

# Curriculum Vitae

Dr. Hendrik Wouters

## Personal information

Surname: Wouters

Name: Hendrik

Address: Stationsstraat 35

Postal code: 9230

City: Wetteren

Province: East-Flanders

Country: Belgium

Tel.: +32 9 294 03 64

Mobile: +32 486 548 384

Date of birth: 1982/12/30

Nationality: Belgian

E-mail : [hendrikwout@gmail.com](mailto:hendrikwout@gmail.com)

Linkedin: <http://www.linkedin.com/pub/hendrik-wouters/9/22a/61>

ResearchGate: [https://www.researchgate.net/profile/Hendrik\\_Wouters](https://www.researchgate.net/profile/Hendrik_Wouters)

Twitter: [https://twitter.com/hendrik\\_wouters](https://twitter.com/hendrik_wouters)

Lirias profile KU Leuven: <http://www.kuleuven.be/wieiswie/nl/person/00074755>

Languages: Dutch (mother language), English (very good), French (mediocre) and German (notions)



## Contact references

Prof. dr. Nicole van Lipzig <[nicole.vanlipzig@kuleuven.be](mailto:nicole.vanlipzig@kuleuven.be)>, KU Leuven

Dr. Matthias Demuzere <[matthias.demuzere@kuleuven.be](mailto:matthias.demuzere@kuleuven.be)>, KU Leuven

Dr. Ulrich Blahak <[ulrich.blahak@dwd.de](mailto:ulrich.blahak@dwd.de)>, Deutsche Wetterdienst

Dr. Koen De Ridder <[koen.deridder@vito.be](mailto:koen.deridder@vito.be)>, Flemish Institute of Technological Research

## Positions

### October 2014 - now, post-doctoral Researcher at KU Leuven

Department Earth and Environmental Sciences

Division of Geography and Tourism

Regional Climate Studies (prof. dr. Nicole van Lipzig)

[funding: BELSPO/SD/CS/04A /MACCBET coordinated by KU Leuven; BELSPO/CORDEX.be coordinated by RMI]

### February 2015 - December 2015, academic staff at Ghent University

Faculty of Engineering and Architecture

Centre for mobility and spatial planning (prof. dr. ir. Luuk Boelens)

[funding: Flemish Adaptation Plan; Department Nature, Agriculture and Energy of the Flemish Government]

### October 2010 - October 2014, joint doctoral research mandate

Flemish Institute of Technological Research and the KU Leuven

[funding: VITO PhD grant; BELSPO/SD/CS/04A /MACCBET; FP7 grant agreements no. 308299 and no. 308497]

### August 2008 - October 2009, Oosterzele, Software programmer

## Certificates

### 16 May 2014, doctor of Philosophy in Geography (Climate)

Arenberg Doctoral School – KU Leuven

Thesis: Improving urban land-cover parametrization in regional climate models. The role of urban aerodynamic, thermal and radiative properties, anthropogenic heat and water retention, promotor: prof. dr. Nicole van Lipzig, co-promotors: dr. Koen De Ridder, dr. Matthias Demuzere

### 13 - 18 may 2012, University of Cyprus. Training School: Urban Physics,

### 7 - 11 februari 2011, Deutsche Flugsicherung, Langen. COSMO training school

### July 2010, Ghent University, Post-graduate weather and climate modelling (Magna Cum Laude)

Thesis: To develop a numerical stable algorithm for mass-flux type equations. (Summa Cum Laude)  
Promotor: Prof. Dr. Jean-François Geleyn

### July 2008, Ghent University. Master in Physics (Cum Laude)

Thesis: a one-dimensional precipitation model (Cum Laude), Promotor: Dr. Bart Catry

## Fields of expertise

Numerical analysis, mathematical methods in physics, atmospheric chemistry and physics, boundary-layer meteorology, land-atmosphere interactions, model parameter estimation, urban climate and pollution modeling, climate variability and statistics, image processing, cartography, high-performance computing, Linux system administration

## Key academic achievements

### 1. The urban land-surface scheme TERRA\_URB for the COSMO(-CLM) atmospheric model

This was the main outcome of my PhD thesis at KU Leuven in cooperation with the Flemish Institute of Technological research (VITO), the Deutsche Wetterdienst (DWD) and the CLM-community. Its innovative methodologies have been published in peer-reviewed SCI scientific journals, see Wouters et al. (2012, 2015, 2016). TERRA\_URB has already been valorized in 5 international scientific projects (KU Leuven, RMI, ARPA, VMM), 2 bachelor and 2 master theses at KU Leuven, and 2 ongoing other PhD projects at ETH Zürich and Lomonosov Moscow State University. It has also become the standard urban parametrization of the COSMO(-CLM) model, and currently being deployed by European operational weather services in the COSMO consortium (DWD, IMS, CIRA ...) and a broad network of climatological scientists (<http://www.clm-community.eu>).

### 2. Model-based urban heat-stress climate indicators for Belgium

These indicators are developed for the Environmental Report (MIRA; <http://www.milieurapport.be>) of the Flemish Environmental Agency (VMM), see De Ridder et al. (2015). They demonstrate climate projections for extreme urban heat stress based on greenhouse-gas emission and land-use scenarios. They are one of the innovative key aspects of the most recent Flemish Climate Report (Brouwers et al. 2015) focusing on the spatial dependency of climate-change impacts at the regional level. The key findings are now being submitted as publication to the **The Proceedings of the National Academy of Sciences**.

### 3. Startup of the Thinktank Climate Adaptation Flanders (UGent/AMRP, DKA, 2015) [<http://dka.ugent.be>]

This involves the constitution of a stakeholder network with experts in research, industry, governmental levels and interest groups for answering widely supported questions about climate-change impacts on Flanders

## Responsibilities

### 1. Member of the CLM-community (<http://www.clm-community.eu>):

**Coordination** of the **SOILVEG\_URB** working group. This working group focusses on the deployment of urban land-surface schemes for the COSMO-CLM model. Therefore, two dedicated workshops have been organized. Hereby, the Urban Model Intercomparison Project **URBMIP** comparing different urban land-surface schemes model comparisons for different cities (Berlin, Basel and Zürich) has been **very successful**, eg., see Trusilova et al. (2015).

**Member** of the **EVAL** working group and participation in the COordinated model PArameter Testing experiment for the COSMO-CLM model **COPAT**.

### 2. Member of the CORDEX.be micro-ensemble modelling consortium

The project – coordinated by the RMI - aims for coherent and detailed information about climate change statistics, uncertainty and impacts for Belgium with a micro-ensemble of regional climate models and local impact models. Hereby, I have contributed, as one of the only partners, the 30-year long high-resolution Belgian downscaling of an EC-EARTH earth system model member with the COSMO-CLM model coupled to TERRA\_URB. These long-term climate simulations comprise one of the outstanding projects of the Flemish Supercomputer centre using the TIER1/MUK infrastructure at Ugent: "CORDEX.be: Combining Regional Downscaling Expertise in Belgium: CORDEX and beyond", see <https://www.vscentrum.be/en/project-and-cases>.

**3. Co-convener** for the session "Urban climate, urban heat island and urban biometeorology" at the European Geoscience Union General Assembly (2015 and 2016) + reviewer Outstanding Student Poster and PICO (OSPP) Award

**4. Member of the bibliographic committee** of the International Association of the Urban Climate (IAUC, 2012 – now)

**5. Secretary** of the Thinktank Climate Adaptation Flanders (UGent/AMRP, 2015) [<http://dka.ugent.be>]

**6. Member of the Steering Committee:** 'Climate Adaptation in qualitative and quantitative directions for spatial design' (study undertaken by Technum and commissioned by the Flemish Government, policy field of Planning, Housing Policy and Immovable Heritage, 2014; 2015)

**7. Member of the Steering Committee** (ongoing): 'MIRA-research project about heat islands in Flanders' (study undertaken by VITO and commissioned by the Flanders Environment Agency)

**8. Reviewer** for several journals: International Journal of Climatology, Urban Climate, Geophysical Research Letters, Atmospheric Chemistry and Physics, Geoscientific Model Development

## Teaching

**1. Initiator (2) and (co-)promotor (3) of bachelor dissertations (KU Leuven)**

**2. Initiator (3) and (co-)promotor (3) of master dissertations (KU Leuven)**

**3. Practical lessons for bachelor course Climatology (KU Leuven, 2013; 2014)**

4. Practical lessons for master course Atmospheric Modelling (KU Leuven, 2012)

5. Workshop Leader, 2012. "making climate maps of the future" (European Geography Association, 2012)

## SCI Publications (peer-reviewed)

### In preparation

**H. Wouters, Nicole van Lipzig and Matthias Demuzere.** Convection-permitting climate downscaling reveal 50% more thunderstorms in Belgium by the end of the 21<sup>st</sup> century.

**H. wouters,** M. Demuzere, K. De Ridder, N.P.M. van Lipzig, The seasonal dependency of urban heat islands and their climatic drivers at the mid-latitude: A model-based case study for the Belgium.

**H. Wouters,** P. Viaene, K. De Ridder, P. Viaene, S. Carl, N. Veldeman, F. Deutsch, N.P.M. van Lipzig. Urban heat islands enhance ozone concentrations.

### In submission

**H. Wouters,** K. De Ridder, Lien Poelmans, Patrick Willems, Parisa Hosseinzadehtalaei, Hossein Tabari, Johan Brouwers, Sam Vanden Broucke, N.P.M. van Lipzig, and M. Demuzere. Heat stress increase towards the mid-21st century twice as large for cities as for rural areas. In submission to **Nature Climate Change**

### Under review

M. Demuzere, S. Harshan, L. Järvi, M. Roth, C.S.B. Grimmond, V. Masson, K.W. Oleson, E. Velasco, **H. Wouters.** Impact of urban canopy models and external parameters on the modelled urban energy balance. Submitted to **Quarterly Journal of the Royal Meteorological Society.**

### Published papers

**Wouters, H.,** Demuzere, M., Blahak, U., Fortuniak, K., Maiheu, B., Camps, J., Tielemans, D., and van Lipzig, N. P. M.: The efficient urban canopy dependency parametrization (SURY) v1.0 for atmospheric modelling: description and application with the COSMO-CLM model for a Belgian summer, **Geoscientific Model Development**, 9, 3027-3054, doi:10.5194/gmd-9-3027-2016, 2016. <http://www.geosci-model-dev.net/9/3027/2016/gmd-9-3027-2016.html>

**Wouters, H.,** Demuzere, M., De Ridder, K., Van Lipzig, N. (2015). The impact of impervious water-storage parametrization on urban climate modelling. **Urban Climate**, 11, 24-50. <http://www.sciencedirect.com/science/article/pii/S2212095514000893>

Demuzere, M., Coutts, A., Göhler, M., Broadbent, A., **Wouters, H.,** Van Lipzig, N., Gerbet, L. (2014). The implementation of biofiltration systems, rainwater tanks and urban irrigation in a single-layer urban canopy model. **Urban Climate**, 10(1), 148-170. <http://www.sciencedirect.com/science/article/pii/S2212095514000844>

**Wouters, H.,** De Ridder, K., Van Lipzig, N., Demuzere, M., Lauwaet, D. (2013). The diurnal evolution of the urban heat island of Paris: a model-based case study during Summer 2006. **Atmospheric Chemistry and Physics**, 13, 8525-8541. <http://www.atmos-chem-phys.net/13/8525/2013/>

**Wouters, H.,** De Ridder, K., Van Lipzig, N. (2012). Comprehensive Parametrization of Surface-Layer Transfer Coefficients for Use in Atmospheric Numerical Models. **Boundary-Layer Meteorology**, 145(3), 539-550. <http://link.springer.com/article/10.1007/s10546-012-9744-3>

Trusilova, K., Schubert, S., **Wouters, H.,** Früh, B., Grossman-Clarke, S., Demuzere, M., and Becker, P.: The urban land use in the COSMO-CLM model: a comparison of three parameterizations for Berlin, **Meteorologische Zeitschrift**, doi:10.1127/metz/2015/0587, 2015.

[https://www.schweizerbart.de/papers/metz/detail/prepub/85019/The\\_urban\\_land\\_use\\_in\\_the\\_COSMO\\_CLM\\_model\\_a\\_comparison\\_of\\_three\\_parameterizations\\_for\\_Berlin](https://www.schweizerbart.de/papers/metz/detail/prepub/85019/The_urban_land_use_in_the_COSMO_CLM_model_a_comparison_of_three_parameterizations_for_Berlin)

## Public reports

De Ridder K., Maiheu B., **Wouters H.** & van Lipzig N. (2015), Indicators of the urban heat island in Flanders, study commissioned by the Flemish Environmental Agency (VMM), MIRA, MIRA/2015/05, VITO. [www.milieurapport.be](http://www.milieurapport.be).

Brouwers J., Peeters B., Van Steertegem M., van Lipzig N., **Wouters H.**, Beullens J., Demuzere M., Willems P., De Ridder K., Maiheu B., De Troch R., Termonia P., Vansteenkiste Th., Craninx M., Maetens W., Defloor W., Cauwenberghs K. (2015) MIRA Climate Report 2015, about observed and future climate changes in Flanders and Belgium. Flanders Environment Agency in collaboration with KU Leuven, VITO and RMI. Aalst, Belgium, 147 pages.

## Newsletters

July 2015, CLM community newsletter research Note: "The impact of impervious storage parametrization on climate modelling"

Editor of the DKA newsletter issues (Thinktank Climate Adaptation Flanders):

August 2015: Startup Thinktank Climate Adaptation Flanders [<http://bit.ly/1T6zhNk>]

November 2015: Flemish adaptation cases for an urban and a rural context [<http://bit.ly/1OasVxw>]

## Oral presentations

**20 – 23 September 2016, Lüneburg, CLM Assembly.**

**Hendrik Wouters**, Matthias Demuzere, Sam Vanden Broucke, Nicole van Lipzig: Detailed climate-change projections for Belgium from urban land-use change and emission scenarios with the COSMO-CLM model coupled to TERRA\_URB: heat stress and extreme precipitation.

Chair for presentations in 'Soil and Vegetation'

**18 - 22 april 2016, Vienna, European Geosciences Union General Assembly.**

**Hendrik Wouters**, Nicole van Lipzig, Sam Vanden Broucke, Lien Poelmans, Hossein Tabari, Parisa Hosseinzadeh Talaei, Johan Brouwers, Matthias Demuzere, Dirk Lauwaet, Bino Maiheu, and Koen De Ridder. *The impact of green-house gas emissions, climate downscaling and land-use change on Belgian urban heat stress scenarios* [[http://presentations.copernicus.org/EGU2016-17703\\_presentation.pdf](http://presentations.copernicus.org/EGU2016-17703_presentation.pdf)]

**7 - 10 March 2016, Offenbach. COSMO/CLM/ART User Seminar 2016**

Gianluca Mussetti, D. Brunner, S. Henne, J. Allegrini, **H. Wouters**, S. Schubert, J. Carmeliet. Impact of model resolution and urban parametrization on urban climate simulation: a case study for Zurich [<http://bit.ly/1XgBSYf>]

**20 - 24 juli 2015, Toulouse. 9th International Conference on Urban Climate / 12th symposium on the urban environment (ICUC9/SUE12)**

**H. Wouters**, N.P.M. van Lipzig, L. Poelmans, M. Demuzere, E. Brisson. *Modelling the relative impact of land-use change and global climate change on increased temperatures in Belgian cities.*

**4 - 7 march 2015, Offenbach. COSMO/CLM/ART User Seminar.**

**H. Wouters**, U. Blahak, J. Helmert, M. Raschendorfer, M. Demuzere, B. Fay, K. Trusilova, D. Mironov, D. Reinert, D. Lüthi, E. Machulskaya. *Towards a standard urban parametrization for COSMO and COSMO-CLM with TERRA\_URB*

**26 November 2014, Uccle**

Invited lecture at the Royal Meteorological Institute of Belgium. **Hendrik Wouters** en M. Demuzere. *Potential climate change adaptation and mitigation strategies in an urban context.*

**29-Aug-2013, Zürich, CLM Assembly 2013.**

**Hendrik Wouters**, Dirk Lauwaet, Peter Viaene, Shaun Carl, Matthias Demuzere, Nele Veldeman, Felix Deutsch. *How much detail in meteorological parameters is needed for urban air-quality modelling.*

**Hendrik Wouters**, Kristina Trusilova, Sebastian Schubert, Matthias Demuzere, Susanne Grossmann-Clarke, Barbara Früh. *URB-MIP: the URBan Model Intercomparison Project.*

**8 – 12 April 2013, Vienna, EGU General Assembly**

**Hendrik Wouters**, Koen De Ridder, Matthias Demuzere, Bino Mahieu, Nele Veldeman, Peter Viaene, Dirk Lauwaet, Nicole van Lipzig. *How much spatial detail in meteorological parameters is needed to model air-quality in a city? A case study for the city of Antwerp, Belgium.*

**4 - 7 march 2013, Offenbach. COSMO/CLM/ART User Seminar**

**Hendrik Wouters**, Matthias Demuzere, Koen De Ridder, Gerd Vogel, Nicole van Lipzig. *Evaporation from urban areas: model sensitivity and results with TERRA-URB standalone.*

**Hendrik Wouters**, Koen De Ridder, Matthias Demuzere, Bino Mahieu, Nele Veldeman, Felix Deutch, Peter Viaene, Erwan Brisson, Nicole van Lipzig. *How much spatial details in meteorological parameters is needed for modelling urban air-quality?*

**1 June 2012, Liège, Meteoclim 2012 at University of Liège**

**Hendrik Wouters**, Koen De Ridder, Nicole P.M. van Lipzig, Matthias Demuzere, Dirk Lauwaet. *'Orography and urban heat island of Paris : an RCM-based study versus a boundary-layer advection approach'.*

**29 October 2012, Uccle, invited talk at Royal Meteorological Institute**

**Hendrik Wouters.** *Multi-scale urban climate and air-quality modeling improvements and scenarios.*

**12 – 16 september 2011, Sept 12th - sept 16th 2011. 11th EMS Annual Meeting.**

**Hendrik Wouters**, Koen De Ridder, Dirk Lauwaet, Nicole van Lipzig. *'To asses the maximum impact of urban heat forcing of Paris during summer 2006 with ARPS'.*

## **29 august – 2 september 2011, Cava De' Tirreni (Italy), CLM user assembly**

**Hendrik Wouters**, Gerd Vogel, Nicole P.M. van Lipzig, Koen De Ridder. Towards urban parametrization of TERRA-ML.

**Hendrik Wouters**, Edouard Davin, Matthias Demuzere, Kristina Trusilova, Sebastian Schubert. Overview of different approaches to include urban surfaces in CCLM.

## **10 november 2010, Uccle, Meteoclim 2010 at the Royal Meteorological Institute**

**Hendrik Wouters**, Jean-Francois Geleyn. An upstream differencing method in the case of varying direction of the flux (post-graduate project).

## **Poster presentations**

### **20 – 23 September 2016, Lüneburg, CLM Assembly.**

**Hendrik Wouters**, Jan-Peter Schulz, Jürgen Helmert, Matthias Raschendorfer, Ulrich Blahak, and Ulrich Schättler. The influence of latest COSMO developments regarding surface-atmospheric interactions on urban climate modelling

### **18 - 22 april 2016, Vienna, European Geosciences Union General Assembly 2016**

*Ivonne Anders, Susanne Brienen, Bucchignani Eduardo, Andrew Ferrone, Beate Geyer, Klaus Keuler, Daniel Lüthi, Mariano Mertens, Hans-Jürgen Panitz, Sajjad Saeed, Jan-Peter Schulz and **Hendrik Wouters**. COPAT – towards a recommended model version of COSMO-CLM .*

### **7 - 10 March 2016, Frankfurt. COSMO/CLM/ART User Seminar 2016**

**Hendrik Wouters**, Matthias Demuzere, Ulrich Blahak, Nicole van Lipzig, Koen De Ridder, Krzysztof Fortuniak, Bino Maiheu, Johan Camps, Daniël Tielemans, Jürgen Helmert, Gianluca Mussetti, Matthias Raschendorfer, Jan-Peter Schulz. News on TERRA\_URB, the urban land-surface parametrization of the COSMO(-CLM) model [<http://bit.ly/1Oaq9bH>]

**Hendrik Wouters**, S. Vanden Broucke, N. van Lipzig, M. Demuzere. To provide a high-quality convection-permitting ensemble member for the Belgian climate change with COSMO-CLM in the CORDEX.be project [<http://bit.ly/1TOjHWG>].

20 - 24 juli 2015, Toulouse. 9th International Conference on Urban Climate / 12th symposium on the urban environment (ICUC9/SUE12)

**H. Wouters**, M. Demuzere, K. De Ridder, U. Blahak, N.P.M. van Lipzig. *Modelling the seasonal dependency of contributions to urban heat islands in Belgium*

**H. Wouters**, U. Blahak, J. Helmert, M. Raschendorfer, M. Demuzere, B. Fay, K. Trusilova, D. Mironov, D. Reinert, D. Lüthi, E. Machulskaya. *Model developments in TERRA\_URB, the upcoming standard urban parametrization of the atmospheric numerical model COSMO(-CLM)*

