



vision on technology

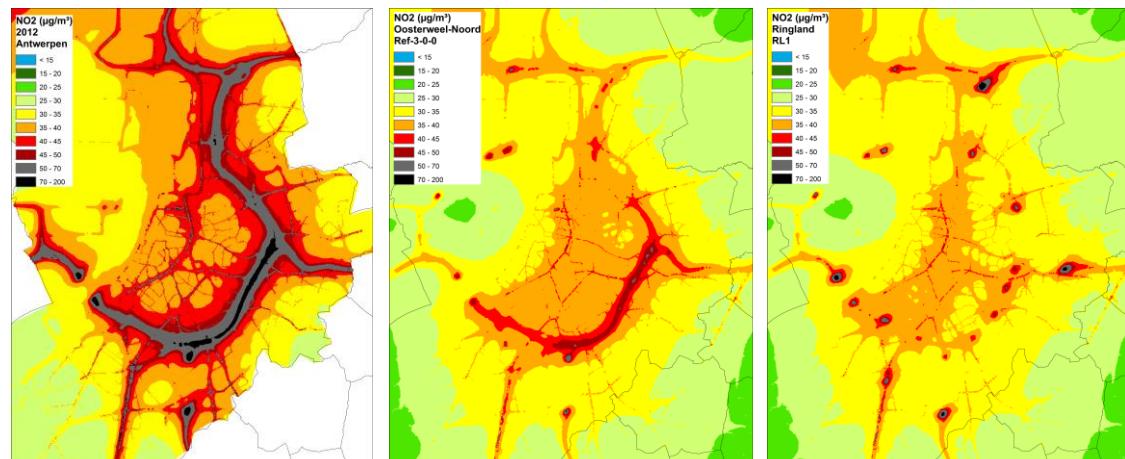


10/05/2016

Air Quality Modelling for Antwerp

Bino Maiheu, on behalf of the VITO urban air quality modelling team.

bino.maiheu@vito.be



Outline

- » Urban air quality modelling at VITO
- » The Antwerp air quality hotspot
- » IFDM/OSPM modelling approach
 - » Methodology
 - » Coupling urban & regional models
 - » Street canyon modelling for the entire city
 - » Validation
- » Antwerp as an urban air quality laboratory
 - » Air quality planning and policy support, e.g. low emission zone
 - » Citizen initiatives in Antwerp : Ringland
 - » Antwerp as virtual air quality lab in FAIRMODE
 - » Antwerp air quality at microscale

AIR QUALITY MODELLING FOR ANTWERP

VITO

The screenshot shows the ATMOSYS website (www.atmosys.eu/faces/index.jsp) running in a Microsoft Internet Explorer browser window. The main content area features a large banner with the text "Plan, Predict and Improve Air Quality" and "Why air quality needs our attention?". Below the banner are sections for "Discover our solutions" (listing tools like air pollution forecast, historical annual maps, time evolution maps, human exposure to air pollution, and model validation tools), "Learn more" (listing topics such as EC emission inventories, data assimilation techniques, high resolution and microscale air quality modelling, INSPIRE compatibility, and city and highway measurement campaigns), and "Background" (describing the core goal of demonstrating solutions and knowledge to evaluate and analyse air pollution in European hotspot regions). A sidebar on the right contains links for Home, News, Services, Expertise, About, and Contact. The browser's address bar shows the URL, and the taskbar at the bottom includes icons for various applications.

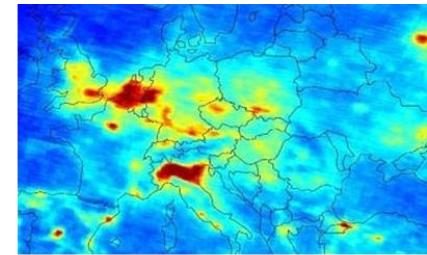
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...) ...)

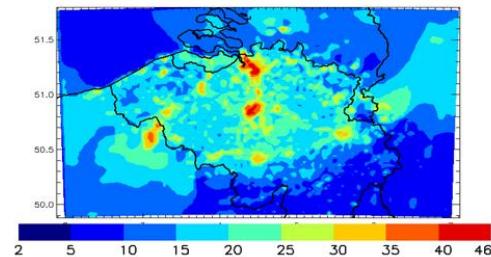
AIR QUALITY MODELLING FOR ANTWERP

Zooming into the Antwerp hotspot : multi-scale air pollution

Continental scale:
Regional hotspots



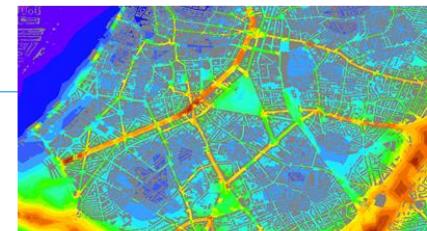
Regional scale:
City hotspots



Urban scale:
Highway hotspots



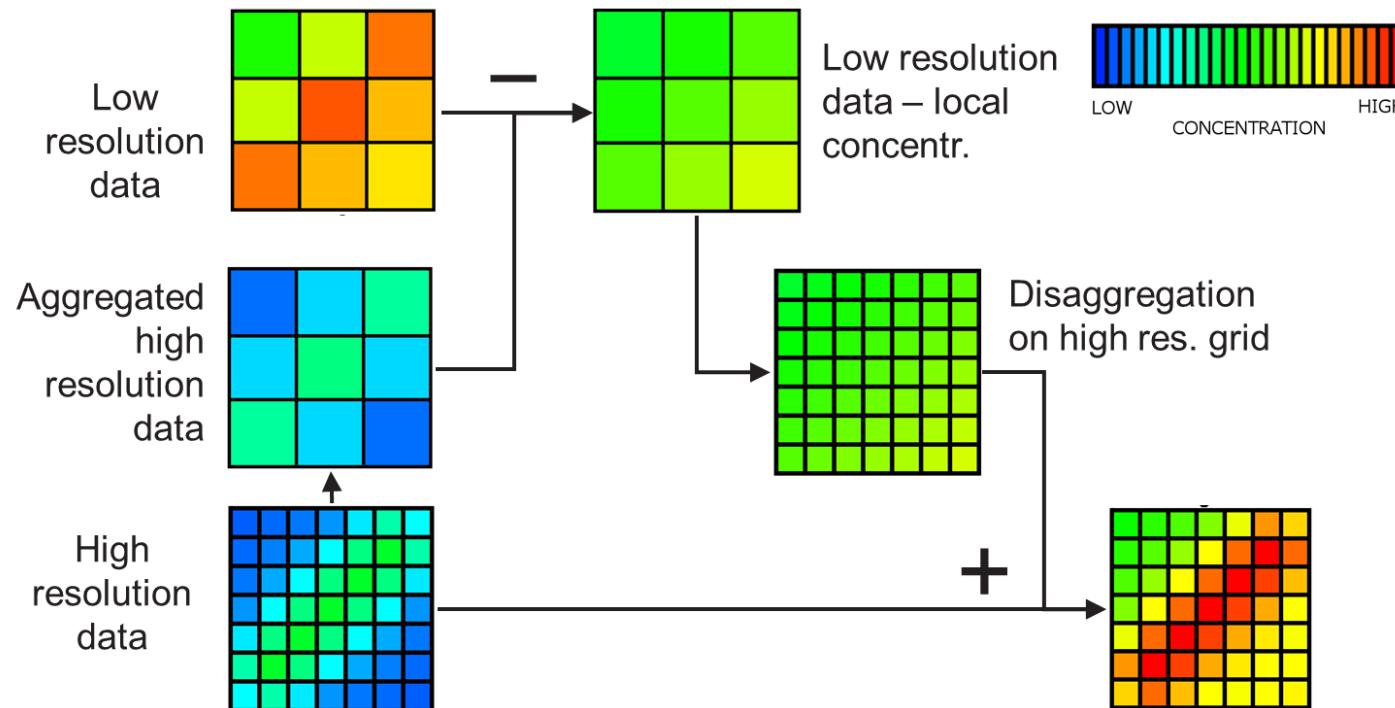
Local scale:
Street canyon hotspots



AIR QUALITY MODELLING FOR ANTWERP

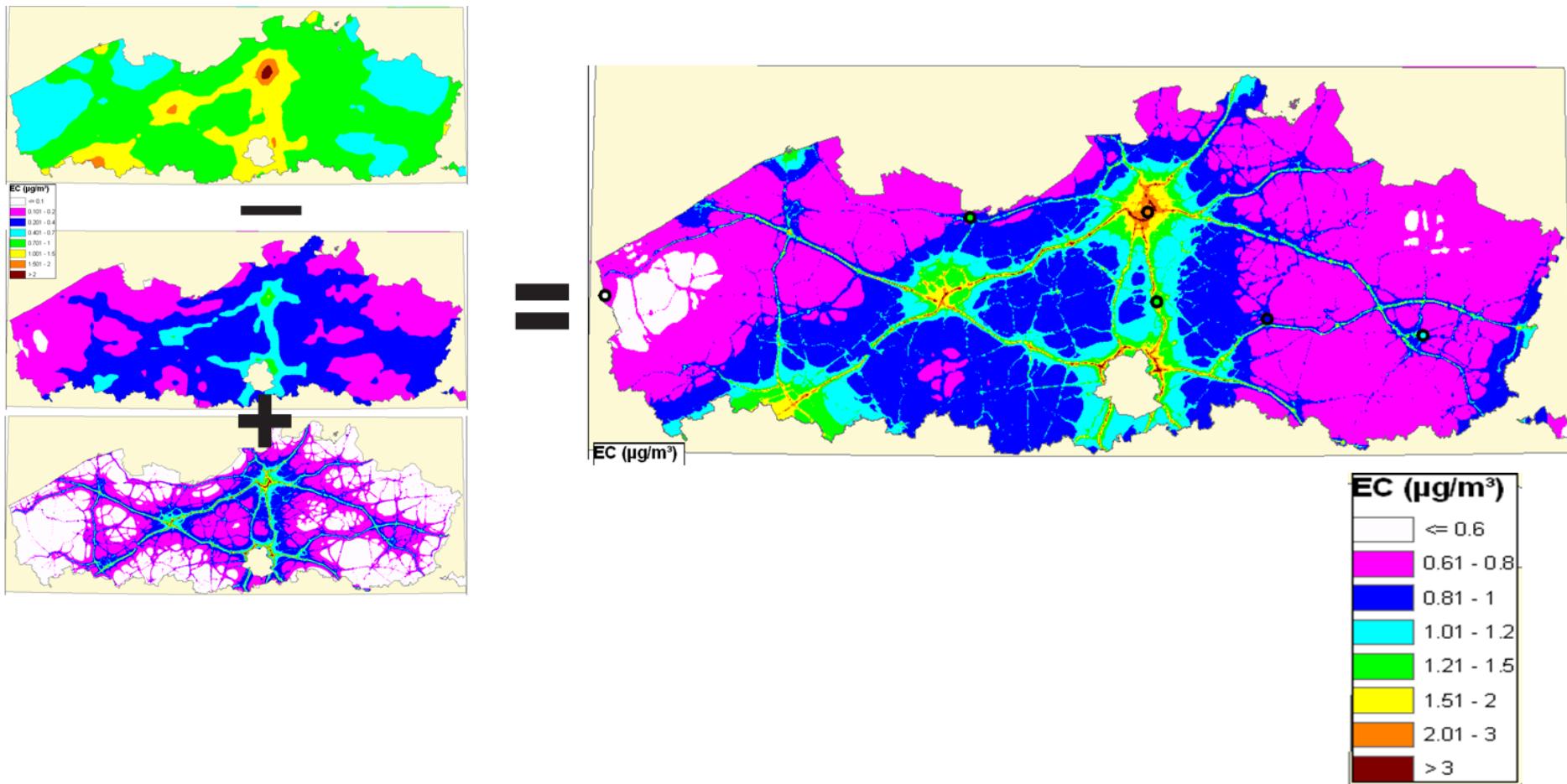
The IFDM/OSPM modelling approach

- » Combining models at different scales
 - » Background usually RIO model or CTM (AURORA)
 - » Double counting correction



AIR QUALITY MODELLING FOR ANTWERP

The IFDM/OSPM modelling approach : double counting correction

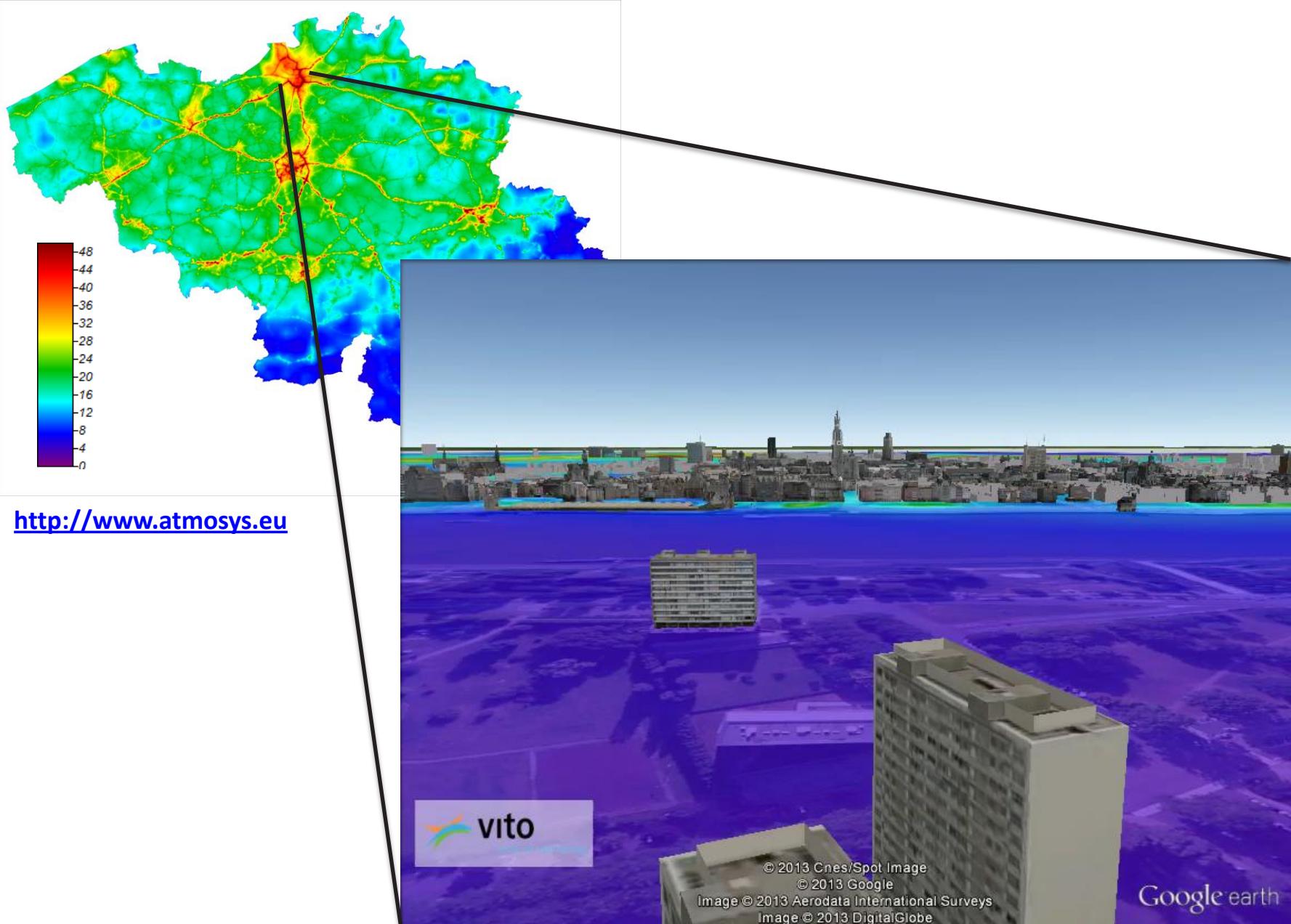


AIR QUALITY MODELLING FOR ANTWERP

Street canyon parametrisation...

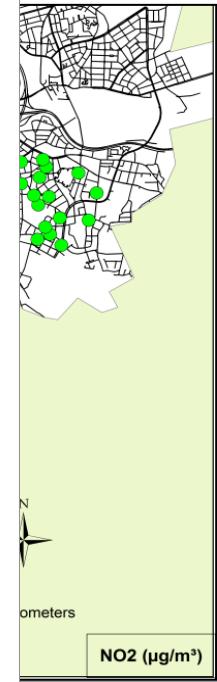
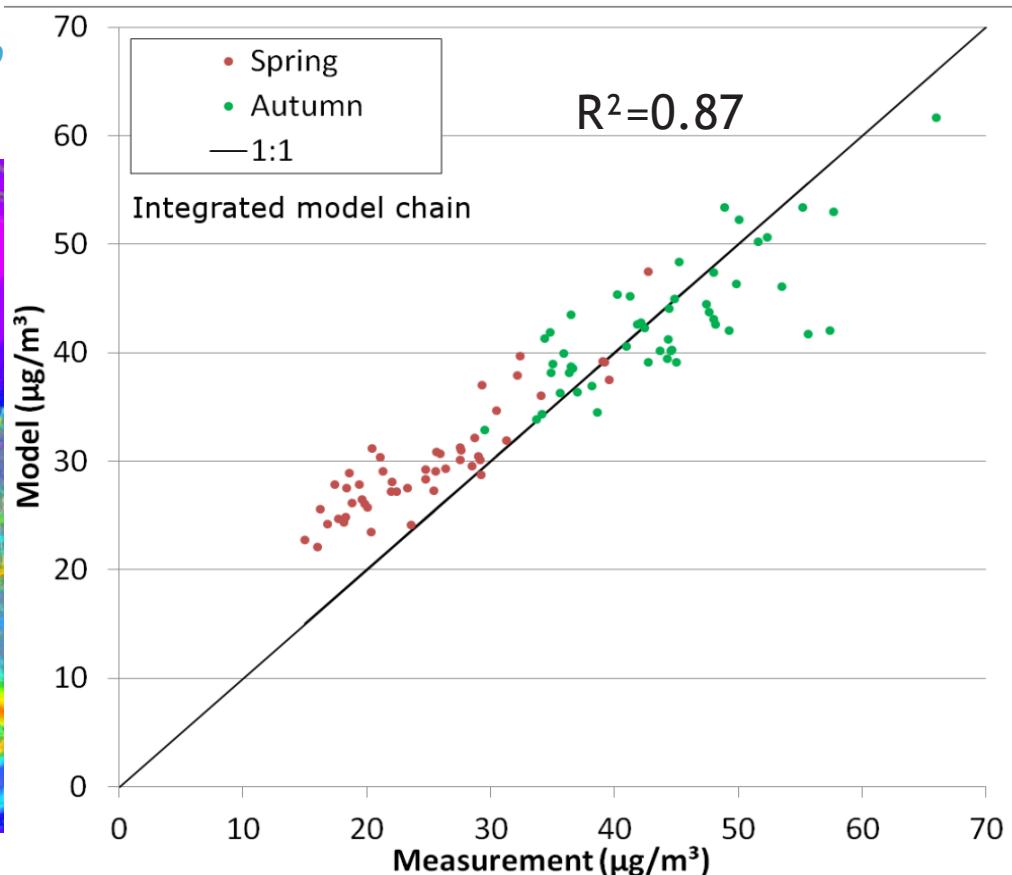
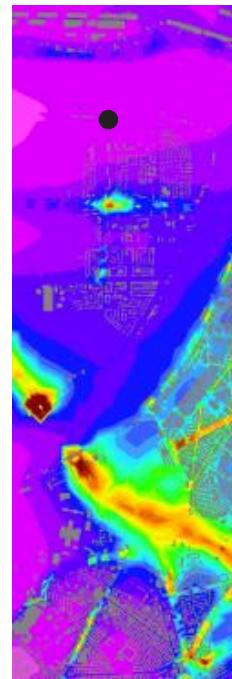
- » In-house developed automated OSPM preprocessor for entire city
- » Street canyon parameters : width, height, distance to nearest crossing, orientation, ...





AIR QUALITY MODELLING FOR ANTWERP

NO₂ exposure camp



- » HEAPS (Health Effects of Air Pollution in Antwerp Schools)
- » Lefebvre, W., Van Poppel, M., Maiheu, B., Janssen, S., Dons, E., 2013. Evaluation of the RIO-IFDM-street canyon model chain. *Atmos. Environ.* 77, 325-337. doi:10.1016/j.atmosenv.2013.05.026

ATMOSYS HIGHWAY CAMPAIGN : AFFLIGEM (E40)

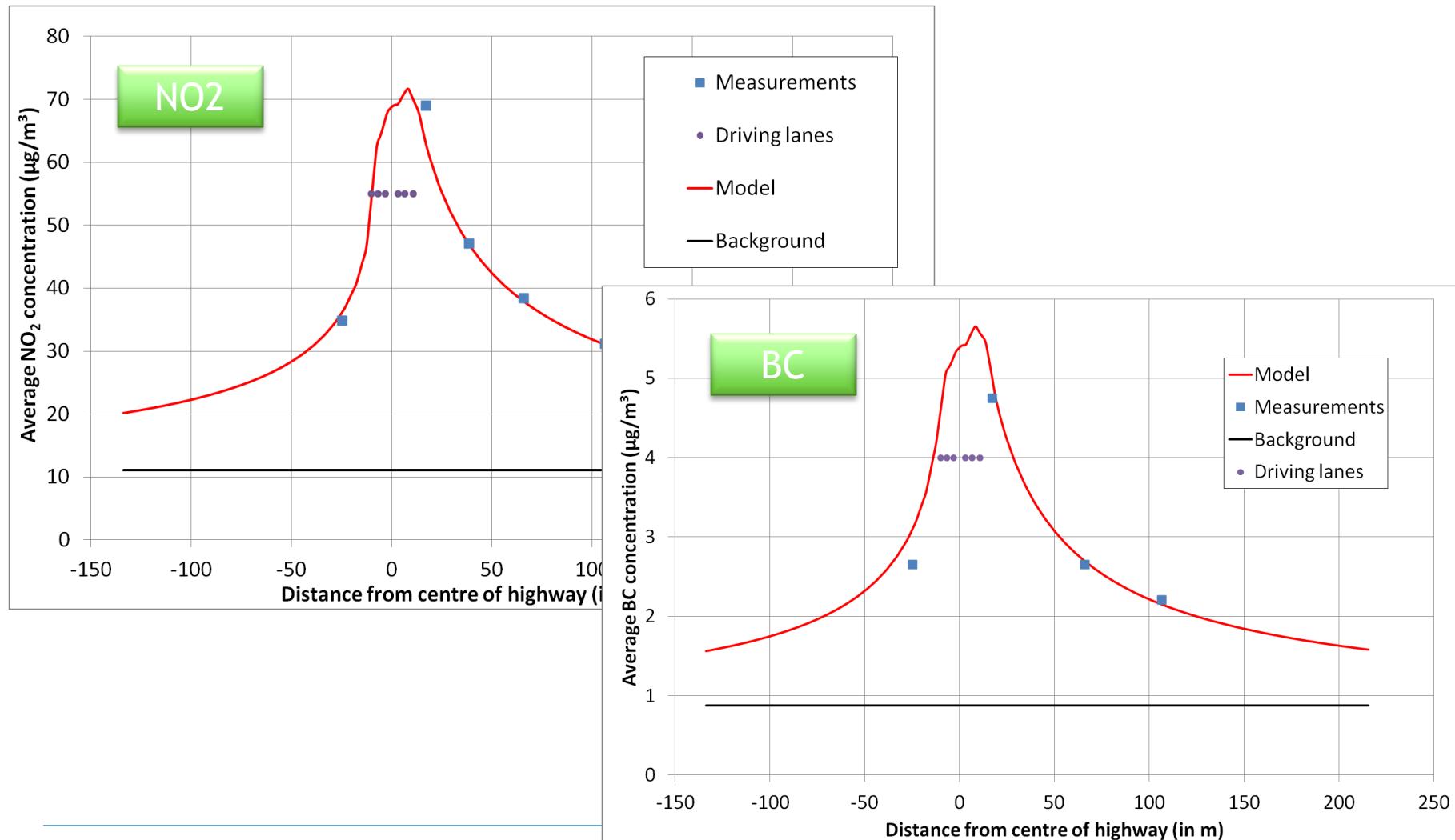
Capturing the concentration gradient around highways...



- » April 2012 until February 2013
- » BC, PM₁₀, PM_{2.5}, NO_x, NH₃, VOC

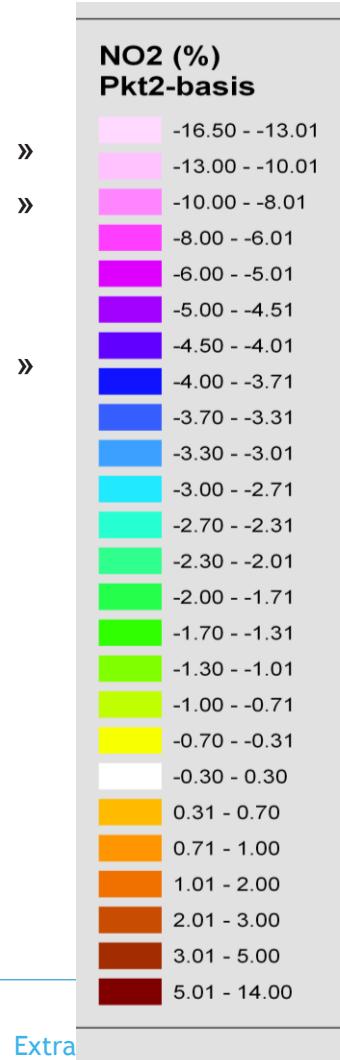


ATMOSYS PROFILES

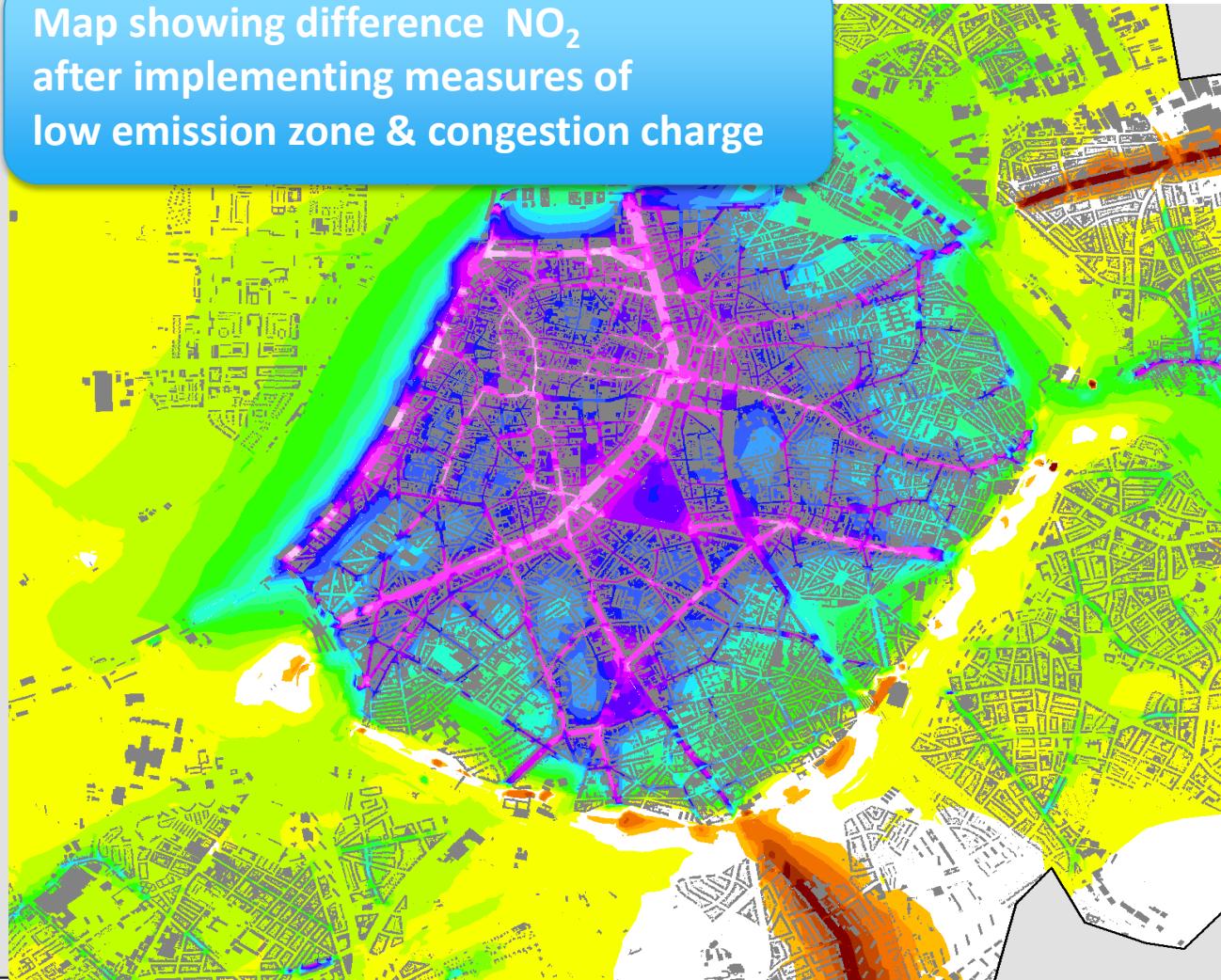


ANTWERP AIR QUALITY

Evaluation of policy options...



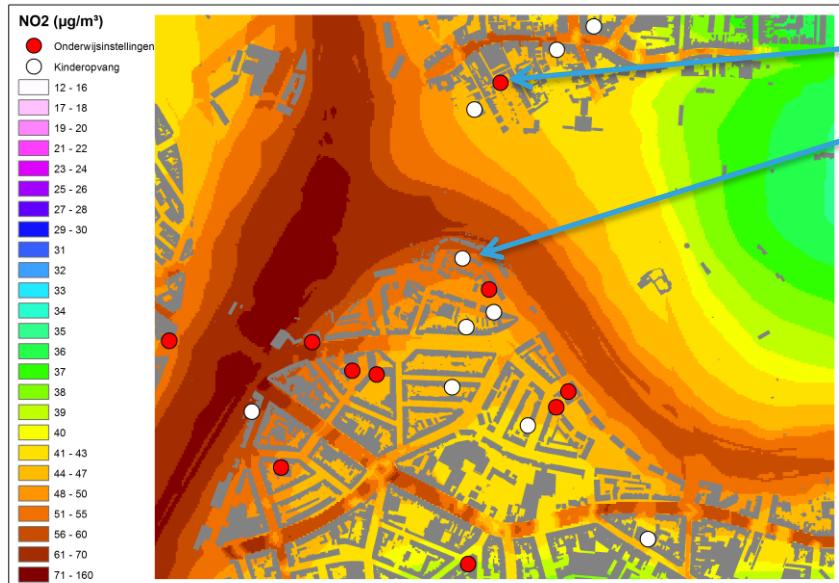
Map showing difference NO₂ after implementing measures of low emission zone & congestion charge



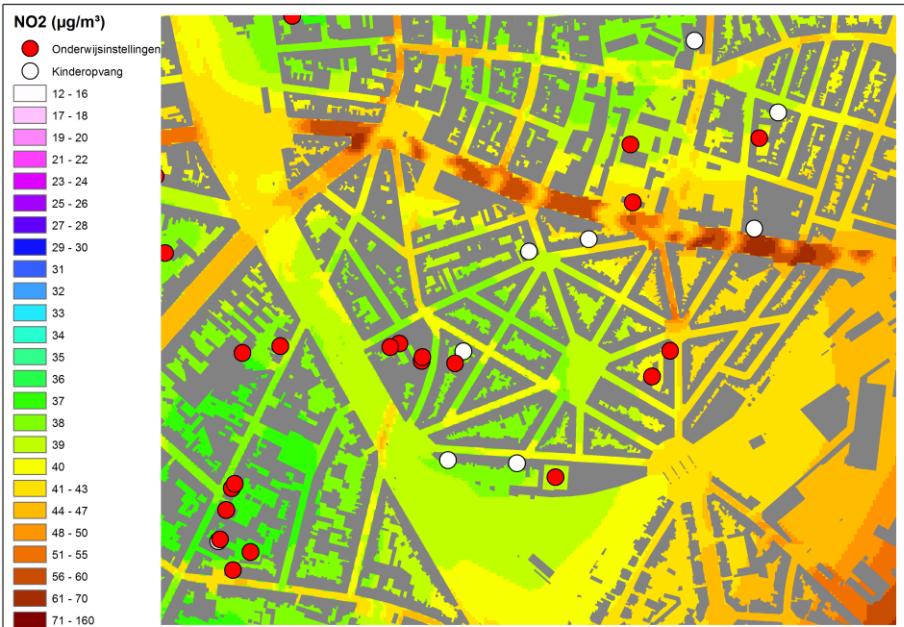
|to

HEALTH: EXPOSURE ASSESSMENT

Exposure assessment at individual house, schools and crèches



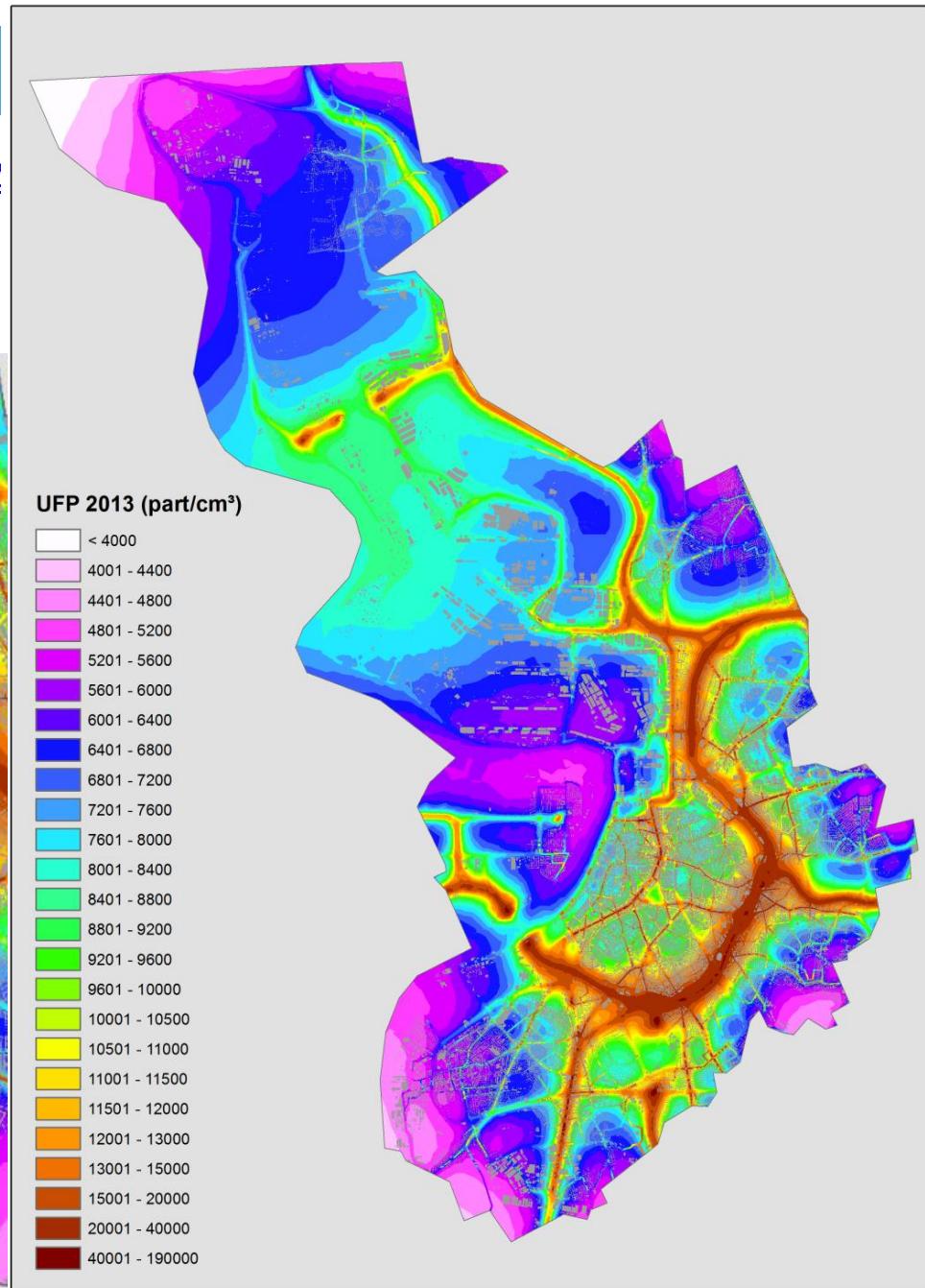
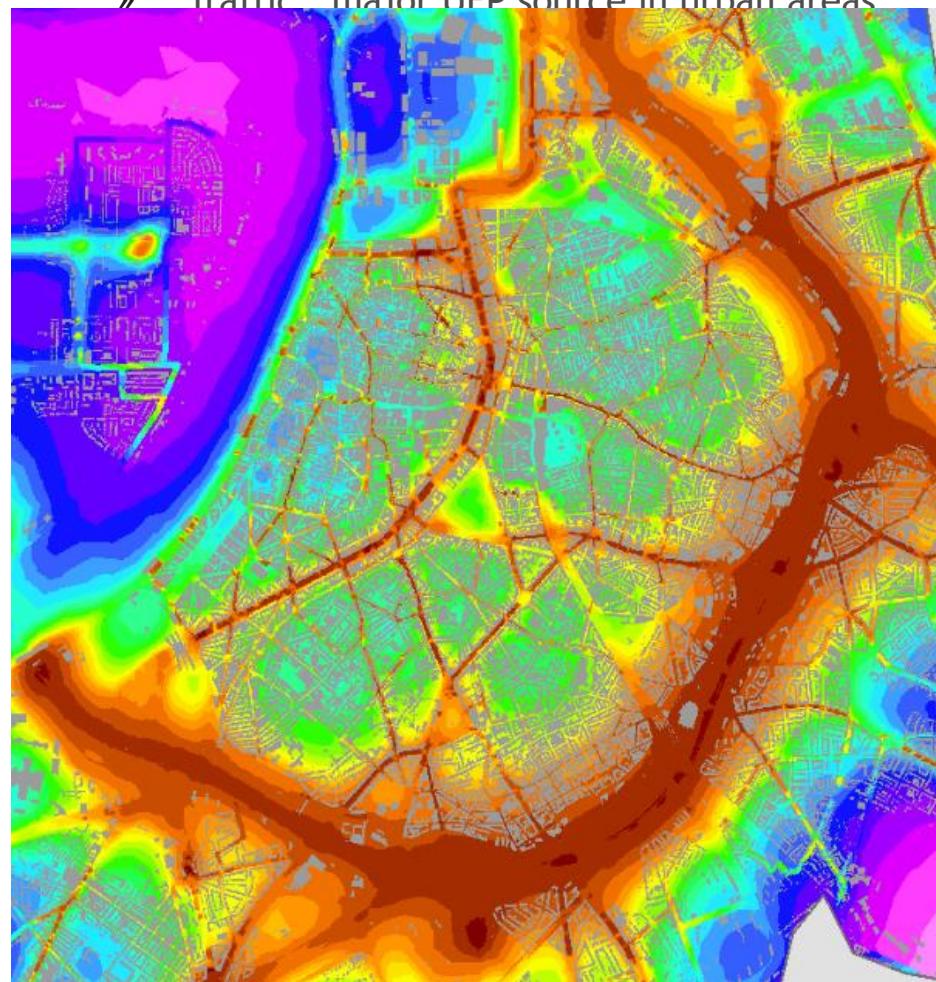
SCHOOL
CRÈCHE



ANTWERP AIR QUALITY

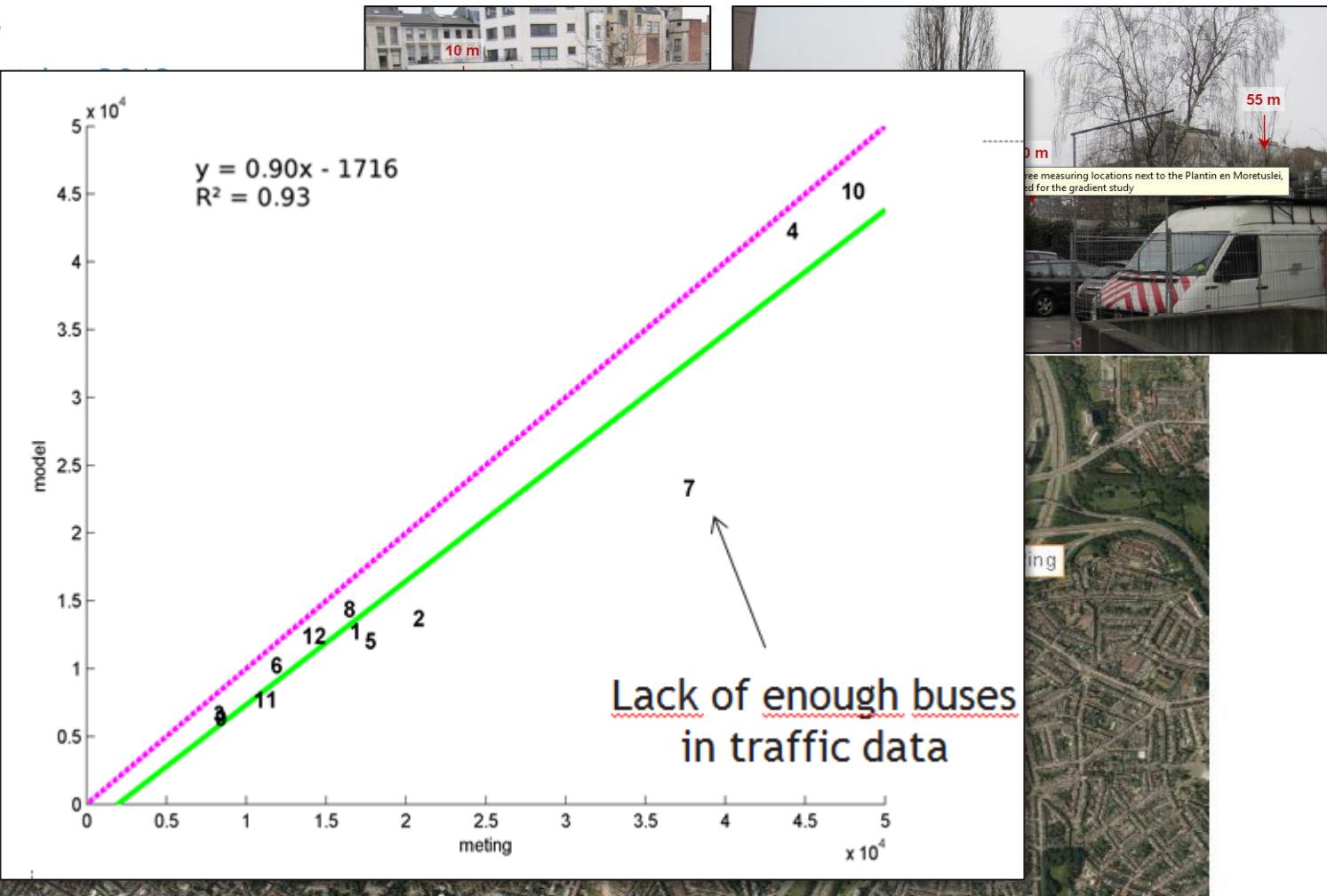
UFP Modelling - The Joquin interreg project ([http://www.joquin.be](#))

» Traffic : major UFP source in urban areas



UFP - VALIDATION

Two campaigns:
February and October



* sampling site



0 500 1.000 m

The screenshot shows the homepage of the Ringland website. At the top, there's a navigation bar with links to 'Agenda', 'Nieuws', 'Over Ringland', 'Academie', 'CurieuzeNeuzen', 'A City is Not a Road', 'Steun ons!', 'Contact', and 'ENGLISH'. The main title 'Een totaaloplossing voor de mobiliteit en de leefbaarheid in en om Antwerpen' is displayed above four circular icons representing traffic flow, green space, urban planning, and realization. Below this is a large image of a modern, green urban landscape. On the left, a video thumbnail shows a highway being covered, with the text 'Overkappen in 4 stappen' and 'Zie hier hoe het werkt'. On the right, there's a graphic for 'CURIEUZE NEUZEN' with a 'Meer info' button. The bottom of the page features a footer with links to 'Wortd de Antwerpse overkappingsintendant een BAM-pion een onafhankelijke actor?', 'Persbericht Ademloos en stRaten-gen', and 'Inspiraakrond project-MER Oosterweelverbinding verdampft'.

Gezonde stad

Bino

STRATEGENERAAL BE X

Varia Kids M10 GMail Google »

Zoeken

HET BOEK OVER HET SINT-ANNABOS

HET SINT-ANNABOS

BEZOEK STRATEN-GENERAAL OOK OP FACEBOOK

StRaten G..
4,7K vind ik leuks

Pagina leuk vinden

Wees de eerste van je vrienden die dit leuk vindt.

CATEGORIEËN

Diest

Doel

Volg

ANTWERP AIR QUALITY

Ringland civilian initiative...

The screenshot shows the homepage of the Ringland crowdfunding campaign. At the top, there's a navigation bar with links: HOME, ONS VOORSTEL, ON TOUR, WORD RINGLANDER, STEUN ONS, and MEER INFO. The main content area features a video player showing a woman smiling, with the text "Word één van de 5000 en steun de studies via www.ringland.be.". To the right, there's a call-to-action button "ik steun de studie". Below the video, a large progress bar indicates "5116 x Bedankt!" and shows a total of "€ 102.320!" raised out of a goal of "€100.000". There are three buttons at the bottom: "Mobiliteitsstudie" (with a double arrow icon), "Leefbaarheidsstudie" (with a heart icon), and "Opbrengsten en kostenstudie" (with an euro sign icon). The background of the page features a stylized illustration of a city skyline and infrastructure.

Word één van de 5000 en steun de studies via www.ringland.be.

Word één van de 5000!

Zorg mee voor de uitvoering van 3 cruciale studies en zet de overkapping nog sterker op de kaart.

Als we politici willen overtuigen om te kiezen voor de overkapping en het mobiliteitsplan van Ringland dan moeten we argumenten op tafel blijven leggen.

Dat kan met extra studies en U kan helpen die te financieren. We zoeken 5000 mensen die 20 euro of meer willen doneren.

ik steun de studie

Maak van Antwerpen zo één van de meest leefbare steden van Europa!

5116 x Bedankt!

€ 102.320!

€100.000

€110.000

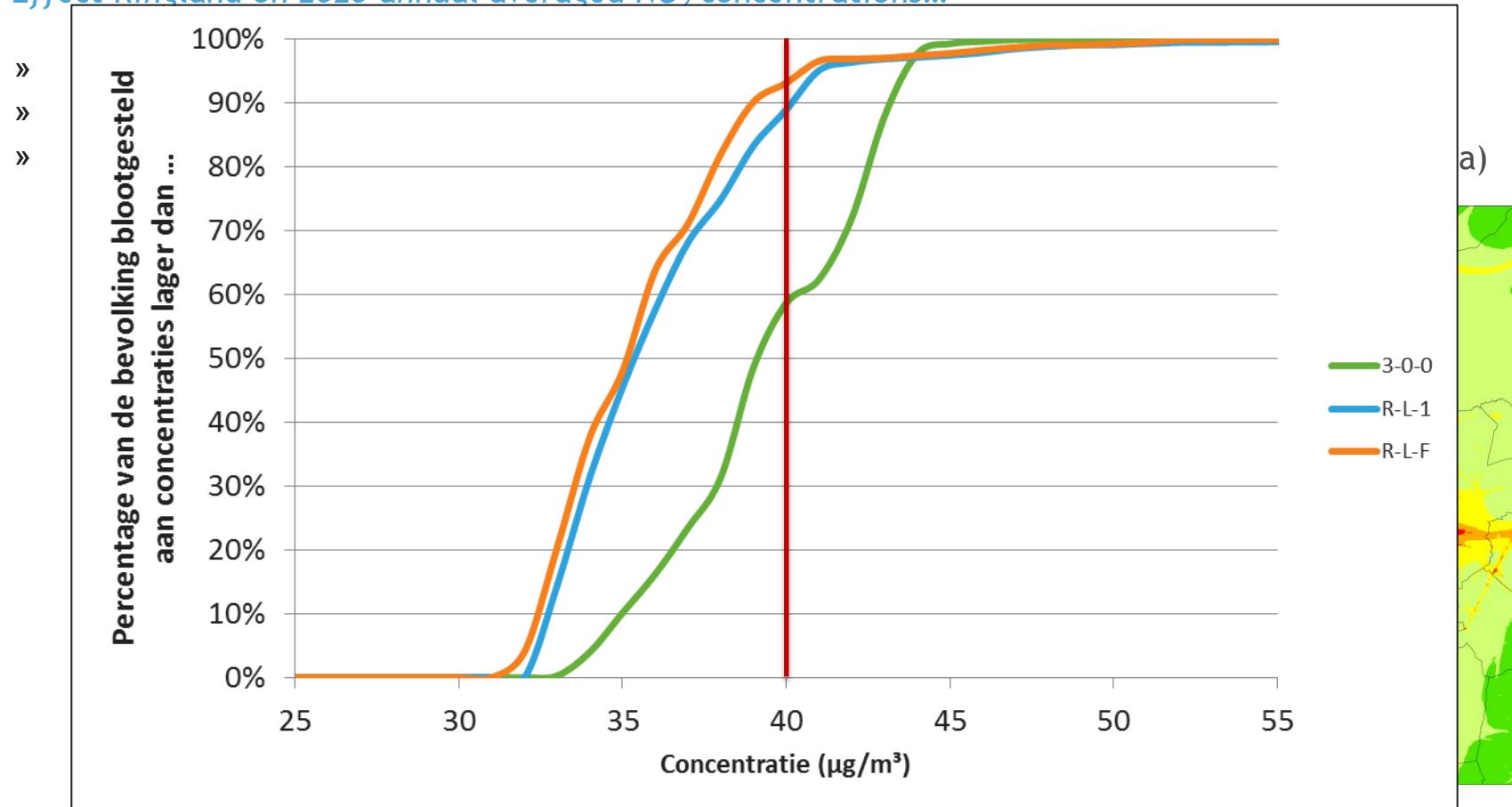
Mobiliteitsstudie

Leefbaarheidsstudie

Opbrengsten en kostenstudie

ANTWERP AIR QUALITY

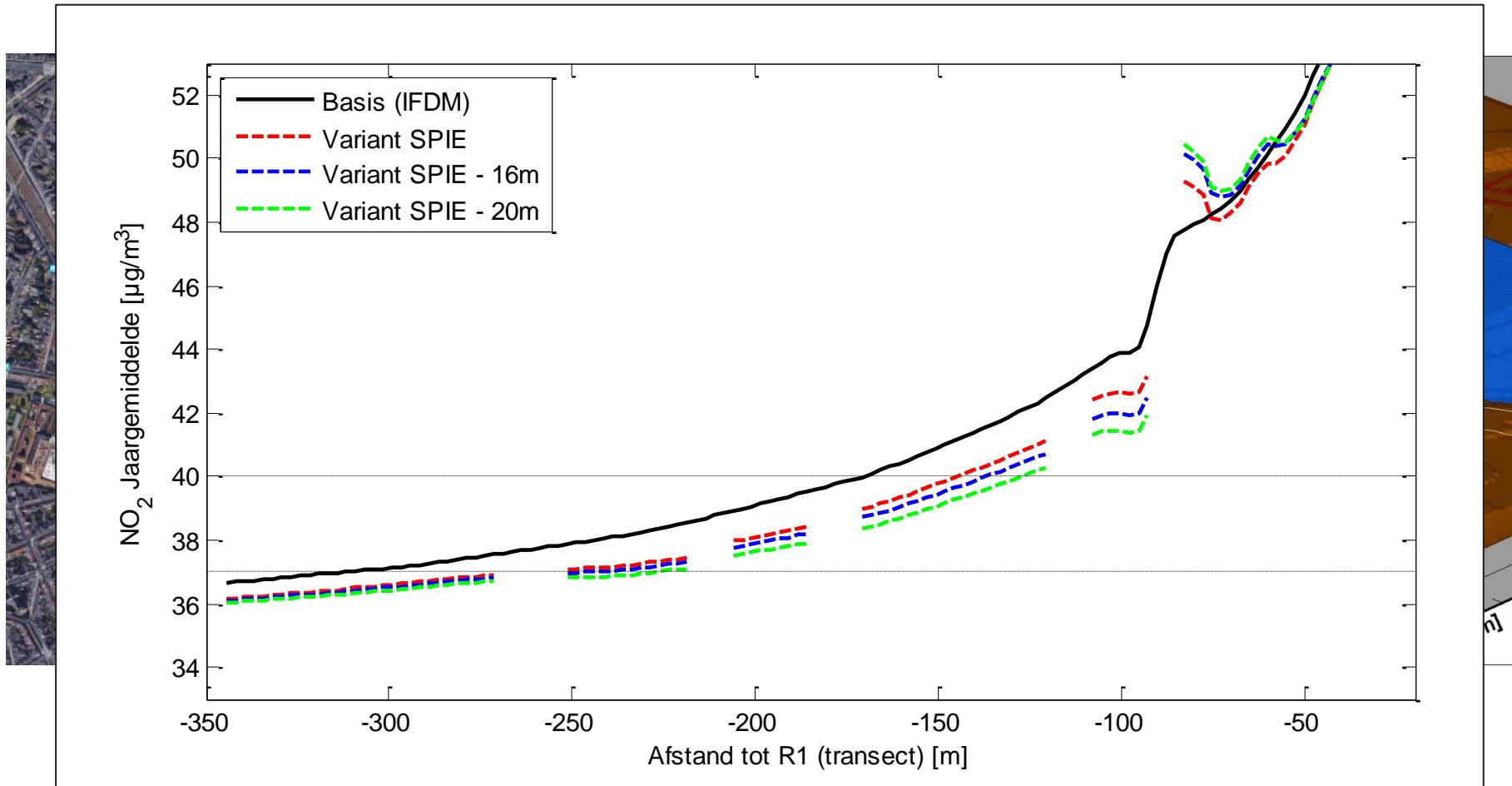
Effect Ringland on 2020 annual averaged NO_x concentrations...



- » Health impact assessment (Van Brusselen et al, 2016) : accepted for publication (PLOS ONE)

ANTWERP AIR QUALITY

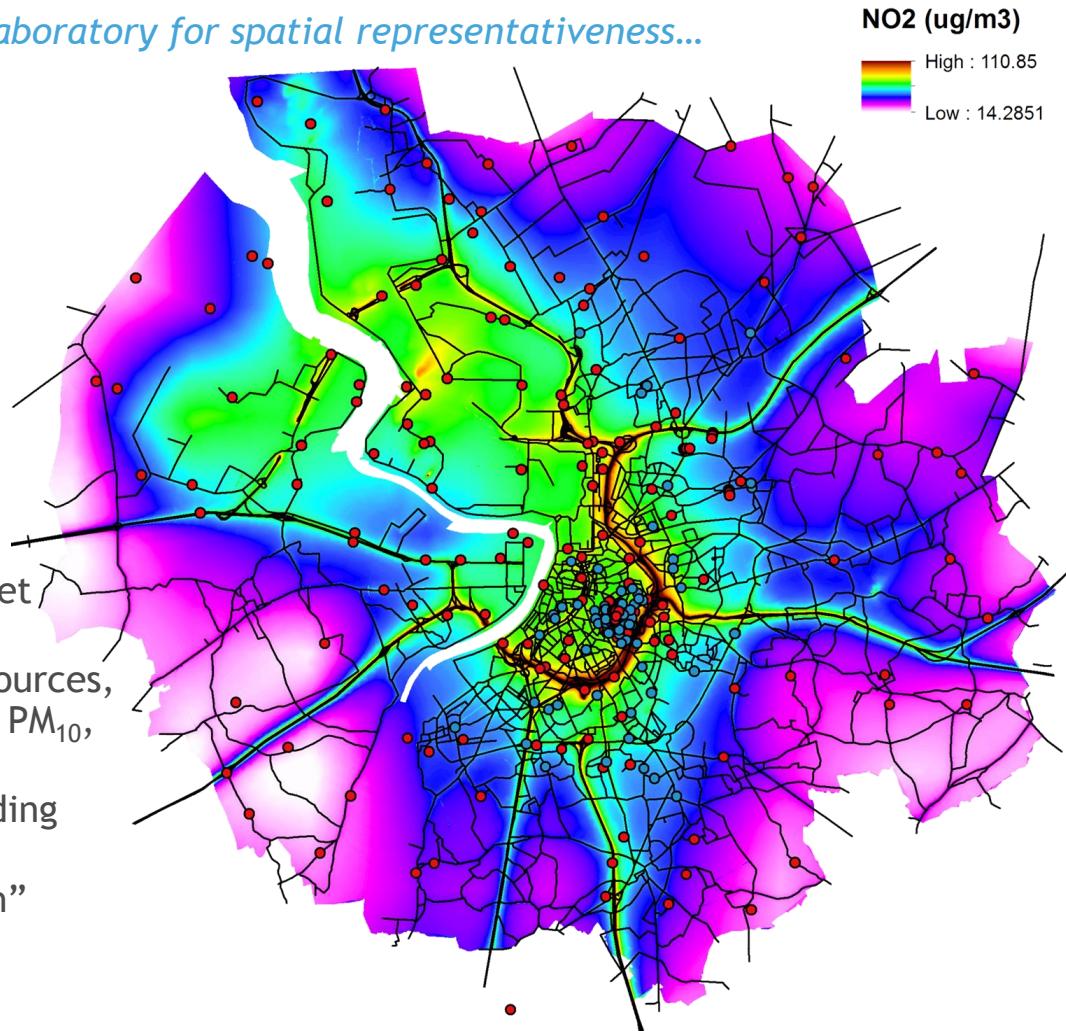
Antwerp air quality at microscale : influence of buffer houses on air quality...



ANTWERP AIR QUALITY

Antwerp as European urban air quality laboratory for spatial representativeness...

- » FAIRMODE
<http://fairmode.jrc.ec.europa.eu/>
- » VITO leads WG1 on assessment
- » CCA-1 Exercise (O. Kracht)
- » Spatial representativeness
 - » Compile benchmarking dataset
 - » Measurements
 - » Traffic data : intensity, fleet composition, ...
 - » Emissions : traffic, point sources, ... : CO, NH₃, NMVOC, NO_x, PM₁₀, PM₂₅, SO_x
 - » GIS info : population, building information, land cover
 - » RIO-IFDM-OSPM as “virtual truth”
 - » 341 virtual receptor points



In summary...

- » Air quality is a multi-scale problem, requiring coherent modelling between scales
- » Remaining hotspots are located in urban environments: NO₂,BC/EC,UFP, ...
- » Air quality & quality of living in general is an essential part of urban development
- » Antwerp as an urban air quality laboratory
 - » Policy support scenario work
 - » Civilian initiatives : e.g. *curieuzezuizen...*
 - » Testbed within FAIRMODE
- » VITO urban air quality modelling expertise : www.atmosys.eu
- » Merci !!