Dr. Etienne TERRENOIRE

SENIOR RESEARCHER IN MODELLING THE AIRCRAFT EMISSIONS CLIMATE EFFECTS

PRESENT AND PAST POSITIONS

2018-present : Senior researcher specialized in the assessment of the climate effect including contrails and NOx aircraft emissions at ONERA.

- Current EU project: SENECA (WP leader), PULSAR, CLAIM.
- Current French DGAC funding project: Cirrus H2 (project leader), Climaviaiton, VOLCAN.

2015-2018: Researcher at CNRS, specialized in the climate effect assessment of aviation.
Laboratoire des Sciences du Climat et de l'Environnement (LSCE - CEA/CNRS/UVSQ).

- Project IMPACT (DGAC funding): aviation emisisons climate effect assessment using OSCAR and LMDz-INCA models.

2010-2014 : Researcher at INERIS, specialized in the Air Quality assessment of European cities.
Institut National de l'Environnement Industriel et des Risques (INERIS).

- LIFE-EC4MACS project: Modelling High-resolution air quality simulation urban increment over Europe

QUALIFICATIONS

2009 : PhD in Atmospheric Science « Modelling the physico-chemistry of the troposphere » mention très honorable, Université de Lille.
Titre: Application of MM5-CHIMERE et MM5-FLEXPART to ozone and PM_{10} air quality modelling over the Nord-Pas-de-Calais region.

2005 : Master Research « Atmosphere and Air Quality » mention AB, Université Paris 7.

2003 : BSc (Hons) « Meteorology », mention AB, University de Reading, U.K.

PEER-REVIEWE's PAPERS (16)

Muller M. and **Terrenoire E.**: Supersonic jet/vortex phase's contrails modelling using a novel RANS/LES coupling approach, in preparation.

Muller M. and **Terrenoire E.**: Air quality CFD simulations over Madrid-Barajas international airport using real aircraft movements, in preparation

Mourouzidis. C, D. Del Gatto, S Adamidis, C. Villena Munoz, C. Lawson, B. Martinez Corzo, P. Leyland, D. Marsh, L. Lim, B. Owen, **E. Terrenoire**, O. Atinault, I. Le Griffon, M. Huet, M. Schaefer, M. Plohr, S. Bake, P. Madden. Preliminary design of next generation Mach 1.6 supersonic business jets to investigate landing & take-off (LTO) noise and emissions – SENECA", *J. Phys.: Conf. Ser.* **2526** 01201, **2023.**

Terrenoire, E., Hauglustaine, D., Cohen, Y., Cozic, A., Valorso, R., Lefèvre, F., and Matthes, S. Impact of present and future aircraft NO_x and aerosol emissions on atmospheric composition and associated direct radiative forcing of climate, Atmos. Chem. Phys., https://doi.org/10.5194/acp-2022-222, **2022.**

Owen, B.; Anet, J.G.; Bertier, N.; Christie, S.; Cremaschi, M.; Dellaert, S.; Edebeli, J.; Janicke, U.; Kuenen, J.; Lim, L.; Terrenoire, E. Review: Particulate Matter Emissions from Aircraft. *Atmosphere* **2022**, *13*, 1230. https://doi.org/10.3390/atmos13081230

Matthes, S.; Lee, D.S.; De Leon, R.R.; Lim, L.; Owen, B.; Skowron, A.; Thor, R.N.; **Terrenoire, E.** (2022). Review: The Effects of Supersonic Aviation on Ozone and Climate. Aerospace, 9, 41. https:// doi.org/10.3390/aerospace9010041

Terrenoire, E. Les différentes facettes du cirrus homogenitus, Lettre 3AF, n° 46, 2021

Terrenoire, E., D. A. Hauglustaine, T. Gasser and O. Penanhoat. (2019). The contribution of carbon dioxide emissions from the aviation sector to future climate change, Environ. Res. Lett. 14 084019. (**EREA award paper**)

Schaap M., K.Cuvelier, C Hendriks, B. Bessagnet, J. Baldasano, A. Colette, P. Thunis, D. Karam, H. Fagerli, A. Graff, R. Kranenburg, A. Nyiri, M. T. Pay, L. Rouil, M. Schulz, D. Simpson, R. Stern, **E. Terrenoire**, P. Wind. (2015). Performance of European chemistry transport models as function of horizontal resolution, *Atmospheric Environment*, *Volume 112*, *Pages 90-105*.

Kiesewetter G., J. Borken-Kleefeld, W. Schöpp, C. Heyes, P. Thunis, B. Bessagnet, **E. Terrenoire**, A.Gsella, and M. Amann (2015). Modelling street level PM10 concentrations throughout Europe: source apportionment and possible futures, *Atmo. Chem Phys., 15, 1539-155.*

Terrenoire E., Bessagnet, B., Rouïl, L., Tognet, F., Pirovano, G., Létinois, L., Beauchamp, M., Colette, A., Thunis, P., Amann, M., and Menut, L. (2015): High-resolution air quality simulation over Europe with the chemistry transport model CHIMERE, Geosci. Model Dev., 8, 21-42.

Colette A., B. Bessagnet, F. Meleux, **E. Terrenoire,** L. Rouïl (2014). Frontiers in air quality modeling. *Geophysical Mod Dev.*, 7, 203-210.

Kiesewetter G., J. Borken-Kleefeld, W. Schöpp, C. Heyes, P. Thunis, B. Bessagnet, **E. Terrenoire**, A.Gsella, and M. Amann (2014). Modelling NO_2 concentrations at the street level in the GAINS integrated assessment model: Projections under current legislation, *Atmo. Chem Phys, 14, 813-829.*

Cuvelier C., P. Thunis, D. Karam, M. Schaap, C. Hendriks, R. Kranenburg, H. Fagerli, A. Nyiri, D. Simpson, P. Wind, M. Schulz, B. Bessagnet, A. Colette, **E. Terrenoire**, L. Rouïl, R. Stern, A.Graff, J.M. Baldasano, M.T. Pay (2013). ScaleDep: Performance of European chemistry-transport models as function of horizontal spatial resolution.

Kiesewetter G., J. Borken-Kleefeld, W. Schöpp, C. Heyes, I. Bertok, P. Thunis, B. Bessagnet, **E. Terrenoire** and M. Amann (2012). Modelling compliance with NO_2 and PM_{10} air quality limit values in the GAINS model, TSAP Report #9. International Institute for Applied Systems Analysis, Laxenburg, Austria, http://ec.europa.eu/environment/air/pdf/TSAP-Report-.pdf

Miglietta M. M., P. Thunis., A. Pederzoli., E. Georgieva., B. Bessagnet., **E. Terrenoire** and A. Colette. Evaluation of WRF model performances in different European regions with the DELTA-FAIRMODE evaluation tool (2012). *International Journal of Environment and Pollution – Vol.50, No.1/2/3/4 pp. 83 – 97.*

OTHER COMMUNICATIONS (25)

Terrenoire. E et al.: SENECA's aircraft emissions evaluations and their environmental considerations, ICAS, 2024.

Vals, M., **Terrenoire, E**., and Bonne, N.: Modeling the formation of contrails produced by H2 fuel emissions, EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-7909, https://doi.org/10.5194/egusphere-egu24-7909, 2024.

Muller, M., **Terrenoire, E.,** Bouhafid, Y., and Bonne, N.: Contrail aging simulation of a supersonic aircraft, EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-9776, https://doi.org/10.5194/egusphere-egu24-9776, 2024.

Muller., M, **E. Terrenoire**, Air quality CFD simulation over Madrid-Barajas international airport using real aircraft movements, ODAS, 2023, Paris.

Terrenoire., E, Muller., M, CFD modelling of an engine plume and multiple plumes dispersion over the Madrid-Barajas international airport, ECATS/AVATOR workshop, 2023, Madrid.

Muller., M, **E. Terrenoire**, Near-field mesh adaptation for contrail modeling of a supersonic aircraft, 57th 3AF international Conference on Applied Aerodynamics, 2023, Bordeaux.

Terrenoire E., D. Hauglustaine, Impact of present and future aircraft NOx and aerosol emissions on atmospheric composition (2020), TAC5, 2022, Bad Aibling.

Muller. M, **E. Terrenoire**, U. Janicke (2022). Comparison of CEDRE and LASPORT plumes for a single aircraft engine at ground**,** TAC5, 2022, Bad Aibling.

Terrenoire et al., (2022). SENECA project: Climate effects assessment of supersonic aviation, ECCOMAS 2022, 2022, Oslo.

Ghedhaïfi W., L. Desprez, E. Montreuil, **E. Terrenoire** (2020). Simulation of Aircraft emissions dispersion by tracking aircraft using CFD, octobre 2020, ECAT3, virtual.

Montreuil E, W. Ghedhaïfi, **E. Terrenoire** (2020). Parametric study of Contrails formation, octobre 2020, ECAT3, virtual.

Terrenoire E., Hauglustaine, D., Gasser, T., Penanhoat, O (2020). Impact of present and future aircraft emissions on atmospheric composition and radiative forcing of climate, octobre 2020, ECAT3, virtual.

Terrenoire E., Hauglustaine, D., Gasser, T., Penanhoat, O (2020). The impact of carbon dioxide aviation emissions on future climate change, mars 2020, AEF 2020, Bordeaux.

Montreuil E, W. Ghedhaïfi, **E. Terrenoire,** S. Matthes, F. Garnier, V. Archilla and R. Mattia. (2020) CFD and aerosol dynamics Box-model to improve dispersion models, octobre 2020, ECAT3, virtual.

Ghedhaïfi W., A. Bienner, R. Megherbi, E. Montreuil, **E. Terrenoire,** X. Vancassel and A. Loseille (2019). Influence of atmospheric conditions on contrail formation: 3D simulation versus Schmidt-Appleman criterion, octobre 2020, août 2019, Canberra.

Ghedhaïfi W., L. Desprez, E. Montreuil, **E. Terrenoire**, T. Henry-Lheureux and F. Garnier (2019). 3D Simulation of aircraft emissions dispersion in the CAEPport area by tracking aircraft as mobile sources, ISABE, août 2019, Canberra.

Terrenoire E., W. Ghedhaïfi, L. Desprez, E. Montreuil (2019). Chemical composition in near-field aircraft plumes at cruise level. ATRS conference, juillet 2019, Amsterdam.

Terrenoire E., Hauglustaine, D., Gasser, T., Penanhoat, O (2016). Impact of the aviation sector on climate, *ECATS2 conference, Athens*, Greece.

Terrenoire E., B. Bessagnet, G. Pirovano, P. Thunis, A. Colette, A. Ung, L. Letinois, L. Rouïl (2012). Evaluation of the CHIMERE model at high resolution over Europe: focus on urban area. *Proceedings of 8th Air Quality Science and Applications 2012, 19-23 mars,* Athènes, Grèce.

Thunis P., B. Bessagnet, **E. Terrenoire**, A. Colette. Application of performance indicators based on observation uncertainty to evaluate a Europe-wide model simulation at urban scale (2012). *ITM conference, Miami, USA.*

Terrenoire E., B. Bessagnet, G. Pirovano, P. Thunis, A. Colette, A. Ung, L. Letinois, L. Rouïl (2012)**.** Evaluation of the CHIMERE model at high resolution over Europe: focus on urban area. *Air Quality Science and Applications 2012, 19-23 mars,* Athènes, Grèce.

Terrenoire E., B. Bessagnet, A. Colette, Edouard Debry, Laurent Létinois, Laure Malherbe , Laurence Rouïl, Frédéric Tognet, Anthony Ung, G Pirovano *(2011).* Urban air quality modelling in EC4MACS. *EC4MACS annual meeting*, IIASA, Laxenburg, Autriche.

Terrenoire E., Bessagnet B., Pirovano G., Amann M., Colette A., Heyes C., Schoepp W., Ung A., Létinois L. (2011). An original method to determine the urban increment for primary $PM_{2.5}$ using WRF/CHIMERE. *Geophysical Research Abstracts*, Vol. 13, *EGU2011-5682*, *EGU General Assembly, Vienna, Autriche*.

Terrenoire E., Fèvre-Nollet V (2009). Origin of two high PM10 concentration episodes over the Dunkerque industrial harbour, France: Case study, *Proceedings of 7th International Air Quality – Science and Application 2009 conference, Istanbul, published by the University of Hertforshire*.

Terrenoire E., Fèvre-Nollet V (2007). Application of a regional atmospheric emission inventory to ozone and PM modelling over the French north region: the summer 2006 heat wave case study, *Proceedings of 29th NATO/CCMS International Technical Meeting on Air Pollution Modelling and its Application XIX*, C. Borrego and A. I. Miranda, eds.