model and its implementation with WRF-Hydro.</p> <p>Under different demand scenarios based on seasonal forecast develop a water management model.</p>
<b>Innovative Aspects of the Project</b>	<p>Utilizing a combination of seasonal forecasts for up to 8 months and a fully integrated, physically-based hydrological/hydraulic model can improve the efficiency of water management in a reservoir system.</p>
<b>Training Opportunities of the Project</b>	<p>The project offers the chance for training in incorporating seasonal forecasts into the use of reservoir operations at significant operational research centers.</p>
<b>Interdisciplinary Aspects</b>	<p>This research will gain benefit from interdisciplinary work of atmospheric science, reservoir operation, and water management.</p>
<b>Intersectoral Mobility</b>	<p>TBD</p>

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<b>Intersectoral Mobility</b>  <input type="checkbox"/> Short Visit  <input type="checkbox"/> Secondment	TBD
<b>International Academic Secondment</b>	TBD

<b>Main Supervisor</b>										
<b>Brief CV</b>	<p><b>Prof. Dr. İsmail YÜCEL</b></p> <p>E-mail: <a href="mailto:iyucel@metu.edu.tr">iyucel@metu.edu.tr</a></p> <p><b>Academic Degrees</b></p> <table><tr><td>Ph.D.</td><td>Hydrology, The University of Arizona, USA</td><td>2001</td></tr><tr><td>M.Sc.</td><td>Hydrology, The University of Arizona, USA</td><td>1996</td></tr><tr><td>B.Sc.</td><td>Meteorological Engineering, İstanbul Technical University, Türkiye</td><td>1993</td></tr></table> <p><b>Professional Networks</b></p> <p>Google Scholar: <a href="https://scholar.google.com/citations?user=RGHnI3YAAAAJ">https://scholar.google.com/citations?user=RGHnI3YAAAAJ</a></p> <p>ResearchGate: <a href="https://www.researchgate.net/profile/Ismail-Yucel-2">https://www.researchgate.net/profile/Ismail-Yucel-2</a></p> <p>Scopus: <a href="https://www.scopus.com/authid/detail.uri?authorId=57204345432">https://www.scopus.com/authid/detail.uri?authorId=57204345432</a></p> <p>ORCID:</p>	Ph.D.	Hydrology, The University of Arizona, USA	2001	M.Sc.	Hydrology, The University of Arizona, USA	1996	B.Sc.	Meteorological Engineering, İstanbul Technical University, Türkiye	1993
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<b>Brief CV</b>	<p><b>Prof. Dr. Orhan GÜNDÜZ</b></p> <p>E-mail: <a href="mailto:orhangunduz@iyte.edu.tr">orhangunduz@iyte.edu.tr</a></p> <p><b>Academic Degrees</b></p> <table><tr><td>Ph.D.</td><td>Environmental Engineering, Georgia Institute of Technology, USA</td><td>2004</td></tr><tr><td>M.Sc.</td><td>Civil Engineering, Georgia Institute of Technology, USA</td><td>2000</td></tr><tr><td>M.Sc.</td><td>Environmental Engineering, Middle East Technical University, Türkiye</td><td>1997</td></tr><tr><td>B.Sc.</td><td>Environmental Engineering, Middle East Technical University, Türkiye</td><td>1994</td></tr></table> <p><b>Professional Networks</b></p> <p>Google Scholar: <a href="https://scholar.google.com/citations?user=zmlGAlsAAAAJ&amp;hl=en">https://scholar.google.com/citations?user=zmlGAlsAAAAJ&amp;hl=en</a></p> <p>ResearchGate: <a href="https://www.researchgate.net/profile/Orhan-Gunduz">https://www.researchgate.net/profile/Orhan-Gunduz</a></p> <p>Scopus: <a href="https://www.scopus.com/authid/detail.uri?authorId=9743239900">https://www.scopus.com/authid/detail.uri?authorId=9743239900</a></p> <p>ORCID: <a href="https://orcid.org/0000-0001-6302-0277">https://orcid.org/0000-0001-6302-0277</a></p>	Ph.D.	Environmental Engineering, Georgia Institute of Technology, USA	2004	M.Sc.	Civil Engineering, Georgia Institute of Technology, USA	2000	M.Sc.	Environmental Engineering, Middle East Technical University, Türkiye	1997	B.Sc.	Environmental Engineering, Middle East Technical University, Türkiye	1994
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<b>Brief CV</b>	<p><b>Prof. Dr. M. Tuğrul YILMAZ</b></p> <p>E-mail: <a href="mailto:tuyilmaz@metu.edu.tr">tuyilmaz@metu.edu.tr</a></p> <p><b>Academic Degrees</b></p> <table><tr><td>Ph.D.</td><td>Earth System Sciences, George Mason University, USA</td><td>2011</td></tr><tr><td>M.Sc.</td><td>Earth Systems, Vrije University Amsterdam, Türkiye</td><td>2005</td></tr><tr><td>B.Sc.</td><td>Civil Engineering, Middle East Technical University, Türkiye</td><td>2003</td></tr></table> <p><b>Professional Networks</b></p>	Ph.D.	Earth System Sciences, George Mason University, USA	2011	M.Sc.	Earth Systems, Vrije University Amsterdam, Türkiye	2005	B.Sc.	Civil Engineering, Middle East Technical University, Türkiye	2003			
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