

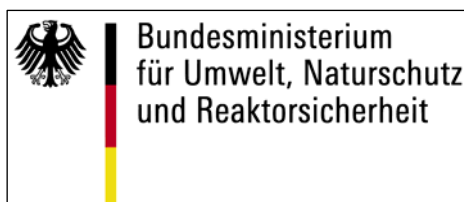
**Proceedings of the
2nd International Conference on Transport,
Atmosphere and Climate (TAC-2)**

Aachen, Germany, and Maastricht, The Netherlands,
22 to 25 June 2009



Edited by

Robert Sausen, Peter F.J. van Velthoven, Claus Brüning and Anja Blum



Ministerie van Verkeer en Waterstaat

<http://www.pa.op.dlr.de/tac/proceedings.html>

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Oberpfaffenhofen, August 2010

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Foreword

The "2nd International Conference on Transport, Atmosphere and Climate (TAC-2)" held in Aachen (Germany) and Maastricht (The Netherlands), 2009, was organised with the objective of updating our knowledge on the impacts of transport on the composition of the atmosphere and on climate, three years after the TAC conference in Oxford (United Kingdom).

The TAC-2 conference covered all aspects of the impact of the different modes of transport (aviation, road transport, shipping etc.) on atmospheric chemistry, microphysics, radiation and climate, in particular:

- engine emissions (gaseous and particulate),
- emission scenarios and emission data bases for transport,
- near-field and plume processes, effective emissions,
- transport impact on the chemical composition of the atmosphere,
- transport impact on aerosols,
- contrails, contrail cirrus, ship tracks,
- indirect cloud effects (e.g., aerosol-cloud interaction),
- radiative forcing,
- impact on climate,
- metrics for measuring climate change and damage,
- mitigation of transport impacts by technological changes in vehicles and engines,
- mitigation of transport impacts by operational means.

The conference was also a forum for dialogue of the QUANTIFY⁴ and ATTICA⁵ project participants with the wider scientific community. While QUANTIFY was a research project, ATTICA's main objective was to produce assessment reports on the atmospheric impact of the different modes of transport (aviation, shipping, land transport) and on metrics to compare the climatic impacts. The ATTICA reports will be published in *Atmospheric Environment* in 2010.

The conference benefited from substantial financial support from the German Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit⁶, from the Dutch Ministerie van Verkeer en Waterstaat⁷, and the European Commission's DG Research, to whom the organizers are extremely grateful.

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⁴ QUANTIFY was an EC funded Integrated Project entitled "Quantifying the Climate Impact of Global and European Transport Systems", see also <http://ip.quantify.eu>.

⁵ ATTICA was an EC funded Specific Support Activity entitled "European Assessment of Transport Impacts on Climate Change and Ozone Depletion", see also <http://ssa-attica.eu>.

⁶ Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

⁷ Ministry of Transport, Public Works and Water Management

Program Committee

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Prof. Horst Friedrich, DLR, Germany
Dr. Jan Fuglestedt, CICERO, Norway
Dr. Pieter Hammingh, PBL, The Netherlands
Mr. Falk Heinen, BMU, Germany
Prof. Rolf Henke, RWTH, Germany
Prof. Ivar Isaksen, UiO, Norway
Dr. Dietrich Knörzer, EC, Belgium
Prof. David S. Lee, MMU, United Kingdom
Prof. Joyce Penner, University of Michigan, USA
Dr. Ernie Weijers, ECN, The Netherlands
Prof. Christos Zerefos, NKUA, Greece

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Conference Agenda

Sunday, 21 June 2009

- 18:00 Registration
20:00 End of Sunday registration time

Monday, 22 June 2009

- 08:00 Registration

Opening Ceremony

Chair: Sausen

- 08:45 Ministerialdirigent Hubert Steinkemper, Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Germany
Opening Address
- 09:00 Dr. Claus Brüning, European Commission
Opening Address
- 09:15 Dr. Frits Brouwer, Director-General, Koninklijk Nederlands Meteorologisch Instituut, The Netherlands
Opening Address
- 09:25 Prof. Dr. Ulrich Schumann, Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany
Opening Address
- 09:35 Prof. Dr. Robert Sausen,
Introduction to Aachen and Maastricht
- 10:00 *Poster setup / Coffee*

Emissions

Chair: N. Dotzek

- 10:30 R. Kurtenbach, E. Anamaterou, C. Helmis, C. Heyder, M. Hoffmann, C. Jahn, A. Niedojadlo, M. O'Connor, K. Schäfer, G. Sgouros and P. Wiesen: *Airport air quality study in Athens. Gaseous and particle emissions from commercial aircraft at take-off condition*
- 10:50 B. Anderson and A. Beyersdorf: *An overview of the NASA Alternative Aviation Fuel Experiment (AAFEX)*
- 11:10 P. Whitefield, D. Hagen, P. Lobo and R. C. Miake-Lye: *Emissions from alternate aviation fuels and their environmental impact*
- 11:30 K. S. Patel, Y. Nayak, and M. Georg: *Polycyclic aromatic hydrocarbon road dust pollution in India*
- 11:50 R. C. Miake-Lye, E. C. Wood, M. T. Timko, Z. Yu, W. B. Knighton and S. C. Herndon: *The effects of alternative fuels on the composition of hydrocarbon and particle emissions from aircraft engines*
- 12:10 H. Hemmer, T. Otten, M. Plohr and A. Döpelheuer: *Emission characteristics of future ultrahigh-bypass-ratio aero engines*

Impact on atmospheric composition I**Chair: J. Penner**

- 12:30 O. Dessens, A. Anger, T. Barker, H. Rogers, R. Jones and J. Pyle (solicited): *Effect of climate control on air pollution: Methodology and preliminary results from one-way coupling of an energy-environment-economy model and atmospheric chemistry model in de-carbonising international transport*
- 13:10 Lunch
- 14:40 T. Halenka, P. Huszar and M. Belda: *On the resolution sensitivity of transportation emission impacts – Application in effective emission concept for ships*
- 15:00 J. Moldanová and L. Persson: *Importance of subscale processes in modelling emissions from shipping*
- 15:20 G. Gadzhev, K. Ganev, D. Syrakov, G. Jordanov, M. Prodanova, N. Miloshev and A. Todorova: *Transport and transformation of air pollution from road and ship transport – Joint analysis of regional-scale impacts and interactions*
- 15:40 V. Matthias, I. Bewersdorff, A. Aulinger and M. Quante: *Enhanced aerosol formation due to ship emissions in the North Sea regions*
- 16:00 V. Eyring, I. Isaksen, T. Berntsen, W. Collins, J. Corbett, O. Endresen, R. Grainger, J. Moldanová, H. Schlager and D. Stevenson: *Transport impacts on atmosphere and climate: Shipping*
- 16:20 Posters / Coffee
- 16:50 S. Dalsøren, M. S. Eide, O. Endresen, G. Gravir, A. Mjelde and I. S. A. Isaksen: *Update on emissions and environmental impacts from the international fleet of ships*
- 17:10 J. Moldanová, E. Fridell, O. Popovicheva, A. Faccinnetto and C. Focsa: *Characterisation of particulate matter and gaseous emissions from a large ship diesel engine*
- 17:30 K. S. Patel and S. Gupta: *Environment impact of the extreme particulate in aerosol and their impact*
- 17:50 M. Prather: *Uncertainties in calculating aviation's impact on global atmospheric chemistry*
- 18:10 End of presentations
- 19:00 Icebreaker (Krönungssaal, Rathaus Aachen)

Chair: F. Heinen**Tuesday, 23 June 2009**

- 08:30 Registration

Clouds and cloud effects**Chair: C. Brüning**

- 09:00 J. Penner and M. Wang: *Effects of aircraft aerosols on cirrus clouds, tropopause temperatures, and water transport to the stratosphere*
- 09:20 U. Burkhardt: *Climate impact of contrail cirrus*
- 09:40 K. Eleftheratos, C. Zerefos and P. Minnis: *Update of man-made and natural trends in cirrus clouds*
- 10:00 M. Vazquez-Navarro, H. Mannstein and B. Mayer: *Lifecycle of contrails*
- 10:20 O. Popovicheva and P. DeMott: *Ice nucleation on soot in contrails and cirrus*
- 10:40 Posters / Coffee
- 11:10 P. Minnis, R. Palikonda, D. Duda and P. Heck: *(solicited) Microphysical properties of contrails derived from satellite measurements*
- 11:40 C. Voigt, T. Jurkat, U. Schumann, D. Schäuble, H. Schlager, A. Petzold, D. Delhaye, A. Dörnbrack, F. Arnold, M. Krämer, J.-F. Gayet, J. Schmale, J. Schneider, S. Borrmann, H. Eichler and the CONCERT team: *Detection of contrails from various aircraft – Overview of the CONCERT (CONtrail and Cirrus ExpeRimenT) campaign*

Chair: K. Gierens

- 12:00 V. Dedesh, R. Tenishev, S. Kiose, V. Popov, E. Pavlova, I. Voronich, M. Lavrov, V. Mogilnikov, A. Zamyatin, R. Kagarmenov, A. Lanshin, A. Evstigneev, A. Nevzorov and O. Popovicheva: *Quantitative forecast model of the formation conditions of steady contrails and prospects of its appliance*
- 12:20 U. Schumann: *A contrail cirrus prediction tool*
- 12:40 A. M. Sayer and R. G. Grainger: *A global ship track climatology from ATSR-2: June 1995 – January 2001*
- 13:00 *Lunch*

Poster session**Chair: N. Dotzek**

- 14:30 Posters on display: *Authors in attendance*
- 16:00 Posters / *Coffee*

Impact on climate I**Chair: P. Hammingh**

- 16:30 B. Kärcher, U. Burkhardt, P. Minnis and S. Unterstrasser: *Impact of microphysical variability on contrail cirrus optical depth and radiative forcing*
- 16:50 N. Lamquin, C. J. Stubenrauch, S. Cros and H. Smit: *Risk assessment of contrail impact on climate using AIRS, MOZAIC and Aero2K databases*
- 17:10 Y. Balkanski, G. Myhre, G. Rädcl and K. Shine: *Direct radiative effect of aerosols emitted by transport: From road, shipping and aviation*
- 17:30 H. Preston, L. L. Lim, D. S. Lee and P. Hooper: *Transport emissions and climate stabilization*
- 17:50 R. B. Skeie, J. S. Fuglestedt, T. Berntsen, M. T. Lund, G. Myhre and K. Rypdal: *Global temperature change from the transport sectors: Historical development and future scenarios*
- 18:10 M. Ponater, N. Stuber, K. P. Shine, E. Highwood, G. Rädcl and S. Dietmüller: *Indications of distinctive efficacies for transport-related ozone perturbations*
- 18:30 *End of presentations*

Wednesday, 24 June 2009

- 08:00 Registration

Impact on atmospheric composition II**Chair: T. Berntsen**

- 08:30 D. Cariolle, R. Paoli, D. Hauglustaine, D. Caro, B. Cuenot and R. Paugam: *Introduction of plume chemistry into large-scale atmospheric models*
- 08:50 N. Sitnikov, H. Schlager, V. Sitnikova, F. Ravegnani, A. Ulanovskiy, A. Lukjanov, A. Roiger, M. Scheibe, M. Lichtenstern and P. Stock: *Investigation of NO₂ pollutions on board of research aircraft (some results of QUANTIFY and POLARCAT field campaigns)*
- 09:10 R. Paoli, R. Paugam, L. Nybelen, C. Sarrat and D. Cariolle: *High-resolution numerical simulations of physico-chemical processes in aircraft wakes*
- 09:30 M. Uphoff and K. H. Schlunzen: *Sensitivity of model results depending on parameterisation of aircraft-induced mixing in a mesoscale model*
- 09:50 S. C. Herndon, E. C. Wood, M. T. Timko, Z. Yu, W. B. Knighton and R. C. Miake-Lye: *The evolution of aircraft engine emissions in the atmosphere*
- 10:10 Posters / *Coffee*
- 10:40 J. Williams, G.-J. van Zadelhoff and P. van Velthoven: *The effect of ice particles on the tropospheric ozone budget via heterogeneous conversion processes*

Impact on climate II**Chair: U. Schumann**

- 11:00 R. Kaur and C. Dey: *Short-haul flights and climate change: What are the effects and potential alternatives?*
- 11:20 M. Z. Jacobson, J. T. Wilkerson, A. D. Naiman and S. K. Lele: *Quantifying the effects of aircraft on climate with a model that treats the subgrid evolution of contrails from all commercial flights worldwide*
- 11:40 *End of presentations*
- 12:00 *Bus transport to Maastricht*
- 13:00 *Lunch (room Napoleon)*

Chair: B. Bregman

- 14:00 Staatssecretaris Tineke Huizinga, Ministerie van Verkeer en Waterstaat, NL: *Welcome address*
- 14:15 Dr. Claus Brüning, EC: *Atmospheric research in the 7th Framework Programme of the EU*
- 14:25 Hein Haak, Climate and Seismology, Koninklijk Nederlands Meteorologisch Instituut, The Netherlands: *Welcome address*
- 14:35 Prof. Robert Sausen, Deutsches Zentrum für Luft- und Raumfahrt: *The impact of transport on climate*
- 15:00 Henk van Hoorn, Ministerie van Verkeer en Waterstaat, NL: *Overview National Transportation Policy of The Netherlands*
- 15:15 Sibrand Hassing, Ministerie van Verkeer en Waterstaat, NL: *Ship emissions and the Road to Copenhagen*
- 15:30 *Coffee*
- 16:00 *Panel Discussion*
- 16:45 *Press conference / Buses to Valkenburg*
- 17:30 *Last bus to Valkenburg*
- 17:30 *Guided tour Fluweelengrot / Ruins*
- 18:45 *Buses to Berg en Terblijt*
- 19:00 *Conference Dinner*
- 22:30 *Buses to Aachen*

Chair: R. Sausen**Thursday, 25 June 2009**

- 08:30 Registration

Impact on climate III**Chair: B. Bregman**

- 09:00 D. S. Lee, D. W. Fahey, P. M. Forster, P. J. Newton, R. C. N. Wit, L. L. Lim, B. Owen and R. Sausen: *Aviation and global climate change in the 21st century*
- 09:20 L. Wilcox, B. Hoskins and K. Shine: *Water vapour emissions from aircraft*
- 09:40 C. Fichter, M. Ponater, V. Grewe and R. Sausen: *Air traffic climate effects in dependency of emission location and altitude*
- 10:00 L. Lim, H. Preston, D. S. Lee: *Exploring the uncertainties involved in calculating temperature response from the transport sector*
- 10:20 S. Unterstrasser and K. Gierens: *Numerical simulations of contrail-to-cirrus transition – The impact of radiation*
- 10:40 *Posters / Coffee*
- 11:10 N. Dotzek: *Technical information concerning your proceedings contribution*

Metrics and mitigation**Chair: J. Moldanová**

- 11:20 J. Fuglestedt, K. P. Shine, J. Cook, D. S. Lee, A. Stenke, R. Skeie, G. J. M. Velders and I. A. Waitz: (solicited) *Comparing climate impacts of transportation*
- 12:00 R. Egelhofer, D. Schmitt and K. Shine: *Aircraft design driven by climate change*
- 12:20 P. Hammingh: *Effects of biofuels on emissions of air pollutants*
- 12:40 U. Kugler, J. Theloke, P. Builtjes, R. Stern, W. Jörß, R. Köble, B. Thiruchittampalam, T. Geftler, M. Uzbasich, R. Friedrich, U. Dämmgen and J. Appelhans: *Abatement strategies to reduce air pollution from transport in Germany*

13:00 *Lunch*

Chair: R. Miake-Lye

- 14:30 T. Berntsen, J. Fuglestedt and K. Rypdal: *Climate effects of passenger cars: Gasoline versus diesel*
- 14:50 H. Mannstein, K. Gierens, K. Graf, A. Waibel, S. Meilinger, A. Seifert and C. Köhler: *Smart aircraft routing – a possibility for mitigation?*
- 15:10 S. Matthes: *ECATS - Mission of Association for an environmental compatible air transport system*
- 15:20 M. Gupta: *Aviation Climate Change Research Initiative (ACCRI): The Next Steps*

Closing Session**Chair: R. Sausen**

- 15:30 *Summary, conclusions, awards, ...*
- 16:00 *Coffee*
- 16:30 *End of meeting*

List of Posters

A. Emissions

- A.01 J. Borken-Kleefeld, H. Steller, G. de Ceuster, F. Vanhove, M. Eide, O. Endresen, H. Behrens, D. Lee, B. Owen, T. Meretei, K. Rypdal, R. Skeie, J. van Aardenne, G. Erhardt and R. Sausen: *QUANTIFY transport emission scenarios up to 2100*
- A.02 J. Moldanová, E. Fridell, O. Popovicheva, A. Faccinnetto and C. Focsa: *Characterisation of particulate matter and gaseous emissions from a large ship diesel engine*
- A.03 A. Okhapkin and A. Shustov: *Simulation and forecasting of the civil aircraft pollutants above the territory of Russia*
- A.04 A. Paxian, V. Eyring, W. Beer, R. Sausen and C. Wright: *Bottom-up emission inventory for international shipping*
- A.05 V. Tishkova, B. Demirjian, D. Ferry, O. Popovicheva, N. Persiantseva, E. Kireeva, N. Shonija, N. Zubareva, J. Moldanova and E. Fridell: *Ship exhaust characterization: Micro-structure, elemental composition, surface chemistry*

B. Impact on atmospheric composition

- B.01 A. Akachat: *Atmospheric pollution and particulate matter concentration at petrol station in semi-urban site*
- B.02 B. Ambade and K. S. Patel: *Chemical composition of rainwater in Raipur*
- B.03 A. J. Badyda: *The multifarious influence of vehicular traffic on the municipal environment*
- B.04 K. Dahlmann, V. Grewe, M. Ponater and S. Matthes: *Trends in ozone concentration caused by emissions from fossil fuel combustion and natural sources*
- B.05 O. Dessens, P. Hoor, M. Gauss, I. S. A. Isaksen, B. Koffi, M. Prather, Q. Tang, P. van Velthoven and J. A. Pyle: *Transport modes impact on atmospheric chemistry: 2000 to 2100 SRES A1 scenario*
- B.06 N. Dotzek, S. Matthes and R. Sausen: *SPIDER model simulations of aircraft plume dilution*
- B.07 K. Gottschaldt, C. Voigt and B. Kärcher: *ECHAM5/Messy simulations with the HO₂ + NO → HNO₃ reaction*
- B.08 J. Hurley and D. S. Lee: *Impact of aviation emissions from multi-year MOZART simulations*
- B.09 V. K. Jena and S. Gupta: *Assessment of chemical composition of atmosphere and its impact*
- B.10 T. Jurkat, C. Voigt, F. Arnold, H. Schlager, M. Lichtenstern and H. Aufmhoff: *Sulfuric acid formation in jet aircraft exhaust - In-flight ion trap CIMS investigations of different aircraft*
- B.11 M. Köhler, G. Rädcl, K. P. Shine, H. L. Rogers and J. A. Pyle: *Regional growth in aircraft NO_x emissions and related atmospheric impacts*
- B.12 R. C. Pike and J. A. Pyle: *Air-quality impacts of large-scale biofuel use: What can a global model tell us about our future decisions?*
- B.13 C. Schnadt Poberaj, R. Bintanja, B. Koffi, O. Dessens, S. Dalsoren, M. Gauss, V. Grewe, P. Hoor, I. Isaksen, D. Olivíe, J. Staehelin and P. Van Velthoven: *QUANTIFY Activity 3: Model evaluation of global chemistry models*

C. Clouds and cloud effects

- C.01 S. L. Baughcum, M. Y. Danilin, L. M. Mioshevich and A. J. Heymsfield: *Properties of ice-supersaturated regions based on radiosonde analysis*
- C.02 S. Dietmüller, M. Ponater, R. Sausen and S. Pechtl: *Some evidence against a significant contrail impact on diurnal temperature range*
- C.03 A. Ferrone, P. Marbaix and J.-P. van Ypersele: *Simulation of aircraft-induced cloudiness in the regional climate model CCLM*
- C.04 K. Graf, B. Mayer, H. Mannstein and U. Schumann: *Aviation fingerprint in diurnal cycle of cirrus over the North Atlantic*

- C.05 E. Kireeva, O. Popovicheva, N. Persinatseva and N. Shonija: *Aviation and ship soot as freezing nuclei of water/sulphate cloud droplets*
- C.06 A. D. Naiman, F. Ham, S. K. Lele, J. T. Wilkerson and M. Z. Jacobson: *Large-eddy simulation of persistent contrails*
- C.07 G. Rädcl, K. Shine and R. Forbes: *Predicting persistent contrails using the ECMWF integrated forecast system*
- C.08 D. Schäuble, C. Voigt, B. Kärcher, P. Stock, H. Schlager, M. Krämer, C. Schiller, R. Bauer, N. Spelten, M. de Reus, M. Szakall, S. Borrmann, U. Weers and T. Peter: *Airborne measurements of the nitric acid partitioning in persistent contrails*
- C.09 S. Unterstrasser, I. Sölch and K. Gierens: *Numerical models for contrail and contrail cirrus simulation*
- C.10 G. M. Whelan, F. Cawkwell, H. Mannstein and P. Minnis: *The use of meteorological data to improve automated contrail detection in satellite imagery over Ireland*
- C.11 A. Zamyatin, V. Dedesh, A. Zhelannikov and R. Kagarmanov: *Peculiarities of airplane vortex wakes and condensation trails interaction and their mathematical modelling*

D. Impact on climate

- D.01 A. Abdellatif: *Sensitivity of climate models*
- D.02 H. H. Asadov and N. M. Suleymanov: *New formulation of atmospheric turbidity factor given by Linke*
- D.03 T. Berntsen and J. Fuglestedt: *Global temperature responses to current emissions from the transport sectors*
- D.04 V. Grewe, M. Plohr, G. Cerino, M. Di Muzio, Y. Deremaux, M. Galerneau, P. de Saint Martin, T. Chaika, A. Hasselrot, U. Tengzelius and V. Korovkin: *Small supersonic transport aircraft (S4TA) – Is the impact upon the atmosphere acceptable? Results from the HISAC project*
- D.05 J. Hilaire and D. S. Lee: *Quantifying the impacts of shipping NOx emissions on tropospheric chemistry and climate*
- D.06 D. Olivie, D. Cariolle, H. Teyssèdre, D. Saint-Martin and F. Karcher: *Climate impact of transport sectors modelled with an atmosphere-ocean general circulation model*
- D.07 D. Peters and R. G. Grainger: *Aerosol optical properties*
- D.08 G. Pitari and D. Iachetti: *Radiative forcing from particle emissions by future supersonic aircraft*
- D.09 M. Ponater: *Distinctive efficacies for the components contributing to total aviation climate impact*
- D.10 R. Rodriguez de Leon and D. S. Lee: *Uncertainties in the radiative properties of cirrus in climate models*
- D.11 A. Skowron, D. S. Lee, J. Hurley and R. R. De Leon: *How realistic is a negative NOx GWP?*

E. Metrics and mitigation

- E.01 A. Agha and M. S. Tamannai: *Fuel cells: A sustainable approach meeting future energy demands*
- E.02 J. Borken-Kleefeld, T. Berntsen and J. Fuglestedt: *Comparing the climate impact of passenger and freight transport modes*
- E.03 O. Deuber: *A matter of choice! Role of metrics in climate policies in aviation*
- E.04 N. Dickson, K. Gierens, H. Rogers and R. Jones: *Vertical spatial scales of ice supersaturation*
- E.05 C. Fichter, M. Ponater, D. S. Lee, V. Grewe, K. Obermaier and R. Sausen: *Effects of global mean flight altitude changes*
- E.06 S. Matthes and K. Gierens: *ECATS - Towards an Environmental Compatible Air Transport System - Research contributions*
- E.07 S. Matthes, V. Grewe and R. Sausen: *REACT4C : A novel concept for environmentally friendly flight routing*
- E.08 P. Viaene, K. Van de Vel, W. Lefebvre, S. Janssen, F. Blommaert, G. Cosemans, K. De Ridder, I. De Vlieger, F. Fierens, C. Mensink, L. Schrooten, J. Vankerkom and T. Van Mierlo: *Impact on air quality of a 90 km/h speed limit during PM10 episodes*

Opening address at the Second International Conference on Transport, Atmosphere and Climate, TAC-2,

Aachen/Maastricht, June 22-25, 2009,

by dr. Frits J.J. Brouwer, Director-General of the Royal Netherlands Meteorological Institute

Mister Chairman, Ladies and Gentlemen,

On behalf of KNMI (the Dutch acronym for: Royal Netherlands Meteorological Institute), being the co-organizer of this TAC-2, I bid you a warm welcome at this conference!

Maybe first a few words about KNMI. As the National Met Service, we are an agency of the Ministry of Transport and Water Management. Being an agency means that we have an own budget scheme and are not directly involved in political issues. Our budget is about 55 MEuro, and some 450 people are employed at KNMI. Being the National Met Service, we have of course a number of operational tasks, such as issuing warnings and alarms for high impact weather. But I am also very proud that about one third of KNMI staff is academic staff and thus devoted to the scientific understanding of weather and climate issues. A major product of this are e.g. the climate scenarios that KNMI issues about every 5 years. These are the official basis for the national policies on e.g. water management, physical planning, health issues, etc.

Now back to TAC-2! Infrastructure is the most vital economic network in the Netherlands. As you probably know, our economically most valuable regions are located below sea level. Last year our Vice Minister, Staatssecretaris Tineke Huizinga - who will speak to you by video on Wednesday afternoon -, set up a commission to advise the Dutch government how to make the Dutch water management climate proof. The commission took into account the possibility that our country will be exposed to a sea level rise of 1.3 m over the next century. Not that such an extreme climate projection will not easily become reality, but it provides a benchmark to make our country climate proof.

To work towards climate adaptation, the Dutch government initiated national programmes to develop a sustainable infrastructure and transport system. At the same time our transport sector has to fulfil the Kyoto Protocol targets and the National Emission Ceilings Directive as part of the European Thematic Strategy on Air Pollution. In addition to the contribution to the concentration of (greenhouse) gases and aerosols in the atmosphere, noise is another important variable for the transport sector, in particular in our urbanised regions. Highways and airports cause noise exposure above threshold levels. KNMI investigates the relationship between such exposures and climate change, to help designing more sustainable infrastructure and traffic systems as part of an integrated adaptation and mitigation strategy.

Our kind of knowledge provides the necessary scientific basis. The relationship between transport emissions and the climate system, the delivery of solid and consistent climate scenarios, the translation of these scenarios into policy proof concepts, and in particular the continuation of climate observations are all crucial elements in such a scientific basis.

Last week KNMI successfully launched the world's first NO₂ sonde at the start of the CINDI Campaign, which hopefully provides reliable in situ NO₂ vertical profiles in the future. These unique measurements complement space-borne NO₂ observations by e.g. the OMI instrument (the Ozone Monitoring Instrument on NASA's EOS/AURA-satellite). I'm sure this conference will show some examples where OMI NO₂ data are involved, illustrating the value of these data. KNMI is proud of its role as PI (Principle Investigator) in the development of the OMI instrument and in providing and analysing the data.

This development illustrates the necessity for innovation in climate science. Without innovations and basic climate research, every adaptation and mitigation strategy to tackle climate change will fail. Note e.g. that satellite data are the eye in the sky; they act as a global watch over the effectiveness of the Kyoto Protocol and mitigation options in the transport sector.

KNMI realises its crucial position and increases its effort to create an effective relationship between science and our national climate and transport policy. We have to transform our observations (in combination with our modelling) to make implementation of climate and transport policy successful. In other words, we have to act as a climate service. The importance of regional climate services increases. The Third World Climate Conference of the WMO (World Meteorological Organisation) which will take place in August/September this year, recognizes this development and will recommend the set up of a global framework on climate services, together with an international Task Force.

Most of the world's economy is found in Mega-cities, most of them located in regions vulnerable to climate change. The infrastructure and transport form the vital networks. Their relation with climate change is one of the most important future research subjects. This conference covers this subject right in the heart!

This year the road to Copenhagen is probably the most heavily used road. I hope that the traffic on this road leads to a solid successor of Kyoto. I also hope that science remains the basis of the new protocol and those that will follow. Conferences such as these, contribute significantly to a better understanding of the contribution of transport to the volume of greenhouse gases and provide the necessary information for the right discussion on this sensitive subject.

I'm therefore honoured to co-open this conference and I wish you all a very interesting and successful, but also a pleasant, time in Aachen and Maastricht!

Thank you for your attention.

Extended Abstracts

