

**Prof. Dr.  
Ralf Ludwig**

Faculty of Geosciences  
Professor for Applied Physical Geography  
and Environmental Monitoring

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Born: October 02, 1967



### Summary

**Prof. Dr. Ralf Ludwig** is Vice-Dean of the Faculty of Geosciences and Professor in Applied Physical Geography and Environmental Modeling at LMU's Department of Geography. His research is focused on process-based and spatially distributed hydrological modeling at the catchment scale, data assimilation and model integration for water resources, land use and climate change impact assessment, including extreme events, from Mediterranean to subarctic environments, and the energy-environment interface. He co-ordinates the FP7-project CLIMB and manages the CLIWASEC cluster of FP7-projects on Climate Change, Water and Security in the Mediterranean, and leads the WP-SCENARIOS in the FP7-project GLOBAQUA, is chair of the Collaborative Program "Changes in the Hydrological Cycle" of the European Climate Research Alliance (ECRA), deputy chair of the Helmholtz research school MICMoR ("Mechanisms and Interactions of Climate Change in Mountain Regions") and Spokesperson of the Albertan-Bavarian Energy-Environment research network ABBY-Net. He is coordinating many climate change oriented research activities with partners in Québec for more than a decade, cosupervises several PhD-projects at the Université Laval, the INRS-ETE and McGill University, is an Adjunct Professor with the Université Laval and a member of the Canadian Centre of Excellence ArcticNet.

### Career

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|-----------|--|
| 2013-2017 | Dean of the Faculty of Geosciences, LMU Munich   |
| 2007+     | Professor for Applied Physical Geography and Environmental Modeling at the Department of Geography, University of Munich             |
| 2005-2007 | Professor for Physical Geography and Remote Sensing at the Department of Geography, Christian-Albrechts-Universitaet zu Kiel         |
| 2000-2005 | Assistant Professor in Research and Teaching at the Department of Geography, University of Munich (LMU), preparation of Habilitation |

### Education

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|------|---|
| 1999 | Dissertation in Geography („The spatially distributed modelling of runoff formation and water balance in the Ammer watershed“, summa cum laude) |
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- 1993 Diploma thesis in Geography („Flood modeling in Berchtesgaden National Park“)
- 1988-1993 Studies of Geography (Physical Geography), Geology, Geophysics and Remote Sensing at the University of Munich (LMU)

### Research Interests

- Analysis of Climate Change and Land Use change impacts on man-environment systems; from tropical to sub-arctic regions
- Hydrological modelling (development and application) for water resources management and extreme events;
- Environmental monitoring, multi-parametric and multi-sensoral remote sensing;
- Analysis of the environment-energy interface;
- Permafrost monitoring and modeling;
- Regional foci: Central Europe, MENA region, Canada

### Activities / Competences / Memberships / Awards

- 2013+ Dean of the Faculty of Geosciences, LMU Munich
- 2018+ Steering Board Member of the LMU Open Science Center ([www.osc.uni-muenchen.de](http://www.osc.uni-muenchen.de))
- 2017+ Steering Committee Member of LMU's "Steuerkreis Nachhaltigkeit" (Sustainability)
- 2015+ Professeur Associée (Adjunct Professor) for Université Laval, Québec, Canada
- 2011+ Steering Committee Member of the Helmholtz Graduate School MICMoR - Mechanisms and Interactions of Climate Change in Mountain Regions
- 2011+ Founder and Steering Committee Member for ABBY-Net (An interdisciplinary network of researchers from Albertan and Bavarian Universities)
- 2015+ Associate Editor for STOTEN - Science of the Total Environment (Elsevier)
- 2013+ Chair of the Collaborative Program "Changes in the Hydrological Cycle" of the European Climate Research Alliance (ECRA, [www.ecra-climate.eu](http://www.ecra-climate.eu))
- 2010-2013 Guest and Associate Editor for J-STARS – Journal of Selected Topics in Applied Earth Observation and Remote Sensing (IEEE)
- 2010-2013 Chair Examination Committee at the Department of Geography, LMU Munich
- 2009-2013 Deputy Director of the Department of Geography, LMU Munich
- 2005-2007 Member of the Board of Directors, Institute of Geography, CAU Kiel
- 2005+ Project Reviewer and Evaluator for the German Research Foundation (DFG), the German Ministry of Education and Research (BMBF), the German Academic Exchange Service (DAAD) and the European Commission (EU, FP7)
- 2005 Faculty Research Program Award of the Canadian Government, Canadian Embassy in Germany
- 2000+ Memberships: IEEE Geoscience and Remote Sensing Society, European Geosciences Union (Member of the Technical Committees "Hydrologic Sciences" and "Remote Sensing"), German Society for Photogrammetry, Remote Sensing und Geoinformation (DPFG), German Society for Canadian Studies (GKS)
- 2000+ Regular reviewer for numerous scientific journals (in hydrology, water resources management, climate change, remote sensing)

### Most Important Publications (selected since 2012)

- [1] Velázquez, J.A., Schmid, J., Ricard, S., Muerth, M., Gauvin St-Denis, B., Minville, M., Chaumont, D., Caya, D., Ludwig, R. and R. Turcotte (2013): An ensemble approach to assess hydrological models' uncertainties in the analysis of climate change impact on water resources. In: *Hydrol. Earth Syst. Sci.*, 17, 565–578.
- [2] Beniston, M., Stoffel, M., Harding, R., Kernan, M., Ludwig, R., Moors, E., Samuels, P. and K. Tockner (2012): Obstacles to data access for research related to climate and water: implications for science and EU policy. *Env. Sc. and Policy*, 17, 41-48
- [3] Marzahn, P., Rieke-Zapp, D. and R. Ludwig (2012): Assessment of Soil Surface Roughness Statistics for Microwave Remote Sensing Applications using a Simple Photogrammetric Acquisition System. In: *ISPRS*, 72, 80-89
- [4] Cassiani, G., Deiana, R., Meyer, S., R. Ludwig, et al. (2012): Noninvasive Monitoring of Soil Static Characteristics and Dynamic States: A Case Study Highlighting Vegetation Effects on Agricultural Land. *Vadose Zone J.* doi:10.2136/vzj2011.0195
- [5] Baghdadi N., Cresson R., El Hajj M., Ludwig R., and La Jeunesse I., 2012. Estimation of soil parameters over bare agriculture areas from C-band polarimetric SAR data using neural networks. *Hydrology and Earth System Sciences (HESS)*, vol. 16, pp. 1607-1621, doi:10.5194/hess-16-1607-2012
- [6] Marzahn, P., Seidel, M. and R. Ludwig (2012): Decomposing Dual-Scale Soil Surface Roughness for Microwave Remote Sensing Applications. In: *Remote Sensing*, 4, 2016-2032
- [7] Wegmüller, U., Santoro, M, Mattia, F., Marzahn, P., Ludwig, R. and N. Floury (2011): Progress in the understanding of narrow directional microwave scattering in agricultural fields. In: *Remote Sensing of Environment*, 2423-2433
- [8] Roemer, H., Kaiser, G., Ludwig, R. and H. Sterr (2011): Monitoring post-tsunami vegetation recovery in Phang-Nga Province, Thailand, based on IKONOS imagery and field investigations - a contribution to the analysis of tsunami vulnerability of coastal ecosystems. In: *Int. J. of Remote Sensing*. Vol. 33/10, 3090-3121
- [9] Ludwig, R., Roson, R., Zografos, C. and G. Kallis (2011): Towards an inter-disciplinary research agenda on climate change, water and security in Southern Europe and Neighbouring countries. In: *Environmental Science and Policy*. doi:10.1016/j.envsci.2011.04.003
- [10] Ludwig, R., I. May, R. Turcotte, L. Vescovi, M. Braun, J.-F. Cyr, L.-G. Fortin, D. Chaumont, S. Biner, I. Chartier, D. Caya, and W. Mauser (2009). The role of hydrological model complexity and uncertainty in climate change impact assessment. *Adv. Geosci.*, 21, 63-71, 2009
- [11] Marzahn, P., Rieke-Zapp, D. and R. Ludwig (2012): Assessment of Soil Surface Roughness Statistics for Microwave Remote Sensing Applications using a Simple Photogrammetric Acquisition System. In: *ISPRS*, 72, 80-89
- [12] Roemer, H., Willroth, P., Kaiser, G., Vafeidis, A.T., Ludwig, R., Sterr, H. and J. Revilla-Diez (2012): Potential of remote sensing techniques for tsunami hazard and vulnerability analysis a case study from Phang-Nga province, Thailand. In: *Natural Hazards and Earth System Sciences NHESS*, 12, 2103-2126.
- [13] M.J. Muerth, B. Gauvin St-Denis, S. Ricard, J.A. Velázquez, J. Schmid, M. Minville, D. Caya, D. Chaumont, R. Ludwig and R. Turcotte (2013): On the need for bias correction in regional climate scenarios to assess climate change impacts on river runoff. In: *Hydrol. Earth Syst. Sci.*, 17, 1189–1204.
- [14] Ke, Q.C., Kou, C., Ludwig, R. and X. Qin (2013): Glacier velocity measurements in the eastern Yigong Zangbo basin, Tibet, China. *Journal of Glaciology*, 59 (218), 1060-1068.
- [15] Jagdhuber, T., Stockamp, J., Hajnsek, I. and R. Ludwig (2014): Identification of Soil

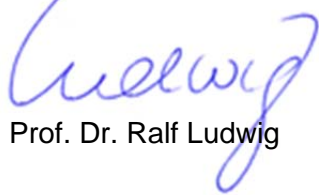
- Freezing and Thawing States using SAR-Polarimetry at C-band. In: *Remote Sensing*, 6(3), 2008-2023.
- [16] Susnik, J., Vamvakeridou-Lyroudia, L., R. Ludwig, et al. (2014): Integrated assessment of sea-level rise and climate change impacts in the lower Nile Delta, Egypt. *Science of the Total Environment*, 503-504, 279-288, DOI:10.1016/j.scitotenv.2014.06.111
- [17] Springer, J., Ludwig, R., and S. Kienzle (2015): Impacts of Forest Fires and Climate Variability on the Hydrology of an Alpine Medium Sized Catchment in the Canadian Rocky Mountains. *Hydrology*; 2(1), 23-47; doi:10.3390 /hydrology2010023
- [18] Beck, I., Ludwig, R., Bernier, M., Levesque, E. and J. Boike (2015): Assessing permafrost degradation and land cover changes (1986-2009) using remote sensing data, Umiujaq, sub-arctic Québec. *Permafrost and Periglacial Processes*, 26 (2), 129-141, DOI: 10.1002/ppp.1839
- [19] Mehdi, B., Ludwig, R. and B. Lehner (2015): Evaluating the impacts of climate change and crop land use change on streamflow, nitrates and phosphorus: A modeling study in Bavaria. *Journal of Hydrology – Regional Studies*, 4, Part B, 60-90, doi: 10.1016/j.ejrh.2015.04.009
- [20] Meyer, S., Blaschek, M., Duttmann, R. and R. Ludwig (2015): Improved hydrological model parametrization for climate change impact assessment under data scarcity – the potential of field monitoring techniques and geostatistics. *Science of the Total Environment*, 543, Part B, 1 February 2016, Pages 906–923
- [21] Gampe, D., Ludwig, R., Qahman, K. and S. Afifi (2015): Applying the Triangle Method for the parameterization of irrigated areas as input for spatially distributed hydrological modeling – assessing future drought risk in the Gaza Strip (Palestine). *Science of the Total Environment*; 543, 877-888. doi: 10.1016/j.scitotenv.2015.07.098
- [22] Beck, I. Ludwig, R., Bernier, M., Strozzi, T. and J. Boike (2015): Vertical movements of frost mounds in Sub-Arctic permafrost regions analysed using geodetic survey and satellite interferometry. *Earth Surface Dynamics*, 3, 409-421, doi:10.5194/esurf-3-409-2015
- [23] Lajeunesse, I., Cirelli, C., R. Ludwig, et al. (2015): Is climate change a threat for water uses in the Mediterranean region? Results from a survey at local scale. *Science of the Total Environment*, 543, B, 981-996, doi: [10.1016/j.scitotenv.2015.04.062](https://doi.org/10.1016/j.scitotenv.2015.04.062)
- [24] Behmel, S., Damour, M., Ludwig, R. and M.J. Rodriguez (2016): Water quality monitoring strategies – and review and future perspectives. *Science of the Total Environment*, doi:10.1016/j.scitotenv.2016.06.235
- [25] Gampe, D., Nikulin, G. and R. Ludwig (2016): Using an ensemble of regional climate models to assess climate change impacts on water scarcity in European river basins. *Science of the Total Environment*, doi: doi:10.1016/j.scitotenv.2016.08.053
- [26] Pistocchi, A., Udias, A., Grizzetti, B., Gelati, E., Koundouri, P., Ludwig, R., Papandreu, A. and I. Souliotis (2017): An integrated assessment framework for the analysis of multiple pressures in aquatic ecosystems and the appraisal of management options. *Science of the Total Environment*. 575, 1477-1488.
- [27] Polanco, E.I., Fleifle, A., Ludwig, R., and M. Disse (2017): Improving SWAT model performance in the Upper Blue Nile Basin using meteorological data integration and subcatchment discretization. *Hydrol. Earth Syst. Sci.*, 21, 4907-4926. Doi: doi.org/10.5194/hess-21-4907-2017
- [28] Wang, L., Marzahn, P., Bernier, M., Jacome, A., Poulin, J. and R. Ludwig (2017): Comparison of TerraSAR-X and PALSAR Differential Interferometry with multi-source DEM for the monitoring of ground displacement in discontinuous permafrost region. *J. Sel. Top. In Adv. Rem. Sens.* 10/9, 4074-4093.
- [29] Chiogna, G., Skrobanek, P., Narany, T.S., Ludwig, R. and C. Stumpp (2018): Effects of

- the 2017 drought on isotopic and geochemical gradients in the Adige catchment, Italy. *Sc. Tot. Env.*, 645: 924-936
- [30] Gampe, D. and R. Ludwig (2018): Evaluation of Gridded Precipitation Data Products for Hydrological Applications in Complex Topography. *Hydrology*, 4, 53, 1-21. doi:10.3390/hydrology4040053
- [31] Mehdi, B., Ferber, F., Ludwig, R. and B. Lehner (2018): Evaluating the importance of non-unique behavioral parameter sets on surface water quality variables under climate change conditions in a mesoscale agricultural watershed. *Water Resources Management*. 32:619–639 <https://doi.org/10.1007/s11269-017-1830-3>
- [32] Vigiak, O., Lutz, S., R. Ludwig and A. Pistocchi (2018): Uncertainty of modelled flow-regime for flow-ecological assessment in Southern Europe. *Sc. Tot. Env.*, 615: 1028-1047.
- [33] Huber Garcia, V., Meyer, S., Kok, K., Verweij, and R. Ludwig (2018): Deriving spatially explicit water uses from land use change modelling results in four river basins across Europe. *Sci. Tot. Env.*, 628-629: 1079-1097.
- [34] Tsyganskaya, V., Martinis, S., Marzahn, P. and R. Ludwig (2018): SAR-based detection of flooded vegetation – a review of characteristics and approaches. *Int. Journal of Rem Sens.* (accepted).
- [35] Herrero, A., Guttierrez-Canovas, C., Vigiak, O., Huber Garcia V., Game, D., Ludwig, R. and S. Sabater (2018): Multi-stressor effects on biological quality elements in the Ebro River: Present diagnosis and predicted responses. *Sci. Tot. Env.*, 630: 1608-1618.
- [36] Wang, L., Marzahn, P., Bernier, M. and R. Ludwig (2018): Mapping permafrost landscape features using an object-based image classification of time series SAR images. *Int. J. Photo. Rem. Sens.* (accepted).
- [37] Behmel, S., Damour, M., Ludwig, R. and M.J. Rodriguez (2018): Participative approach to elicit water quality monitoring needs from stakeholder groups – an application of Integrated Watershed Management. *Journal of Environmental Management* (accepted).
- [38] Yu, L., Martinis, S., Plank, S. and R. Ludwig (2018): An automatic change detection approach for rapid flood mapping in Sentinel-1 SAR data. *INT. J. Applied Earth Observation and Geoinformation*. 73: 123-135.
- [39] Willkofer, F., Schmid, F.J., Komischke, H., Korck, J., Braun, M. and R. Ludwig (2018): The impact of bias correcting regional climate model results on hydrological indicators for Bavarian catchments. *J. Hydrology – Regional Studies*. 19: 25-41.
- [40] Mehdi, B., Lehner, B., and R. Ludwig (2018): Modeling crop land use change derived from influencing factors selected and ranked by farmers in North temperate agricultural regions. *Sci. Tot. Env.*, 631-632: 407-420.
- [41] Tsyganskaya, V., Martinis, S., Marzahn, P. and R. Ludwig (2018): Detection of temporary flooded vegetation using Sentinel-1 time series data. *Remote Sensing* (accepted).
- [42] Perra, E., Piras, M., Deidda, R., G. Mascaro, G, Meyer, S. and R. Ludwig (2018): Multimodel assessment of climate change-induced hydrologic impacts for a Mediterranean catchment. *Hyd. Earth. Sys. Sci.*, (accepted).

### **Key research projects (selected from within the last 5 years)**

- 2017-2020 HiOS – Flash Floods and Surface Runoff (Bavarian State Ministry for the Environment, module leader; 360k€ (total 1.6M€))
- 2015-2019 ClimEX – Climate Change and hydrological extreme events – Risks and Perspectives for water resources management (Bavarian State Ministry for the Environment, project leader; 720k€)
- 2015-2017 BayKliZ – Klimazukunft Bayern (Bavarian State Ministry for the Environment, project leader; 180k€)
- 2014-2019 GLOBAQUA – Managing the effects of multiple stressor conditions on aquatic ecosystems under water scarcity (EU-FP7, module and WP leader; 850 k€ (total 7.8M€))
- 2016-2019 SustainableGAS – Scenarios for the expansion of renewable gases in the heating and electricity market (German Ministry for the Economy and Energy, project leader, 189k€)
- 2014-2017 DykesUnderPressure – Technical and ecological vulnerability and resilience of dyke landscapes (German Aerospace Center, project leader; 220k€)
- 2010-2014 CLIMB – Climate Induced Changes on the Hydrology in Mediterranean Basins: Reducing Uncertainty and Quantifying Risk” (EU-FP7, project coordinator; leader of the cluster of EU-FP7-projects CLIWASEC; 3.3M€)
- 2010-2013 QBIC<sup>3</sup> - Adapting regional watershed management to climate change in Québec and Bavaria (Bavarian State Ministry for the Environment, project leader; 750k€)
- 2009-2019 NUNAVIK – Using Remote Sensing for the monitoring and modelling of snow cover dynamics and permafrost decline in Northern Québec (project leader; 200k€)

Munich, 08.08.2018



Prof. Dr. Ralf Ludwig