CEREA activity report – 2024

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SHI Yiji, École nationale des ponts et chaussées, ED SIE
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Published articles in peer-reviewed international journals

[1] **C. Durand**, **T. S. Finn**, **A. Farchi**, **M. Bocquet**, G. Boutin and E. Ólason. 'Data-driven surrogate modeling of high-resolution sea-ice thickness in the Arctic'. In: *The Cryosphere* 18 (2024), pp. 1791–1815. DOI: 10.5194/tc-18-1791-2024.

[2] **É. Launay**, V. Hergault, **M. Bocquet**, **J. Dumont Le Brazidec** and **Y. Roustan**. 'Bayesian inversion of emissions from large urban fire using in situ observations'. In: *Atmos. Environ.* 323 (2024). DOI: 10.1016/j.atmosenv.2024.120391.

[3] S. Driscoll, A. Carrassi, J. Brajard, L. Bertino, **M. Bocquet** and E. Olason. 'Parameter sensitivity analysis of a sea ice melt pond parametrisation and its emulation using neural networks'. In: *J. Comput. Sci.* 79 (2024), p. 102231. DOI: 10.1016/j.jocs.2024.102231.

[4] **J. Dumont Le Brazidec**, **P. Vanderbecken**, **A. Farchi**, **M. Bocquet**, G. Broquet and G. Kuhlmann. 'Deep learning applied to CO_2 power plant emissions quantification using simulated satellite images'. In: *Geosci. Model Dev.* 17 (2024), pp. 1995–2014. DOI: 10.5194/gmd-17-1995-2024.

[5] F. Liang, J. P. Valdes, **S. Cheng**, L. Kahouadji, S. Shin, J. Chergui, D. Juric, R. Arcucci and O. K. Matar. 'Liquid–Liquid Dispersion Performance Prediction and Uncertainty Quantification Using Recurrent Neural Networks'. In: *Industrial & Engineering Chemistry Research* (2024). DOI: 10.1021/acs.iecr.4c00014.

[6] Y. Chen, P. Smith, A. Carrassi, I. Pasmans, L. Bertino, **M. Bocquet**, **T. S. Finn**, P. Rampal and V. Dansereau. 'Multivariate state and parameter estimation with data assimilation on sea-ice models using a Maxwell-Elasto-Brittle rheology'. In: *The Cryosphere* 18 (2024), pp. 2381–2406. DOI: 10.5194/tc-18-2381-2024.

[7] N. Basha, R. Arcucci, P. Angeli, C. Anastasiou, T. Abadie, C. Q. Casas, J. Chen, **S. Cheng** et al. 'Machine learning and physics-driven modelling and simulation of multiphase systems'. In: *International Journal of Multiphase Flow* 179 (2024), p. 104936. DOI: 10.1016/j.ijmultiphaseflow.2024.104936.

[8] **M. Bocquet**, **P. J. Vanderbecken**, **A. Farchi**, **J. Dumont Le Brazidec** and Y. Roustan. 'Bridging classical data assimilation and optimal transport: the 3D-Var case'. In: *Nonlin. Processes Geophys.* 31 (2024), pp. 335–357. DOI: 10.5194/npg-31-335-2024.

[9] V. Eyring, W. D. Collins, P. Gentine, E. A. Barnes, M. Barreiro, T. Beucler, **M. Bocquet**, C. S. Bretherton, H. M. Christensen, K. Dagon, D. J. Gagne, D. Hall, D. Hammerling, S. Hoyer, F. Iglesias-Suarez, I. Lopez-Gomez, M. C. McGraw, G. A. Meehl, M. J. Molina, C. Monteleoni, J. Mueller, M. S. Pritchard, D. Rolnick, J. Runge, P. Stier, O. Watt-Meyer, K. Weigel, R. Yu and L. Zanna. 'Pushing the frontiers in climate modelling and analysis with machine learning'. In: *Nat. Clim. Change* 14 (2024), pp. 916–928. DOI: 10.1038/s41558-024-02095-y.

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[16] **T. S. Finn**, **L. Disson**, **A. Farchi**, **M. Bocquet** and **C. Durand**. 'Representation Learning with Unconditional Denoising Diffusion Models for Dynamical Systems'. In: *Nonlinear Processes in Geophysics* 31 (Sept. 2024), pp. 409–431. ISSN: 1023-5809. DOI: 10.5194/npg-31-409-2024.

[17] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. 'Generative diffusion for regional surrogate models from sea-ice simulations'. en. In: *Journal of Advances in Modeling Earth Systems* 16.10 (2024), e2024MS004395. ISSN: 1942-2466. DOI: 10.1029/2024MS004395.

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[19] C. Xie, J. Hu, G. Vasdravellis, X. Wang and **S. Cheng**. 'Explainable AI model for predicting equivalent viscous damping in dual frame–wall resilient system'. In: *Journal of Building Engineering* 96 (2024), p. 110564. DOI: 10.1016/j.jobe.2024.110564.

[20] J. Jose, A. Gires, **Y. Roustan**, E. Schnorenberger, I. Tchiguirinskaia and D. Schertzer. 'Multifractal analysis of wind turbine power and rainfall from an operational wind farm – Part 1: Wind turbine power and the associated biases'. In: *Nonlin. Processes Geophys.* 31 (2024), pp. 587–602. DOI: 10.5194/npg-31-587-2024.

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[22] **P. Letournel**, C. Listowski, **M. Bocquet**, A. Le Pichon and **A. Farchi**. 'Evaluating Numerical Weather Prediction Models in the Middle Atmosphere Using Coherent Oceanic Acoustic Noise Observations'. In: *J. Geophys. Res. Atmos.* 129 (2024), e2024JD042034. DOI: 10.1029/2024JD042034.

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[24] J. Céspedes, S. Kotthaus, J. Preissler, C. Toupoint, L. Thobois, M.-A. Drouin, J.-C. Dupont, **A. Faucheux** and M. Haeffelin. 'The Paris low-level jet during PANAME 2022 and its impact on the summertime urban heat island'. In: *Atmos. Chem. Phys.* 24.20 (2024), pp. 11477–11496. DOI: 10.5194/acp-24-11477-2024.

[25] K. T. Cevolani, **L. Lugon**, E. V. Goulart and J. M. Santos. 'Influence of distinct mobility scenarios on NO2, PM2. 5 and PM10 street-level concentrations—A case study in a Brazilian urban neighborhood'. In: *Atmospheric Pollution Research* 15.7 (2024), p. 102126.

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[27] E. Kostenidou, B. Marques, B. Temime-Roussel, Y. Liu, B. Vansevenant, **K. Sartelet** and B. D'Anna. 'Secondary organic aerosol formed by Euro 5 gasoline vehicle emissions: chemical composition and gas-to-particle phase partitioning'. In: *Atmos. Chem. Phys.* 24.4 (2024), pp. 2705–2729. DOI: 10.5194/acp-24-2705-2024.

[28] **V. Lannuque** and **K. Sartelet**. 'Development of a detailed gaseous oxidation scheme of naphthalene for secondary organic aerosol (SOA) formation and speciation'. In: *Atmos. Chem. Phys.* 24.15 (2024), pp. 8589–8606. DOI: 10.5194/acp-24-8589-2024.

[29] C. Lin, R. Ooka, H. Kikumoto, C. Flageul, **Y. Kim**, Y. Zhang and **K. Sartelet**. 'Impact of solid road barriers on reactive pollutant dispersion in an idealized urban canyon: A large-eddy simulation coupled with chemistry'. In: *Urban Climate* 55 (2024), p. 101989. DOI: 10.1016/j.uclim.2024.101989.

[30] C. Lin, R. Ooka, H. Kikumoto, **Y. Kim**, Y. Zhang, C. Flageul and **K. Sartelet**. 'Impact of gas dry deposition parameterization on secondary particle formation in an urban canyon'. In: *Atmos. Environ.* 333 (2024), p. 120633. DOI: 10.1016/j.atmosenv.2024.120633.

[31] **A. Maison**, **L. Lugon**, **S.-J. Park**, C. Boissard, **A. Faucheux**, V. Gros, C. Kalalian, **Y. Kim**, J. Leymarie, J.-E. Petit, **Y. Roustan**, O. Sanchez, **A. Squarcioni**, M. Valari, C. Viatte, J. Vigneron, A. Tuzet and **K. Sartelet**. 'Contrasting effects of urban trees on air quality: From the aerodynamic effects in streets to impacts of biogenic emissions in cities'. In: *Sci. Tot. Environ.* 946 (2024), p. 174116. DOI: 10.1016/j.scitotenv.2024.174116.

[32] **A. Maison**, **L. Lugon**, **S.-J. Park**, A. Baudic, C. Cantrell, F. Couvidat, B. D'Anna, C. Di Biagio, A. Gratien, V. Gros, C. Kalalian, J. Kammer, V. Michoud, J.-E. Petit, M. Shahin, L. Simon, M. Valari, J. Vigneron, A. Tuzet and **K. Sartelet**. 'Significant impact of urban tree biogenic emissions on air quality estimated by a bottom-up inventory and chemistry transport modeling'. In: *Atmos. Chem. Phys.* 24.10 (2024), pp. 6011–6046. DOI: 10.5194/acp-24-6011-2024.

[33] L. Menut, A. Cholakian, R. Pennel, G. Siour, S. Mailler, M. Valari, **L. Lugon** and Y. Meurdesoif. 'The CHIMERE chemistry-transport model v2023r1'. In: *Geosci. Model Dev.* 2024 (2024), pp. 1–44.

[34] **T. Sarica**, C. Chaillou, **Y. Roustan**, C. Larrieu, S.-E. Wali and **K. Sartelet**. 'Differentiated impact of low-exhaust-emission vehicles on NO 2 and particle concentrations in the Paris region'. In: *Eur. Transp. Res. Rev.* 16.1 (2024), p. 34. DOI: 10.1186/s12544-024-00660-2.

[35] **K. Sartelet**, **Z. Wang**, **V. Lannuque**, S. Iyer, F. Couvidat and **T. Sarica**. 'Modelling molecular composition of SOA from toluene photo-oxidation at urban and street scales'. In: *Environ. Sci.: Atmos.* 4 (8 2024), pp. 839–847. DOI: 10.1039/D4EA00049H.

[36] X.-J. Wang, Y.-F. Li, T. Gu, P. Xiang, **S. Cheng** and L.-J. Jia. 'Data-driven void growth prediction of aluminum under monotonic tension using deep learning'. In: *Journal of Constructional Steel Research* 222 (2024). DOI: 10.1016/j.jcsr.2024.109002.

[37] **Z. Wang**, F. Couvidat and **K. Sartelet**. 'Response of biogenic secondary organic aerosol formation to anthropogenic NOx emission mitigation'. In: *Sci. Tot. Environ.* 927 (2024), p. 172142. DOI: 10.1016/j.scitotenv.2024.172142.

[38] S. Yamanouchi, S. M. Gamage, S. Torbatian, J. Zalzal, L. Minet, A. Smargiassi, Y. Liu, L. Liu, F. Azargoshasbi, J. Kim, **Y. Kim**, D. Yazgi and M. Hatzopoulou. 'Validation and analysis of the Polair3D v1.11 chemical transport model over Quebec'. In: *Geoscientific Model Development* 17.9 (2024), pp. 3579–3597. DOI: 10.5194/gmd-17-3579-2024.

Peer-reviewed chapters and proceedings

[1] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet** and J. Brajard. 'Towards diffusion models for large-scale sea-ice modelling'. In: *ICML 2024 Machine Learning for Earth System Modelling Workshop*. July 2024. DOI: https://doi.org/10.48550/arXiv.2406.18417.

[2] J. Meuer, M. Witte, **T. S. Finn**, C. Timmreck, T. Ludwig and C. Kadow. 'Latent Diffusion Model for Generating Ensembles of Climate Simulations'. In: *ICML 2024 Machine Learning for Earth System Modelling Workshop*. July 2024. DOI: https://doi.org/10.48550/arXiv.2407.02070.

Non-peer-reviewed chapters and proceedings

[1] **H. Amino**, C. Flageul, **B. Carissimo** and **M. Ferrand**. 'CFD study of PM10 dispersion in a sports stadium using a mesh based on geometry obtained from a 3-D cloud of laser points'. 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. In: *22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes*. Pärnu, Estonia: HARMO 2024, 2024. June 10-13, 2024.

[2] **G. Balvet**, **Y. Roustan** and **M. Ferrand**. 'Extended abstract: A methodology to derive Monin-Obukhov universal functions consistent with second order turbulence models'. In: *22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes*. HARMO 2024, 2024.

[3] **D. Ladet**, **Y. Roustan**, O. Duclaux and S. Jouenne. 'Modeling amines and degradation products in the plume of asset with carbon capture technology'. In: *22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes*. HARMO 2024, 2024.

[4] B. Berlioux, **B. Amiot**, **M. Ferrand**, R. Le Berre, H. Pabiou and R. Knikker. 'Évaporation d'un plan d'eau pour différents systèmes de photovoltaïque flottant'. In: *Journées Nationales de l'Energie Solaire*. 2024.

[5] B. Berlioux, **B. Amiot**, **M. Ferrand**, R. Le Berre, H. Pabiou and R. Knikker. 'Evaporation of Reservoir for Different Floating Photovoltaic Layouts'. In: *42nd European Photovoltaic Solar Energy Conference and Exhibition (EU-PVSEC)*. 2024.

[6] **J. Vernier**, S. Edouard, **B. Amiot**, M. Van Iseghem, **M. Ferrand**, D. Combes, G. Schuchardt and **P. Massin**. 'CFD, a radiative model, and a plant model to capture the interactions between solar panels, the atmosphere, the soil, and the plants in agrivoltaic configurations.' In: *EGU General Assembly Conference Abstracts*. 2024, p. 17971.

International conference oral presentations

[1] **L. Lugon**, C. Kemgne, V. L. Vot, N. Mauchard, B. V. Quang, C. Wang, J. Vigneron, F. Dugay, O. Sanchez and **K. Sartelet**. *Estimating the impact of mobility scenarios on urban air quality: a regional scale analysis*. EGU General Assembly. Wien, Austria. April 17, 2024.

[2] **L. Lugon**, C. Kemgne, V. Le Vot, N. Mauchard, B. Vu Quang, C. Wang, J. Vigneron, F. Dugay, O. Sanchez and **K. Sartelet**. *Estimating the impact of mobility scenarios on urban air quality with a street resolution using a multi-scale modelling approach*. Air pollution conference Brazil - CMAS South America. Sao Paulo, Brazil. June 06, 2024.

[3] **K. Sartelet**. *Urban heterogeneities of multi-pollutants down to the street scale*. Air pollution conference Brazil - CMAS South America. Sao Paulo, Brazil. June 06, 2024. invited.

[4] **K. Sartelet**, J. Zhong, E. Athanasopoulou, **L. Lugon**, **S. Park** and R. Harrison. *ST for Urban Mapping and Deterministic Modelling*. RI-Urbans 3rd Science Meeting. Helsinki, Finland. September 25-26, 2024.

[5] **S. Park**, L. Lugon, Y. Kim, A. Baudic, L. Di Antonio, C. Di Biagio, F. Dugay, O. Favez, V. Ghersi, A. Gratien, A. Maison, J.-E. Petit, A. Rosso, M. Valari, J. Vigneron, O. Sanchez and K. Sartelet. *Modelling pollutant concentrations over Paris city with the high-resolution traffic emissions using CHIMERE/MUNICH*. 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Pärnu, Estonia. September 10-13, 2024.

[6] **T. S. Finn**, S. Driscoll, **C. Durand**, **A. Farchi**, **M. Bocquet**, Y. Chen, A. Carrassi, J. Brajard and L. Bertino. *Hybrid modelling with deep learning for improved sea-ice forecasting*. Cross-VESRI Symposium on Non-locality in Parameterizations. January 25, 2024. [online].

[7] **M. Bocquet**, **P. J. Vanderbecken**, **A. Farchi**, **J. Dumont Le Brazidec** and **Y. Roustan**. *Bridging classical data assimilation and optimal transport*. ISDA online event: Advancements in Variational Data Assimilation. https://isda-online.univie.ac.at/online-events/february-2024-advancements-in-variational-data-assimilation/. February 2, 2024. [invited, online].

[8] S. Driscoll, A. Carrassi, J. Brajard, L. Bertino, **M. Bocquet**, E. Ólason and A. Lawless. *Emulating melt ponds on sea ice with neural networks*. DARC seminar of the University of Reading. The University of Reading, Reading, UK. February 7, 2024. [invited].

[9] **C. Durand**, **T. S. Finn**, **A. Farchi**, **M. Bocquet**, G. Boutin and E. Ólason. *Data-driven surrogate modeling of high-resolution sea-ice thickness in the Arctic*. SuperIce kick-off meeting. NERSC, Bergen, Norway. February 14, 2024. [invited, online].

[10] **M. Bocquet**, **P. J. Vanderbecken**, **A. Farchi**, **J. Dumont Le Brazidec** and **Y. Roustan**. *Bridging classical data assimilation and optimal transport*. Oceanix webinar. https://cia-oceanix.github.io/webinar. February 21, 2024. [invited, online].

[11] A. Carrassi, L. Bertino, **M. Bocquet**, J. Brajard, Y. Chen, S. Driscoll, **C. Durand**, **A. Farchi**, **T. S. Finn**, C. Jones, I. Pasmans and F. Porro. *Using Machine Learning, Data Assimilation and Their Combination to Improve a New Generation of Arctic Sea-Ice Models*. 2024 SIAM Conference on Uncertainty Quantification. Trieste, Italy. February 26-March 01, 2024. [invited].

[12] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. *Representation Learning with Denoising Diffusion Models for Geophysical Systems*. 2024 SIAM Conference on Uncertainty Quantification. Trieste, Italy. February 26-March 01, 2024. [invited].

[13] **C. Durand**, **T. S. Finn**, **A. Farchi**, **M. Bocquet**, G. Boutin and E. Ólason. *Data-driven surrogate modeling of high-resolution sea-ice thickness in the Arctic*. METOF workshop. Bologna, Italy. March 13, 2024. [invited].

[14] P. Chelin, R. D. Kutzner, J. Brochet, S. Caville, M. Ray, X. Landsheere, J. Cuesta, G. Siour, **Y. Roustan**, F. Hase and C. Camy-Peyret. *Impact of new retrieval settings on time-series and diurnal variation of retrieved ammonia total columns by ground-based remote sensing (OASIS observatory) over Greater Paris*. EGU General Assembly. Wien, Austria. April 17, 2024.

[15] **T. S. Finn**, **C. Durand**, F. Porro, **A. Farchi**, **M. Bocquet**, Y. Chen and A. Carrassi. *A Data-Driven Sea-Ice Model with Generative Deep Learning*. EGU General Assembly 2024. Vienna, Austria. April 18, 2024.

[16] S. Driscoll, A. Carrassi, J. Brajard, L. Bertino, **M. Bocquet**, E. Ólason and A. Lawless. *Replacing parametrisations of melt ponds on sea ice with machine learning emulators*. EGU General Assembly 2024. Vienna, Austria. April 19, 2024.

[17] **M. Bocquet**, **P. J. Vanderbecken**, **A. Farchi**, **J. Dumont Le Brazidec** and **Y. Roustan**. *Bridging classical data assimilation and optimal transport*. DARC seminar of the University of Reading. The University of Reading, Reading, UK. April 24, 2024. [invited, online].

[18] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. *A data-driven sea-ice model with generative deep learning.* SASIP Webinar. April 24, 2024. [online].

[19] **S. Cheng**. *Machine learning and data assimila- tion for high-dimensional dynamical systems.* Seminar of school of earth system science, Tianjin Univeristy. [online]]. May 16, 2024. [invited].

[20] A. Carrassi, L. Bertino, **M. Bocquet**, J. Brajard, Y. Chen, S. Driscoll, **C. Durand**, **A. Farchi**, **T. Finn**, C. Jones, I. Pasmans and F. Porro. *Hybrid Physical-Data Driven and Surrogate Sea-Ice Modelling.* ESA-ECMWF workshop on Machine Learning for Earth System Observation and Prediction. Frascati, Italy. May 09, 2024.

[21] **A. Farchi**, M. Chrust, **M. Bocquet**, P. Laloyaux and M. Bonavita. *Model error correction with data assimilation and machine learning: from theory to the ECMWF forecasting system.* ESA-ECMWF workshop on Machine Learning for Earth System Observation and Prediction. Frascati, Italy. May 09, 2024.

[22] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. *Data-Driven Sea-Ice Modelling with Generative Deep Learning.* ESA-ECMWF workshop on Machine Learning for Earth System Observation and Prediction. Frascati, Italy. May 09, 2024.

[23] **M. Bocquet**, **A. Farchi**, **T. S. Finn**, **C. Durand**, **S. Cheng**, M. Bonavita, P. Laloyaux, M. Chrust, J. Brajard, A. Carrassi, L. Bertino, S. Driscoll, Y. Chen, I. Pasmans, Ó. Einar and P. Rampal. *AI and weather forecasting: What's left for the meteorologists?* Grenoble Artificial Intelligence for Physical Sciences (GAP 2024). Grenoble, France. May 29, 2024. [invited].

[24] **S.-J. Park**, **Y. Kim**, **L. Lugon**, A. Baudic, L. D. Antonio, C. D. Biagio, F. Dugay, O. Favez, V. Ghersi, A. Gratien, **A. Maison**, J.-E. Petit, A. Rosso, M. Valari, J. Vigneron, O. Sanchez and **K. Sartelet**. *Modelling pollutant concentrations over Paris city with the high-resolution traffic emissions using CHIMERE/MUNICH.* Air Pollution Conference Brazil 5th CMAS South America. São Paulo, Brazil. June 5-7, 2024.

[25] **G. Balvet**, **Y. Roustan** and **M. Ferrand**. *A methodology to derive Monin-Obukhov universal functions consistent with second order turbulence models.* 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Pärnu, Estonia. June 10-13, 2024.

[26] **H. Bounouas**, O. Connan, D. Hebert, P. Laguionie, P. Roupsard, **É. Dupont**, **Y. Lefranc**, **A. Faucheux** and **Y. Roustan**. *Experimental study and modeling of the meandering effect on plume dispersion under low wind conditions in an urban environment.* 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Pärnu, Estonia. June 10-13, 2024.

[27] **B. Cuilhé**, **M. Ferrand**, **Y. Roustan** and **C. Bertrand**. *Precomputed wind field database for fast atmospheric dispersion calculation: modelling of low frequency effects with triple decomposition.* 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Pärnu, Estonia. June 10-13, 2024.

[28] **D. Ladet**, **Y. Roustan**, O. Duclaux and S. Jouenne. *Modeling amines and degradation products in the plume of asset with carbon capture technology.* 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Pärnu, Estonia. June 10-13, 2024.

[29] **A. Farchi**, M. Chrust, **M. Bocquet**, P. Laloyaux and M. Bonavita. *Model error correction with data assimilation and machine learning: from theory to the ECMWF forecasting system.* 19th international EnKF workshop. Os, Norway. June 17-19, 2024.

[30] **M. Bocquet**, **A. Farchi**, **T. S. Finn**, **C. Durand**, **S. Cheng**, M. Bonavita, P. Laloyaux, M. Chrust, J. Brajard, A. Carrassi, L. Bertino, S. Driscoll, Y. Chen, I. Pasmans, Ó. Einar and P. Rampal. *Data assimilation, surrogate models, and deep learning for the geosciences.* GTE-IA – Les enjeux de l'IA en géosciences. TGCC CEA Bruyères-Le-Châtel, France. June 18, 2024. [invited].

[31] **M. Bocquet**, **A. Farchi**, **T. S. Finn**, **C. Durand**, **S. Cheng**, M. Bonavita, P. Laloyaux, M. Chrust, J. Brajard, A. Carrassi, L. Bertino, S. Driscoll, Y. Chen, I. Pasmans, Ó. Einar and P. Rampal. *Leveraging deep learning for geophysical data assimilation and surrogate models.* Mathematical and Statistical Foundations of Digital Twins. Institute for Mathematical and Statistical Innovation (IMSI), Chicago, USA. June 26, 2024. [invited].

[32] **A. Farchi**, M. Chrust, **M. Bocquet**, P. Laloyaux and M. Bonavita. *Model error correction with data assimilation and machine learning: from theory to the ECMWF forecasting system.* Cross-VESRI convening. Cambridge, United Kingdom. July 7-10, 2024.

[33] **C. Durand**, **T. S. Finn**, **A. Farchi**, **M. Bocquet**, L. Bertino and J. Brajard. *Four-dimensional variational data assimilation with a sea-ice thickness emulator.* ESA Polar Science Week. Copenhagen, Denmark. September 5, 2024. [invited].

[34] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet** and A. Carrassi. 'The two revolutions ... and sea-ice modelling?' M^2LInES team meeting. In: Online. September 18, 2024. [invited].

[35] **M. Bocquet**, **A. Farchi**, **T. S. Finn**, **C. Durand**, **S. Cheng**, M. Bonavita, P. Laloyaux, M. Chrust, J. Brajard, A. Carrassi, L. Bertino, S. Driscoll, Y. Chen, I. Pasmans, Ó. Einar and P. Rampal. *Artificial intelligence, data assimilation, and data-driven surrogate models for the climate.* Workshop: Energy, mathematics, and theoretical challenges. Institut Henri Poincaré (IHP), Paris, France. October 3, 2024. [invited].

[36] **S. Cheng**, C. Quilodran, J. Ming, C. Prentice, S. Harrison, Y. Guo, **M. Bocquet** and R. Arcucci. *Machine learning and data assimilation for combining simulation and observation data*. Schulmberger AI Lab (Paris) global Webnair. Clamart, France. October 14, 2024. [invited].

[37] **M. Lab**, **Y. Roustan**, S. Oppo, A. Armengaud, L. Le Berre, B. Temime-Roussel and H. Wortham. *Modelling the evolution of maritime plumes with a regional plume-in-grid model*. International Technical Meeting On Air Pollution Modeling And Its Application. Copenhagen, Denmark. October 14-18, 2024.

[38] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal, J. Brajard and A. Carrassi. *Generative diffusion surrogates for sea-ice modelling*. SuperIce Workshop. Frascati, Italy. November 04, 2024.

[39] **C. Durand**, **T. S. Finn**, **A. Farchi**, **M. Bocquet**, L. Bertino and J. Brajard. *Four-dimensional variational data assimilation with a sea-ice thickness emulator*. OceanPredict'24. Paris, France. November 21, 2024.

[40] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. *Data-driven sea-ice modelling with generative deep learning*. OceanPredict '24 conference. Paris, France. November 21, 2024.

[41] **S. Cheng**. *Making the Most of Sparse Data: Machine Learning and Inverse Modelling in Air Quality and Geoscience*. Computer science department seminar, University of Virginia, USA. December 9, 2024. [invited,online].

[42] **K. Sartelet**. *Urban heterogeneities of multi-pollutants down to the street scale*. Summer Lecture - Zhejiang University School of Earth Sciences. online. July 24, 2024. invited.

[43] **S. Park**, **L. Lugon**, **Y. Kim** and **K. Sartelet**. *Influence of local concentrations in outdoor exposure of urban population to particle mass, number, and black carbon*. The European Aerosol Conference. Tampere, Finland. August 25-28, 2024.

[44] **K. Sartelet**. Introduction of the model intercomparison and modelling down to the street scale with CHIMERE/MUNICH. Paris Olympics RDP General Assembly. Paris, France. November 26-28, 2024.

[45] **H. Amino**, C. Flageul, **B. Carissimo** and **M. Ferrand**. *CFD study of PM10 dispersion in a sports stadium using a mesh based on geometry obtained from a 3-D cloud of laser points*. 2024.

[46] B. Berlioux, **B. Amiot**, **M. Ferrand**, R. Le Berre, H. Pabiou and R. Knikker. *Evaporation of Reservoir for Different Floating Photovoltaic Layouts*. 2024.

[47] N. Carnec, T. Duforestel, B. Wall-Ribot, **M. Ferrand**, M. O. Abadie and K. Limam. 'Towards a better 0D-1D modelling approach for more accurate prediction of Indoor Air Quality (IAQ) in Buildings'. In: *Indoor Air 2024 Sustaining the Indoor Air Revolution: Raise Your Impact*. 2024.

International conference poster presentations

[1] Y. Chen, P. Smith, A. Carrassi, I. Pasmans, L. Bertino, **M. Bocquet**, **T. S. Finn**, P. Rampal and V. Dansereau. *Multivariate State and Parameter Estimation Using Data Assimilation in a Maxwell-Elasto-Brittle Sea Ice Model.* EGU General Assembly 2024. Vienna, Austria. April 18, 2024.

[2] **S. Cheng**, D. Chen, M. Kasoar, Y. Guo and R. Arcucci. *Wildfire modellings with GNN and generative AI.* ESA-ECMWF workshop. Frascati, Italy. May 7-10, 2024.

[3] **M. Lab**, **Y. Roustan**, S. Oppo, A. Armengaud, L. Le Berre, B. Temime-Roussel, S. Sauvage and H. Wortham. *Modelling the impact of maritime emissions on air quality in the Bay of Marseille.* 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Pärnu, Estonia. June 10-13, 2024.

[4] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet** and J. Brajard. *Towards diffusion models for large-scale sea-ice modelling.* ICML 2024 Machine Learning for Earth System Modelling Workshop. Vienna, Austria. July 26, 2024.

[5] J. Meuer, M. Witte, **T. S. Finn**, C. Timmreck, T. Ludwig and C. Kadow. *Latent Diffusion Model for Generating Ensembles of Climate Simulations.* ICML 2024 Machine Learning for Earth System Modelling Workshop. Vienna, Austria. July 26, 2024.

[6] **L. Daphné**, **Y. Roustan** and O. Duclaux. *Modeling formation of gaseous and particulate secondary compounds issue of amine OH-initiated oxidation degradation pathways experiment.* International Technical Meeting On Air Pollution Modeling And Its Application. Copenhagen, Denmark. October 14-18, 2024.

[7] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. *Data-driven sea-ice modelling with generative deep learning.* 12th International Workshop on Sea Ice Modelling, Assimilation, Observations, Predictions and Verifications. Frascati, Italy. November 5, 2024.

[8] B. Marques, E. Kostenidou, B. Temime-Roussel, L. Fine, C. Ferronato, B. Vansevenant, Y. Liu, **K. Sartelet** and B. D'Anna. *New insight into primary and secondary emissions from Euro6 diesel and gasoline vehicles.* The European Aerosol Conference. Tampere, Finland. August 25-28, 2024.

[9] **K. Sartelet**, Z. Wang, F. Couvidat, V. Lannuque, S. Iyer and T. Sarica. *Molecular representation of toluene secondary organic aerosols in 3D air-quality models.* The European Aerosol Conference. Tampere, Finland. August 25-28, 2024.

National conference oral presentations

[1] **K. Sartelet** and S. Kotthaus. *Arbres en ville et qualité de l'air.* Apport d'ACTRIS-FR dans les projets PARIS REUSS-I du PEPR VDBI. Workshop ACTRIS-FR. Oléron, France. Oct. 15-18, 2024.

[2] **O. Jacquot**, V. Ehrlacher, G. Stoltz, T. Lelièvre and **K. Sartelet**. *Réduction de modèle pour la dynamique des aérosols*. 37ème congrès français sur les aérosols, CFA 2024. Paris, France. March 19-20, 2024.

[3] **K. Sartelet**. *Impact de la végétation sur la qualité de l'air*. GT Transition écologique – Ville durable. ANRT, Paris, France. March 19, 2024. invited.

[4] **K. Sartelet**. *Arbres en ville et qualité de l'air*. Journée écologie urbaine, la biodiversité, une composante de l'aménagement urbain. Campus Pierre et Marie Curie, Paris, France. Dec. 19, 2024. invited.

[5] **M. Bocquet**, **A. Farchi**, **Q. Malartic**, M. Bonavita, P. Laloyaux, M. Chrust, **T. S. Finn**, **C. Durand**, F. d'Andrea, J. Brajard and A. Carrassi. *AI and weather forecasting: What's left for the meteorologists?* Seminar at LAGA laboratory, Paris 13 University. Paris, France. March 11, 2024. [invited].

[6] **S. Cheng**, J. Hu, K. Zhu, N. Kovalchuk, A. Soulsby, M. Simmons, O. Matar and R. Arcucci. *Using explainable AI to predict drop coalescence under confinement*. ChemEngDayUK 2024 - The Royal Society of Chemistry. London, UK. April 25, 2024.

[7] **M. Bocquet**, **A. Farchi**, **T. S. Finn**, **C. Durand**, **S. Cheng**, M. Bonavita, P. Laloyaux, M. Chrust, J. Brajard, A. Carrassi, L. Bertino, S. Driscoll, Y. Chen, I. Pasmans, Ó. Einar and P. Rampal. *Leveraging deep learning for geophysical data assimilation and surrogate models*. Seminar at Laboratoire des Sciences du Climat et de l'Environnement. LSCE, Gif-Sur-Yvette, France. July 2, 2024. [invited].

[8] **C. Durand**, **T. S. Finn**, **A. Farchi**, **M. Bocquet**, L. Bertino and J. Brajard. *Four-dimensional variational data assimilation with a sea-ice thickness emulator*. EDITO Model Lab Project workshop. IGE, Grenoble. October 1, 2024. [invited, online].

[9] **A. Farchi**, M. Chrust, **M. Bocquet**, P. Laloyaux and M. Bonavita. *Model error correction with data assimilation and machine learning: from theory to the ECMWF forecasting system*. Seminar at CERFACS. Toulouse, France. October 9, 2024. [invited].

[10] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. 'The two revolutions ... and sea-ice modelling?' Talk at the CNES COMET TSI Seminar series. In: Online. November 12, 2024. [invited].

[11] **M. Bocquet**, **A. Farchi**, **T. S. Finn**, **C. Durand**, **S. Cheng**, Y. Chen, I. Pasmans and A. Carrassi. *Are ensemble-based data assimilation methods necessary for accurate filtering?* Seminar at Météo-France. Toulouse, France. November 15, 2024. [invited].

[12] **T. S. Finn**, **C. Durand**, **A. Farchi**, **M. Bocquet**, P. Rampal and A. Carrassi. 'The two revolutions ... and sea-ice modelling?' Seminar at LSCE. In: Paris-Saclay, France. November 27, 2024. [invited].

[13] J. Cuesta, V. Gros and **K. Sartelet**. *Thème modélisation atmosphérique et qualité de l'air*. Présentation du projet URBHEALTH. Séminaire IPSL. Paris, France. March 21-22, 2024.

[14] **K. Sartelet**. *Arbres en ville et qualité de l'air*. Présentation du projet URBHEALTH. Journées scientifiques annuelles Villes Durables Bâtiments Innovants. Bordeaux, France. Nov. 20-22, 2024.

[15] B. Berlioux, **B. Amiot**, **M. Ferrand**, R. Le Berre, H. Pabiou and R. Knikker. *Évaporation d'un plan d'eau pour différents systèmes de photovoltaïque flottant*. 2024.

Summer or winter schools

[1] **L. Lugon**. *Atmospheric chemistry modeling*. ERCA - European Research Course on Atmospheres. Grenoble, France. January, 2024. [invited].

[2] **L. Lugon**. *Atmospheric aerosols*. ERCA - European Research Course on Atmospheres. Grenoble, France. January, 2024. [invited].

[3] **L. Lugon**. *Introduction to air quality modeling*. ERCA - European Research Course on Atmospheres. Grenoble, France. January, 2024. [invited].

Committee activities

Editorial boards

[1] **M. Bocquet**. Associate Editor. 'Foundations of Data Science', journal of the AIMS.

[2] **M. Bocquet**. Associate Editor for the topic *Dynamical Systems*. 'Frontiers in Applied Mathematics and Statistics'.

[3] **S. Cheng**. Executive Guest Editor for the topic *Advances in physics aware machine learning*. 'Computer Physics Communications'.

[4] **S. Cheng**. Early Career Researcher Editorial Board. 'Meteorological Applications'.

[5] **S. Cheng**. Member of Topical Advisory Panel for *AI Remote Sensing*. 'Remote Sensing'.

[6] **K. Sartelet**. Editor for the special issue *Air quality research at street level*. Interjournal 'Atmospheric Chemistry and Physics' and 'Geoscientific Model Developments'.

Conference organisation

[1] **B. Carissimo**. Steering Committee of the 22sd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes (HARMO22). Pärnu, Estonia. June 10-13, 2024.

Conference session chairing

[1] **K. Sartelet** and **L. Lugon**. Chair of Session *Street Scale Air Quality Modeling and Urban Climate Sessions*. CMAS Conference South America. Sao Paolo, Brazil. June 5-9, 2024.

[2] **K. Sartelet**. Chair of Session *Local-scale Air Quality*. Paris Olympics RDP General Assembly. Paris, France. November 26-28, 2024.

Scientific committees

[1] **M. Bocquet**. Bureau member of SAMA (Statistique pour l'Analyse, la Modélisation et l'Assimilation) of Institut Pierre-Simon Laplace Institute (IPSL).

[2] **M. Bocquet**. Membre du conseil scientifique du GdR 'Défis théoriques pour les sciences du climat'.

[3] **M. Bocquet**. Member of the Comité scientifique consultatif de Météo-France (COMSI) board.

[4] **B. Carissimo**. Member of the scientific Committe of the 22nd International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes (HARMO22).

[5] V. Cuesta, V. Gros and **K. Sartelet**. Co-animation of the IPSL theme on Atmospheric Composition and Air Quality.

[6] **E. Dupont**. Member of the Scientific Committee of 'Site instrumental de recherche par télédétection atmosphérique' (SIRTA).

[7] A. Elassa Etuman, **L. Lugon**, L. Marelle, **K. Sartelet** and M. Valari. Animation of the IPSL working group on Atmospheric Composition Modelling.

[8] **A. Farchi**. Scientific committee, European Center for Scientific Computing (CERFACS).

[9] **Y. Roustan**. Member of the board of OSU-EFLUVE.

[10] **Y. Roustan**. Member of the scientific committee of OSU-EFLUVE.

[11] **K. Sartelet**. Member of the Scientific Committe 'Arbres et climat', Ville de Paris.

[12] **K. Sartelet**. Member of the ANSES working group on wood heating.

[13] **K. Sartelet**. Member of the board of OSU-EFLUVE as representative of college A called 'university professors and assimilated personnel'.

[14] **K. Sartelet**. Member of the ICEO steering committee.

Thesis committees

[1] **Y. Roustan**. Rapporteur, PhD, Ezekiel Waiguru Nyaga, 'Modélisation de la qualité de l'air en Afrique de l'Est pour évaluer les sources et évaluer des scénarios futurs d'atténuation de la pollution atmosphérique.' Université Paris Cité, France. December 17, 2024.

[2] **K. Sartelet**. Examiner, PhD, Pauline POUYES, 'Etude de l'aérosol organique secondaire d'origine biogénique : caractérisation de marqueurs moléculaires et étude de leur réactivité hétérogène d'intérêt atmosphérique'. Université de Bordeaux, France. December 13, 2024.

[3] **Y. Roustan** and **M. Ferrand**. Directeur de thèse / Encadrant, PhD, Guilhem Balvet, 'Modélisation lagrangienne de la dispersion de polluants gazeux/particulaires dans des écoulements atmosphériques stables, neutres et instables.' École nationale des ponts et chaussées. March 3, 2024.

[4] **M. Bocquet** and **A. Farchi**. PhD advisor, PhD, Quentin Malartic, 'Machine Learning, Data Assimilation and Dynamical Systems'. École nationale des ponts et chaussées. May 13, 2024.

[5] **M. Bocquet**. Rapporteur, HdR, Antoine Berchet, 'L'approche atmosphérique pour les cycles biogéochimiques : développements méthodologiques et applications transverses'. Université Paris-Saclay. September 27, 2024.

[6] **Y. Roustan** and **K. Sartelet**. Directeur de thèse / Présidente du jury, PhD, Alexis Squarcioni, 'Développement d'un modèle numérique de qualité de l'air multiéchelle pour le milieu urbain.' École nationale des ponts et chaussées. October 4, 2024.

[7] **M. Bocquet**. Rapporteur, PhD, Clément Brochet, 'Enrichissement de prévisions d'ensemble à résolution kilométrique à l'aide de méthodes génératives'. Université de Toulouse. November 15, 2024.

[8] **M. Bocquet**, **A. Farchi** and **T. Finn**. PhD advisor, PhD, Charlotte Durand, 'Deep learning, data assimilation and sea-ice dynamics'. École nationale des ponts et chaussées. December 2, 2024.

[9] **M. Bocquet**. Rapporteur, PhD, Nemo Malhomme, 'Apprentissage statistique pour les modèles climatiques'. Université Paris-Saclay. December 4, 2024.

[10] **Y. Roustan**. Examinateur, PhD, Sylvain Caville, 'Spectroscopie embarquée pour la distribution verticale d'ammoniac (NH_3) et de dioxyde de carbone (CO_2).' Université de Reims, France. July 4, 2024.

Teaching

École nationale des ponts et chaussées and affiliated masters

[1] **M. Bocquet**, **A. Farchi**, **J. Dumont Le Brazidec** and **T. S. Finn**. *Introduction to Data Assimilation*. Master MOCIS et WAPE Num2.2 and ADOMO. (École nationale des ponts et chaussées).

[2] **S. Cheng**. *Graduate project defense and evaluation (2023-2024)*. IMI Department Senior Project (IMIP2). (École nationale des ponts et chaussées).

[3] **S. Cheng**. *Graduate project supervision (2024-2025)*. IMI Department Senior Project (IMIP2). (École nationale des ponts et chaussées).

[4] **S. Cheng**. *Statistiques numériques et analyse de données*. IMI Department (STNUM). (École nationale des ponts et chaussées).

[5] **M. Ferrand**. *Mécanique des fluides incompressibles - 1*. 2nd year ENPC. École des Ponts ParisTech. [teacher].

[6] **M. Ferrand**. *Mécanique des fluides incompressibles - 2*. 2nd year ENPC. École des Ponts ParisTech. [teacher].

[7] **K. Sartelet**. *TP - modélisation de la pollution atmosphérique*. 2nd year ENPC - POLU1. École des Ponts. [teacher].

[8] **Y. Roustan**. *Externalité des transports*. Master TraDD. École Nationale des Ponts et Chaussées. [teacher].

[9] **Y. Roustan**. *Modélisation numérique*. Master SGE. UPC - UPEC - ENPC. [teacher, coordinator].

[10] **K. Sartelet**. *Atmospheric Environment and Air Quality*. 2nd year ENPC - POLU1. École des Ponts. [teacher, coordinator].

[11] **K. Sartelet**. *Emissions et dépôts des polluants atmosphériques*. 2nd year ENPC - POLU1. École des Ponts. [teacher.

[12] **K. Sartelet**. *Modélisation des aérosols*. Master SGE. UPC - UPEC - ENPC. [teacher, coordinator].

[13] **K. Sartelet**. *Visibilité et ozone stratosphérique*. 2nd year ENPC - POLU1. École des Ponts. [teacher].

[14] **K. Sartelet**. *Qualité de l'air et santé*. 2nd year ENPC - POLU1. École des Ponts. [teacher].

[15] **K. Sartelet**. *Pollution photochimique*. 2nd year ENPC - POLU1. École des Ponts. [teacher].

[16] **K. Sartelet**. *Formation des particules*. 2nd year ENPC - POLU1. École des Ponts. [teacher].

[17] **K. Sartelet**. *Qualité de l'air urbain*. 2nd year ENPC - DSOTV. École des Ponts. [teacher].

[18] **K. Sartelet**. *Conseil de département du département VET*. Ville, environnement, transport. École des Ponts. [participant].

Other schools and masters

[1] **B. Carissimo**. *Air pollutant dispersion modeling*. Master. IMT Atlantique. [teacher].

[2] **S. Cheng**. *Reduced order modelling for dynamical systems using neural networks*. Environmental Data Science and Machine Learning MSc. Imperial College London. May 14th, 2024. [teaching (3 hours guest lecture)].

[3] **M. Ferrand**. *Mécanique des Fluides - 2*. M2FESup Génie civil. École Normale Supérieure Paris Saclay. [teacher].

[4] **L. Lugon**, **Y. Kim** and **K. Sartelet**. *Training session: MUNICH and SinG modelling*. Air pollution conference Brazil - CMAS South America. Sao Paulo, Brazil. [teacher].

[5] **L. Lugon**. *TP CHIMERE/SSH-aerosol in CHIMERE training*. CHIMERE training. Paris, France. [teacher].

[6] **Y. Roustan**. *Qualité de l'air et Santé*. 3rd year. École Nationale des Travaux Publics de l'État. [teacher].

[7] **Y. Roustan**. *Qualité de l'air et Santé*. 3rd year ENTPE. École Nationale des Travaux Publics de l'État. [teacher, coordinator].

[8] **Y. Roustan**. *Les outils de modélisation - La "valeur" des données modélisées*. Master TSE. Université Paris-Est Créteil. [teacher].

[9] **Y. Roustan**. *Pollutions et risques*. Licence Génie Urbain. Université Gustave Eiffel. [teacher, coordinator].

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