CV, JULIE JEBEILE

philosopher of science and engineer-physicist

PERSONAL INFORMATION

Address	Universität Bern, Institut für Philosophie, Länggassstrasse 49a, 3012 Bern, Switzerland
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EDUCATION

2013	**PhD in philosophy** "*Explanation and Understanding with Scientific Models*" IHPST, Université Paris 1 – Panthéon-Sorbonne, France Supervisors: Anouk Barberousse and Jacques Dubucs Committee: Max Kistler, Margaret Morrison †, François-David Sebbah & Mauricio Suárez Date of defense: 11 December 2013
2009	**Master in philosophy** Université Panthéon-Sorbonne, Paris, France
2007	**Master in physics** Institut National Polytechnique de Grenoble, France
2007	**Master in engineering** Grenoble Engineering school of Physics (PHELMA), France

CURRENT POSITIONS

2024–2028	**SNF Professor** Project PRIMA "Climate Change Adaptation through the Feminist Kaleidoscope" Universität Bern, Switzerland
Since 2023	**CNRS Researcher** (Tenured, full-time research position, released from 2024 to 2028) Centre national de recherches météorologiques (UMR3589), Toulouse, France

PREVIOUS POSITIONS

2019–2022	**Postdoc** "*Epistemology of climate change*" Institut für Philosophie & Oeschger Center for Climate Change Research, Universität Bern, Switzerland
2016–2019	**Postdoc** "*Climate models for policy-making*" Institut Supérieur de Philosophie, Université catholique de Louvain, Belgium
2015–2016	**Postdoc** "*Data processing and visualization in astrophysics*" CEA Saclay, Astrophysics department, Saclay, France
2014–2015	**Postdoc** "*Collective judgment formation within the IPCC*" Université Paris-Sorbonne, France
2013–2014	**Teaching assistant** (full time) Université de Technologie de Compiègne
2007–2009	**Engineer** in atomic physics

TEACHING ACTIVITIES

Since 2009, to Bachelor's and Master's students in philosophy, science and engineering: history and philosophy of science, epistemology, philosophy of environment, environmental ethics and animal ethics, philosophy of climate science, ecofeminism

2019–2022 **Philosophical issues in modeling climate change** (with Ralf Hand, Vincent Lam and Jakob Zscheischler) – Master 1 and 2 in philosophy, geography, climate science and physics, Universität Bern (18 students; 14 hours)
Themes: uncertainty, probability and risk; model evaluation; detection and attribution; tipping points

2020–2021 **Philosophy of science perspectives on the climate challenge** (with Vincent Lam and Mason Majszak) – Master 1 and 2 in philosophy, Universität Bern (12 st.; 26h)
Themes: climate models; values and objectivity; climate injustices

2017–2018 **Ecofeminism** – Master 1 and 2 in philosophy, Université catholique de Louvain (15 st.; 30h)
Themes: activist, spiritual and philosophical dimensions; criticism of reductionism and rationalism; politics of situated knowledge

2016–2017 **Philosophy of environment** – Master 1 and 2 in philosophy, Université catholique de Louvain (15 st.; 30h)
Themes: social responsibility; precautionary principle; risk society; intrinsic value of Nature; anti-speciesism, deep ecology; ethical foundations of sustainable development

2014–2016 **Philosophy of science** – Second-year in philosophy, Université Paris 1 (40 st.; 48h)
Themes: unity of sciences; dynamics of science; scientific methods; laws, explanation and causality

2014–2015 **Philosophy of science** – First-year in philosophy, Université Paris-Est Créteil (30 st.; 24h)
Themes: scientific knowledge; scientific realism and anti-realism; scientific explanation; scientific change
Epistemology – Second-year in philosophy, Université Paris-Est Créteil (10 st.; 18h)
Themes: definition of knowledge (Gettier problem); structure and nature of justification; sources of knowledge; skepticism

2013–2014 **Philosophy of science** – All levels in engineering, Université de Technologie de Compiègne (50 st.; 73h)
Themes: dynamics of science; scientific explanation; scientific realism; emergence and reductionism
Ethics (20 st.; 45h)
Themes: ecological and environmental issues; bioethics; scientific authority; ethics of technology

2010–2012 **History and philosophy of science** – First-year in physics, Université Pierre et Marie Curie (32h/year)
Methodology in history of science (32h/year)

2009–2010 **Physics** (geometrical optics) – First-year in biology, Université Paris 13 Nord (64h/year)

PUBLICATIONS

Domains: philosophy of science, feminist epistemologies, social epistemology. Covered topics: scientific models and computer simulations, climate science, values in science and technology, collaborative practices in science, collective expertises

The abstracts are given in the Appendix.

Book

- Jebeile, Julie. *Épistémologie des modèles et des simulations numériques. De la représentation à la compréhension scientifique*, CNRS éditions, collection ALPHA, preface by Anouk Barberousse, **2019**, EAN : 9782271086143, 222 p., 15 x 23 cm, link

Articles in international peer-reviewed journals

- Jebeile, Julie. From regional climate models to usable information, *Climatic Change*, **2024**, *accepted*, doi:10.1007/s10584-024-03693-7
- Majszak, Mason & Jebeile, Julie. Expert judgment in climate science: how it is used and how it can be justified, *Studies in History and Philosophy of Science*, **2023**, vol. 100, 32-38, 7 p. doi:10.1016/j.shpsa.2023.05.005
- Jebeile, Julie, Lam, Vincent, Majszak, Mason & Räz, Tim. Machine learning and the quest for objectivity in climate model parameterization, *Climatic Change*, **2023**, 176, 101,19 p. doi:10.1007/s10584-023-03532-1
- Jebeile, Julie & Roussos, Joe. Usability of climate information: toward a new scientific framework, *WIREs Climate Change*, **2023**, 14(5), e833, doi:10.1002/wcc.833
- Drouet, Isabelle, Andler, Daniel, Barberousse, Anouk & Jebeile, Julie. Expert reports by large multidisciplinary groups: the case of the International Panel on Climate Change, *Synthese*, **2021**, vol. 199, 14491-14508, 18 p. doi:10.1007/s11229-021-03430-y
- Jebeile, Julie & Crucifix, Michel. Value management and model pluralism in climate science, *Studies in History and Philosophy of Science Part A*, **2021**, vol. 88, August, 120-127, 8 p. doi:10.1016/j.shpsa.2021.06.004
- Jebeile, Julie & Barberousse, Anouk. Model spread and progress in climate modelling, *European Journal for the Philosophy of Science*, **2021**, vol. 11, no. 3, 19 p. doi:10.1007/s13194-021-00387-0
- Ardourel, Vincent & Jebeile, Julie. Numerical instability and dynamical systems, *European Journal for the Philosophy of Science*, **2021**, vol. 11, no. 49, 21 p. doi:10.1007/s13194-021-00372-7
- Jebeile, Julie, Lam, Vincent & Räz, Tim. Understanding Climate Change with Statistical Downscaling and Machine Learning, *Synthese*, **2020**, vol. 199, 1877–1897, 21 p. doi:10.1007/s11229-020-02865-z
- Jebeile, Julie. The Kac ring or the art of making idealisations, *Foundations of Physics*, **2020**, 50:10, 1152-1170, 19 p. doi:10.1007/s10701-020-00373-1
- Jebeile, Julie & Crucifix, Michel. Multi-model ensembles in climate science: mathematical structures and expert judgements, *Studies in History and Philosophy of Science Part A*, **2020**, vol. 83, October, pp. 44-52, 9 p. doi:10.1016/j.shpsa.2020.03.001
- Jebeile, Julie. Values and objectivity in the Intergovernmental Panel on Climate Change, *Social Epistemology*, **2020**, 34:5, 453-468, 16 p. doi:10.1080/02691728.2020.1779380

- Jebeile, Julie & Ardourel, Vincent. Verification & Validation of simulations against holism, *Minds and Machines*, **2019**, 29:1, 149-168, 20 p. doi:10.1007/s11023-019-09493-8
- Jebeile, Julie. Collaborative scientific practice, epistemic dependence and opacity: the case of space telescope data processing, *Philosophia Scientiae*, **2018**, no. 22(2), pp. 59–78, 20 p. doi:10.4000/philosophiascientiae.1483
- Jebeile, Julie. Explaining with simulations. Why visual representations matter, *Perspectives on Science*, **2018**, vol. 26, no. 2, March-April, pp. 213-238, 26 p. doi:10.1162/POSC_a_00273
- Jebeile, Julie. Computer simulation, experiment, and novelty, *International Studies in the Philosophy of Science*, **2017**, 31:4, 379-395, 17 p. doi:10.1080/02698595.2019.1565205
- Ardourel, Vincent & Jebeile, Julie. On the presumed superiority of analytical solutions over numerical methods, *European Journal for the Philosophy of Science*, **2017**, issue 7, pp. 201–220, 20p. doi:10.1007/s13194-016-0152-2
- Jebeile, Julie. Les simulations sont-elles des expériences numériques ?, *Dialogue: Canadian Philosophical Review/Revue canadienne de philosophie*, volume 55, issue 01, **2016**, pp. 59-86, 28p. doi:10.1017/S0012217315001122
- Jebeile, Julie & Barberousse, Anouk. Empirical agreement in model validation, *Studies in History and Philosophy of Science Part A*, volume 56, April **2016**, pp 168–174, 7p. doi:10.1016/j.shpsa.2015.09.006
- Jebeile, Julie & Kennedy, Ashley. Explaining with models: the role of idealizations, *International Studies in the Philosophy of Science*, **2015**, volume 29, number 4, pp. 383-392, 10p. doi:10.1080/02698595.2015.1195143

Articles in peer-reviewed collective volumes

- Jebeile, Julie. Values and objectivity in the Intergovernmental Panel on Climate Change, in: Baghramian, M. & Martini, C. (eds.) *Questioning Experts and Expertise*, Routledge, **2023**, Chapter 13, reprinted paper
- Jebeile, Julie. Objectivité du GIEC, in: Israel-Jost, V. (ed.), *Objectivité(s)*, Collection "Science, éthique et société", Academia, l'Harmattan, **2021**, pp. 127-151, 25p. link
- Barberousse, Anouk & Jebeile, Julie. How do the validations of simulations and experiments compare?, in: Beisbart, C. & Saam, N. J. (eds.), *Computer Simulation Validation – Fundamental Concepts, Methodological Frameworks, and Philosophical Perspectives*, Cham: Springer, **2019**, pp. 925-942, 18p. doi:10.1007/978-3-319-70766-2_38
- Jebeile, Julie. Idealizations in empirical modeling, in Lenhard, J. & Carrier, M. (eds.) *Mathematics as a tool: Tracing New Roles of Mathematics in the Sciences*, Boston Studies in the Philosophy of Science, **2017**, pp. 213-232, 20p. doi:10.1007/978-3-319-54469-4_12
- Jebeile, Julie. Centrale nucléaire : notre nouvelle Tour de Babel ?, in Guay, A. & Ruphy, S. (eds.) *Science, philosophie, société*, IVe congrès de la SPS, Presses universitaires de France-Comté, collection Sciences : concepts et problèmes, **2017**, pp. 143-158, 16p. link
- Jebeile, Julie. Nuclear power plant: our new Tower of Babel? in C. Luetge & J. Jauernig (eds.), *Business Ethics and Risk Management*, Ethical Economy, Volume 43, Springer Science & Business Media Dordrecht, **2014**, pp 129-143, 15p. doi:10.1007/978-94-007-7441-4_9
- Jebeile, Julie. Le tournant computationnel dans les sciences : la fin d'une philosophie de la connaissance, in Varenne, F. & Silberstein, M. (eds.) *Modéliser & simuler. Épistémologies et*

pratiques de la modélisation et de la simulation, tome 1, Editions Matériologiques, **2013**, pp.171-189, 19p. link

TALKS

Refereed Conference Papers

2023
- *A new framework for climate science* with Joe Roussos, symposium "Climate storylines: perspectives at the intersection of philosophy of science and climate science" with Vincent Lam, Marina Baldissera Pacchetti, Mathias Frisch, Laura Garcia Portela &Ted G. Shepherd, EPSA conference, Belgrade, September 20-23

2022
- *Expert Judgment in Climate Science* with Mason Majszak, symposium "Consensus and Dissent in Science: New Perspectives" with Haixin Dang, Inmaculada de Melo-Martin, Kristen Intemann, Boaz Miller & Miriam Solomon, Philosophy of Science Association (PSA) conference, Pittsburgh, November 10-13

2021
- *Expert Judgment in Climate Science* with Mason Majszak, European Philosophy of Science Association Conference, Turin, September 15-18
- *Numerical instability and dynamical systems* with Vincent Ardourel, symposium "Perspectives on the success of applications of mathematics in scientific practice" with Nic Fillion & Cyrille Imbert, conference of la Société de Philosophie des Sciences, Mons, Belgium, September 8-10

2020
- *The Impact of Statistics and Machine Learning on Understanding in Climate Modeling* with Vincent Lam and Tim Räz, workshop "Data Science in Climate and Climate Impact Research", ETH Zurich, August 20-21

2019
- *Consensus and independence in climate modeling*, symposium "Modeling consensus and consensus models" with Mathias Frisch & Eva Barlösius, European Philosophy of Science Association (EPSP) conference, Geneva, September 11-14

2018
- *Epistemic opacity of computer simulations: a black-boxing feature*, conference series: Science and Art of Simulation IV, HLRS, Stuttgart, November 28-30
- *Climate models: still uncertain, yet improved* with Anouk Barberousse, symposium "Diversity, Uncertainty, and Action: Coping with a Plurality of Climate Models" with Gab Abramowitz, Mathias Frisch, Eric Winsberg, Philosophy of Science Association (PSA) conference, Seattle, November 1-4
- *Verification (& Validation) of Simulations against Holism* with Vincent Ardourel, congrès de la Société de Philosophie des Sciences, Nantes, July 4-6

  \+ symposium "Numerical Solution Practices" with Jabel Ramirez & Nicolas Fillion, Robert Moir, Matthias Brandl & Johannes Lenhard, Society for Philosophy of Science in Practice (SPSP) conference, Ghent, June 29-July 1
- *Ensemble of climate models or missed opportunity?* with Michel Crucifix, Models & Simulations 8, University of South Carolina, March 15-17
- *Learning from a toy model: the Kac ring*, congrès international triennal de la SoPhA, Louvain-la-Neuve, July 2-5

2017
- *Value Institutionalisation in Scientific Expertise*, with Thomas Boyer-Kassem, Expertise and Expert Knowledge workshop, University College Dublin, May 29-30, *accepted*
- *Collaborative scientific practice, epistemic dependence and opacity: the case of space telescope data processing*, symposium "Epistemology of Big Data in Physics", Deutsche Physikalische Gesellschaft Bremen, March 13-17

• *Learning from a toy model: the Kac ring*, European Congress of Analytic Philosophy, Munich, August 21-26, *accepted*

2016 • *Climate models: still uncertain, yet improved* with Anouk Barberousse, Models & Simulations 7, University of Barcelona, May 18-20

• *Is value-free scientific expertise possible?* with Thomas Boyer-Kassem, René Descartes Lectures, University of Tilburg, September 5-7

• *Traitement des données et simulation numérique : quelle différence ?* with Vincent Israel-Jost, congrés de la Société de Philosophie des Sciences, University of Lausanne, June 29 – July 1

• *Learning from a toy model: the Kac ring*, Society for Philosophy of Science in Practice (SPSP) conference, Rowan University, June 17-19, *accepted*

2015 • *Explaining with Simulations. Why Visual Representations Matter*, Philosophy of Science Group in India conference, Tata Institute of Social Sciences, Mumbai, December 19-21

• *Transparency, secrecy and high-risk technologies: a democratic dilemma* with Cyrille Imbert, MANCEPT workshops in political theory "Privacy and Transparency", Manchester, September 1-3

• *Are Numerical Solutions Preferable to Exact Solutions?* with Vincent Ardourel, British Society for the Philosophy of Science, University of Manchester, July 2–3

+ Conference on Algorithms and Complexity in Mathematics, Epistemology and Science (ACMES), London, Ontario, May 6-8, accepted

• *About "numerical experiments"*, Society for Philosophy of Science in Practice (SPSP) conference, University of Aarhus, June 24-26

2014 • *Idealization in the Process of Model Explanation* with Ashley Graham Kennedy, Philosophy of Science Association (PSA) conference, Chicago, November 6-9

• *La prise de décision démocratique à propos des technologies à haut risque et le problème des informations sensibles* with Cyrille Imbert, congrès de la Société de Philosophie des Sciences, Lille, June 25-27

• *The role of empirical agreement in the validation of computer simulations* with Anouk Barberousse, Models & Simulations 6, University of Notre Dame, May 9-11

2013 • *Verification & Validation of computer simulations: a philosophical analysis*, History and Philosophy of Computing conference, ENS Paris, October 28-31

• *Explanatory models and de-idealization* with Ashley Graham Kennedy, symposium "De-idealization in the Sciences" with Mieke Boon, Sara Green, Tarja Knuutila & Mary S. Morgan, Society for Philosophy of Science in Practice (SPSP) conference, Toronto, June 26-29

• *Le triangle de Levins : modélisation scientifique et compromis*, Rencontres doctorales internationales en philosophie des sciences, Université de Franche-Comté, Besançon, September 19-20

2012 • *Verification & Validation of computer simulations: a philosophical analysis*, Models & Simulations 5, Helsinki, June 14-16

• *Cellular automata simulations: are they really of a special kind?* with Vincent Ardourel, Turing Centenary conference, Cambridge, June 18-23, *accepted*

• *L'émergence faible : analyse philosophique de sa définition computationnelle*, Société de Philosophie Analytique (Sopha), Paris, May 4-6

• *L'industrie du nucléaire civil : la division du travail comme facteur de risque*, congrès de la Société de Philosophie des Sciences, Montréal, June 1-3 *accepted*

2011 • *Collective Understanding or Shared Understanding?*, "The Collective Dimension of Science" conference, Nancy, December 8-10

• *Nuclear Energy Industry: the Division of Labor in Design and Research Offices as a Risk Factor*, Business Ethics and Risk Management conference, Munich, December 8-10

• *From models to simulations: how is it possible to overcome the loss of understanding?*, Society for Philosophy of Science in Practice conference, Exeter, June 22-24

+ Seventh European Conference of Analytic Philosophy, Milan, Sept. 1-6

+ Epistemology of Modeling and Simulation conference, Pittsburgh, April 1-3

2010 • *Understanding the universe with computer simulations*, Integrating Complexity: Environment and History conference, University of Western Ontario, London, October 7-10

• *Numerical calculations versus certainty*, European Graduate School "Calculation, Intuition, and A Priori Knowledge", University of Tilburg, October 5-8

Invited talks

2024 • *tbd*, at Sabine Undorf's invitation, keynote speaker, Workshop on Identifying Values across Climate Impact Science, Potsdam Institute for Climate Impact Research (PIK), June 20-21

• *tbd*, at Filipe Drapeau Contim's and Marie Gueguen's invitation, Conférences de l'IPR, Institut de Physique de Rennes, May 21

• *Approche féministe des sciences du climat*, at Julie Hämmerli's and Florian Gatignon's invitation, Conférences PhilEAs, Université de Genève, March 21

2023 • *Le contrat social entre les sciences du climat et la société*, at Michael Stambolis-Ruhstorfer's invitation, Academic Freedom and Climate Change, Université de Limoges, October 13

• *Sciences du climat et objectivité*, with Roland Séférian, Summer school SPS – IHPST, La Villa Clythia, Fréjus, September 10-15

• *Epistemic inequality in climate modelling*, at Lukas Beck and Henrik Thorén's invitation, "The Dismal Shape of Things to Come? - Evaluating Climate Economics as a Guide to Democratic Decision-making", RIVET project workshop, Lund University, Sweden, September 7-8

• *Modèles dans la science, les modèles pour la prise de décision politique*, at Yves Tramblay's invitation, summer school « études d'impacts des changements climatiques en hydrologie », Banyuls, June 30

• *From scientific knowledge to politically useful information: a philosophical shift*, at Philipp Haueis' invitation, Institute for Interdisciplinary Studies of Science (I2SoS) colloquium (online), June 27

• *L'objectivité en sciences* (round table), with Guilhem Corot, Claire Grino & Stéphanie Ruphy, IXe Congrès de la Société de philosophie des sciences (SPS) « Genre et Sciences », Nanterre, June 1rst

• *From scientific knowledge to politically useful information: a philosophical shift*, IZWT colloquium, Bergische Universität Wuppertal (online), April 12

2022

- *Philosophy of climate science* & *Values in climate science*, "PSL Week: Reading the IPCC Assessment Reports", Université Paris, March 7
- *Climate change and epistemic challenges*, at Denis Buehler's invitation, Nicod Philosophy Colloquium, Paris, February 11
- « *Connaissance utile* » *: le cas des sciences du climat*, at Stéphanie Ruphy's invitation, Jeudis de l'histoire et de la philosophie des sciences, ENS Paris, February 3

2021

- *Narratives, Explanations and Models in Historical Science*, at Ange Pottin and Jean-Pascal Anfray's invitation, séminaire de la composante Mathesis de la République des Savoirs, ENS Ulm, Paris, December 2
- *Prédictions climatiques et incertitudes*, at Sébastien Poinat's invitation, colloque "La Connaissance incertaine et ses vertus", Nice, November 18-20
- *Feminist perspectives on philosophy of climate science*, at Ely Mermans' invitation, GRÉEA (Groupe de recherche en éthique environnementale et animale), Montréal (online), October 26
- *L'autorité de la science et la confiance en l'expertise*, at Olivier Sartenaer's invitation, conférence-forum d'éducation scientifique, Charleroi, Belgium, October 6-8
- *Model spread and progress in climate modelling*, at Samuel Somot's invitation, seminar of the Centre National de Recherches Météorologiques (CNRM) (online), September 30
- *Usability in climate science: moving from natural science to science-for-policy* with Joe Roussos, "Values in science" workshop, Institute for Future Studies, Stockholm (online), May 17-18

2020

- *Pluralisme des modèles et incertitudes dans les sciences du climat*, at Nadine de Courtenay's invitation, "Nombre & Mesure" seminar, SPHERE, Université Paris Diderot, December 16
- *Understanding with Climate Models and the Impact of Machine Learning*, at Marco Panza's invitation, Doing Science in the Artificial Age, Paris, December 14-16
- *Les valeurs dans les sciences du climat*, at Cyrille Imbert and Thomas Boyer-Kassem's invitation, séminaire d'épistémologie sociale et formelle, Sorbonne Université, Paris, November 25
- *From Regional Climate Models to Actionable Impact Information*, at Marina Baldissera Pacchetti's invitation, workshop on climate information for adaptation, University of Leeds, October 15-16 and 19-21
- *Quantification des incertitudes climatiques : perspectives épistémologiques*, at Isabelle Drouet's invitation, séminaire du laboratoire Sciences, Normes, Démocratie, Sorbonne Université, February 26
- *Complexité des objets techniques et interdisciplinarité des acteur·rice·s : sources d'opacité épistémique dans les missions spatiales*, at Anne Lefebvre's invitation, journées d'études "Designer pour l'aérospatiale aujourd'hui", MSH Paris-Saclay, February 7
- *Valeurs et objectivités en science : le cas des sciences du climat*, at Loic Labrousse's invitation, journées d'éthique et d'intégrité scientifique des ED de Sciences de la Terre de Paris, January 31

2019

- *Values and objectivity in the IPCC*, IV POND Conference: Science and Objectivity, University of Barcelona, September 26-27

• *Pluralité des modèles climatiques et quantification des incertitudes*, at Franck Varenne and Vincent Ardourel's invitation, séminaire EpistéMod, IHPST, Paris, May 21

• *Problèmes épistémologiques soulevés par la modélisation et la simulation scientifiques*, at Olivier Guichard's invitation, colloquium of mathematics, University of Strasbourg, February 8

• Participation about *epistemic inequality, injustice and violence* in the plenary "epistemic inequalities and gender in workplace incl. university", GT21 Diversité des savoirs, Association international des sociologues de langue française, University of Namur, February 7

2018 • *How can Climate Models effectively assist Policy Decisions?*, at Philip Kitcher's and Bernard Reber's invitation, "Scientific findings and democratic ideals", Columbia-Paris Alliance Program, New-York, December 06-07

• *Multi-model ensembles for the quantification of climate uncertainty*, at Jossi Berkovitz's and Joel Katzav's invitation, "Issues in the Theoretical Foundations of Climate Science: Scientific and Philosophical Perspectives" workshop, IHPST, University of Toronto, November 15

• *Values in Climate Modeling*, at Vincent Israel-Jost's invitation, workshop "Objectivité(s)", Louvain-la-Neuve, Belgium, June 21-22

• *Climate models and policy making*, at Ashley Kennedy's invitation, Florida Atlantic University, Boca Raton, March 12

2017 • *Epistemic opacity of computer simulations*, at Nic Formanek's invitation, workshop "TranSim", High performance computing centre in Stuttgart (HLRS), June 1-2

• *Epistemological analysis of computer simulations*, seminar "Histoire et Philosophie de l'informatique", IHPST, Paris, April 27

• *Les modèles climatiques peuvent-ils servir à la prise de décision politique ?*, séminaire d'épistémologie sociale sur l'expertise, Archives Poincaré, Nancy, March 24

2016 • *Climate models: new philosophical issues*, at Henk Dijkstra's invitation, IMAU Colloquium, Institute for Marine and Atmospheric research, Utrecht, May 17

• *Les enjeux épistémiques de la simulation et de la virtuelle dans le contexte des neurosciences (on the Human Brain Project simulations)*, seminar on collaborative practices in science, Sorbonne, Paris, March 7

2015 • *Incertitudes dans les modèles climatiques (Uncertainties in climate models)*, seminar Probability, decision, uncertainty, IHPST, Paris, April 17

• *Communicating about climate uncertainties*, at Giovanni Valente's invitation, Pittsburgh, February 26

• *Le rôle ambivalent des idéalisations dans les modèles scientifiques*, seminar of IHPST Paris, February 9

2014 • *Understanding the human brain with computer simulations*, at Jean-Pierre Changeux's invitation, "The Epistemology of Simulation: How can in silico simulation help understand & reproduce complex processes such as higher brain functions?", Human Brain Project SP12 conference, Institut Pasteur, Paris, June 26

• *Analyse philosophique des idéalisations scientifiques. Le cas particulier de la couche limite*, séminaire du laboratoire LadHyx, Ecole Polytechnique, Massy-Palaiseau, January 17

- Discussion on *Decision and complexity: the case of rare but extremely serious events*, colloque "La décision : processus et dynamiques", PRES Sorbonne, January 16
- *La compréhension scientifique au moyen de la modélisation*, at Fabien Grégis' invitation, séminaire doctoral en histoire et philosophie de la physique, laboratoire SPHERE, Paris, March 6

2013
- *La validation des simulations numériques* at Stéphanie Ruphy's invitation, "Simulations numériques : spécificités méthodologiques et enjeux sociétaux" workshop, Université Pierre Mendès France, Grenoble, November 28

2012
- *Weak emergence in nature* with Anouk Barberousse, "Emergence in science" conference, Université Paris-Sorbonne, December 11
- *Emergence and Novelty* with Anouk Barberousse, "Reductionism and Emergent Properties" conference, Université Pierre et Marie Curie, November 16-17
- *Des modèles classiques aux modèles numériques : quel(s) changement(s) pour la représentation ?*, Ecole CNRS Berder, France, April 1-6
- *De l'ambivalence des idéalisations et des abstractions dans la compréhension scientifique*, Research seminar of philosophy, ENS Lyon, Centre d'Epistémologie des Sciences Cognitives, February 10

2011
- *Nuclear Power Industry: our New Tower of Babel?*, at Michael Weisberg's invitation, Philosophy of Science workshop, University of Pennsylvania, Philadelphia, May 11

Communications in seminars

2023
- *Information utile et stratégies de modélisation climatique*, youtube, Webinaire TRACCS, September 22
- *Jugements d'expert : pertinents en dépit ou en vertu de leur subjectivité ?*, Jeudi du climat, CNRM Toulouse, July 6
- *Des connaissances aux services climatiques : réflexions épistémologiques sur la notion d'utilité*, Jeudi du climat, CNRM Toulouse, April 20

2022
- *Stratégies de modélisation climatique : entre normes scientifiques et valeurs sociales*, Clim'Actions week, IPSL, Paris (online), June 28

2021
- *Feminist perspectives on philosophy of climate science*, at Vera Hoffmann-Kolss' invitation, Colloquium Theoretical Philosophy, Universität Bern, November 5

2019
- *Mathematical models in historical explanations*, CEFISES seminar, Université catholique de Louvain, March 20

2018
- *GIEC et objectivité forte*, course "Societies, populations, environment, development: interdisciplinary problems and approaches" by Nathalie Frogneux and Jean-Pascal van Ypersele, Master in sciences and management of environment, UCL, October 17

2017
- Communication on *feminist approaches in reproductive biology and primatology*, course "research methods on gender" by Florence Degavre, master degree in gender studies, six universities of the Wallonia-Brussels Federation November 10
- *De l'utilité des modèles climatiques*, with Michel Crucifix, Work In Progress seminar, Université catholique de Louvain, March 15

2016
- *Les modèles climatiques au service de la politique*, seminar GRICE (Groupe de Recherche Interdisciplinaire sur la Crise Ecologique), Université catholique de Louvain, October 12

- *Explaining with simulations: Why can it be difficult? Why are visual representations useful?*, postdoc seminar, astrophysics department, CEA Saclay, May 10
- Commentator of Sylvia Wenmackers' talk *Neo-Leibnizian Analysis of Indeterminism in Newtonian Physics*, SePPhiA seminar, SND, Paris, February 4

2015
- *Analogie entre simulation numérique et observation* with Vincent Israel-Jost, séminaire Philo-Doctes, Université Paris 4, June 18
- *La transparence dans l'industrie*, talk for the doctoral formation of the IFP School, June 15
- *Is there a collective expert? The case of the IPCC* with Isabelle Drouet, colloque en l'honneur de Daniel Andler, June 11-12

2013
- *Information, secrecy and public debates* with Cyrille Imbert, symposium "Nuclear industry and waste depositories: public policy, public debates and risk perception'", MSH Lorraine, Nancy, December 18-20

2010
- *Expérience numérique : un abus de langage ?*, PhD student day, IHPST Paris, February 11

2009
- *Physique classique, physique quantique : deux paradigmes incommensurables ?*, journée de présentation des travaux de master 2, IHPST Paris, April 8

ORGANISATIONS OF SCIENTIFIC MEETINGS

International conferences

2021 "*Integrated History and Philosophy of Climate Data*", with Dania Achermann, Universität Bern, August 25-27

2015 "*Uncertainty in Climate Science and its Impact on Decision-making*", with Isabelle Drouet, Université Paris-Sorbonne, May 26-28

2011 "*The plurality of numerical methods in computer simulations and their philosophical analysis*", with Anouk Barberousse, IHPST Paris, November 3-5

Seminars and workshops

2018–2019 Seminar GRICE (Groupe de Recherche Interdisciplinaire sur la Crise Ecologique) on animal ethics, with Johannes Martens, Université catholique de Louvain

2017–2018 Seminar GRICE on ecofeminism and philosophy of climate change, Université catholique de Louvain

2017–2019 Seminar on feminist epistemologies, Université catholique de Louvain

2018 Doctoral day of the Research group on gender studies (GREG), Université catholique de Louvain, February 8

2017 Workshop "*La crise écologique : quels scénarios pour la transition ?*", with Olivier Sartenaer, Université catholique de Louvain, May 3

2016–2017 Seminar GRICE on ecological transitions, with Olivier Sartenaer

2014-2015 Seminar DéciGIEC on climate uncertainties, with Isabelle Drouet, Université Paris-Sorbonne

2014 Workshop PHITECO (Philosophy, Technology and Cognition), with Cléo Collomb and Anne Lefebvre, COSTECH, Université de Technologie de Compiègne, January 27-31

2013 Workshop "*Nuclear industry and waste depositories: public policy, public debates and risk perception*", with Cyrille Imbert, MSH Lorraine, Nancy, December 18-20

2012 Doctoral day, Institut Jean Nicod and IHPST, with François Le Corre, June 11

2011 Workshop "*Computational architecture: why does it matter?*", with Cyrille Imbert, IHPST, Paris, November 2

Reading groups

2016–2018 "Feminist epistemologies", Université catholique de Louvain
2011–2012 van Fraassen's book "Scientific representation: Paradoxes of Perspective", IHPST Paris
2009–2011 Graduate seminar in philosophy of science "Philsci", IHPST Paris

SERVICE TO THE PROFESSION

Institutional responsibilities

2023–2031 Co-chair of the Core Project 1 "Practitioner's interaction platform" of the TRACCS programme, with Sandrine Anquetin and Nathalie de Noblet-Ducoudré
2023 Member of the thesis committee of Nicolas Chapgelin in sociology about computer simulation in climate science, Sorbonne Université/CNRS laboratoire GEMASS
2023 Member of the committee for the position of "MCF" "in history and epistemology of biomedical sciences, Sorbonne Université
2022 Member of the thesis committee of Christophe Depaus, UCLouvain, Title: "Etude de la rationalité chez les acteurs institutionnels de la gestion des déchets radioactifs : analyse épistémologique et dimensions éthiques"
2018-2021 Member of the thesis committee of Ludovic Touzé-Peiffer, in epistemology of climate science, Sorbonne Universités, Title: "Paramétrisation de la convection atmosphérique dans les modèles numériques de climat – Pratiques et enjeux épistémologiques"

Reviews for international journals and conferences, and editorial responsibility

since 2013 Referee for international journals: *Environmental Science and Policy* (2023), *European Journal in Philosophy of Science* (2020*2), *European Journal of Analytic Philosophy* (2014), *History and Philosophy of the Life Sciences* (2013), *Lato Sensu* (2015, 2019*2), *Minds and Machines* (2022), *Perspectives on Science* (2020), *Philosophy of Science* (2017, 2020, 2021, 2022), *Philosophy and Technology* (2019), *Simulation* (2020), *Studies in History and Philosophy of Modern Physics* (2019), *Studies in History and Philosophy of Science* (2020*3, 2022*2, 2023), *Synthese* (2017, 2018, 2019*2, 2021)
2024 Member of the scientific committee of MRC 2024 "Models, Representation, and Computation" (tribute to Paul Humphreys & Margaret Morrison)
Member of the scientific committee of the 11èmes Rencontres doctorales internationales en philosophie des sciences (RDIPS)
2023 Member of the scientific committee of the summer school SPS – IHPST on "Objectivity in science"
2019 Referee for the 2019 European Philosophy of Science Association Conference (EPSA)
2011–2013 Member of the editorial committee of *Philonsorbonne*, journal of the department of philosophy, University Paris 1 Panthéon-Sorbonne

Memberships of scientific societies

2018-2021 Member of the administrative board of the French Society for Philosophy of Science (SPS)
Vice-president, with Thomas Pradeu, in charge of the relations with other societies

since 2019 Ordinary member of the Society for Women in Philosophy Switzerland (SWIP)

Participations in research projects

2019–2022 "*The Epistemology of Climate Change: Philosophy of science perspectives on the climate challenge*", philoclimate.ch, Bern

2014-2015 Project "DéciGIEC – Décision et indécision en matière climatique : du GIEC aux politiques publiques", Université Paris-Sorbonne

2014 "*Modelling of biological systems based on theoretical physics: epistemological analysis*", Lille

2013 Project IDRéP "*Nuclear information at stake*", CNRS NEEDS project, Nancy

2011–2013 COLEXIA "*Extended scientific knowledge: creation, validation and dissemination*", Nancy

2009–2011 COMPUPHYS "*The computational turn in physics*", ANR project, Paris

APPENDIX: PUBLICATIONS + ABSTRACTS

Monograph

- Jebeile, Julie. *Épistémologie des modèles et des simulations numériques. De la représentation à la compréhension scientifique*, CNRS éditions, collection ALPHA, preface by Anouk Barberousse, **2019**, EAN : 9782271086143, 222 p., 15 x 23 cm, link

  Understanding phenomena often requires using mathematical models of the target systems. In particular, this requires obtaining, through them, reliable answers to whyquestions. In this context, we achieve understanding once the models are acceptable and intelligible; this is the central assumption in this thesis. This double requirement is thus studied first in the analysis of analytical models, and then in the analysis of simulation models. This study first allowed us to highlight the positive role of idealizations in understanding through analytical models. Next, it allowed for an identification of the consequences of the computational turn. There is in fact a gap between a computational model and its results, partly because of the epistemic opacity of computer simulations. This gap seems to doubly hinder our understanding of simulated phenomena. On the one hand, some epistemological difficulties arise which are specific to the justification and the use of simulation models. These difficulties contravene their acceptability. On the other hand, since simulation is not open to direct inspection, it seems difficult for a user to make the relation between the model content and its results. Nevertheless, visual representations seem to play a fundamental function in allowing us to overcome the opacity issue, and thus to provide us with explanatory elements to our why-questions.

Articles in international peer-reviewed journals

- Jebeile, Julie. From regional climate models to usable information, *Climatic Change*, **2024**, *accepted*, doi:10.1007/s10584-024-03693-7

  Today, a major challenge for climate science is to overcome what is called the "usability gap" between the projections derived from the climate models and the needs of the end-users. Regional climate models (RCMs) are expected to provide usable information concerning a broad class of impacts and for a wide range of end-users. It is often assumed that the development of more accurate, more complex RCMs with higher spatial resolution should bring process understanding and local projections, thus overcoming the usability gap. In this paper, I rather assume that the credibility of climate information should be pursued together with two other criteria of usability, which are salience and legitimacy. Based on the Swiss climate change scenarios, I study the attempts at meeting the needs of end-users, and outline the trade-off modellers and users have to face with respect to the cascade of uncertainty. The upshot of the paper is that the trade-off between salience and credibility sets the conditions under which RCMs can be deemed adequate for the purposes of addressing the needs of end-users and of gearing the communication of the projections toward direct use and action.

- Majszak, Mason & Jebeile, Julie. Expert judgment in climate science: how it is used and how it can be justified, *Studies in History and Philosophy of Science*, **2023**, vol. 100, 32-38, 7 p. doi:10.1016/j.shpsa.2023.05.005

  Like any science marked by high uncertainty, climate science is characterized by a widespread use of expert judgment. In this paper, we first show that, in climate science, expert judgment is used to overcome uncertainty, thus playing a crucial role in the domain and even at times supplanting models. One is left to wonder to what extent it is legitimate to assign expert judgment such a status as an epistemic superiority in the climate context, especially as the production of expert judgment is particularly opaque. To begin answering this question, we highlight the key components of expert judgment. We then argue that the justification for the status and use of expert judgment depends on the competence and the individual subjective features of the expert producing the judgment since expert judgment involves not only the expert's theoretical knowledge and tacit knowledge, but also their intuition and values. This goes against

the objective ideal in science and the criteria from social epistemology which largely attempt to remove subjectivity from expertise.

- Jebeile, Julie, Lam, Vincent, Majszak, Mason & Räz, Tim. Machine learning and the quest for objectivity in climate model parameterization, *Climatic Change*, **2023**, 176, 101,19 p. doi:10.1007/s10584-023-03532-1

  Parameterization and parameter tuning are central aspects of climate modeling, and there is widespread consensus that these procedures involve certain subjective elements. Even if the use of these subjective elements is not necessarily epistemically problematic, there is an intuitive appeal for replacing them with more objective (automated) methods, such as machine learning. Relying on several case studies, we argue that, while machine learning techniques may help to improve climate model parameterization in several ways, they still require expert judgment that involves subjective elements not so different from the ones arising in standard parameterization and tuning. The use of machine learning in parameterizations is an art as well as a science and requires careful supervision.

- Jebeile, Julie & Roussos, Joe. Usability of climate information: toward a new scientific framework, *WIREs Climate Change*, **2023**, 14(5), e833, doi:10.1002/wcc.833

  Climate science is expected to provide usable information to policymakers, to support the resolution of climate change. The complex, multiply connected nature of climate change as a social problem is reviewed and contrasted with current modular and discipline-bounded approaches in climate science. We argue that climate science retains much of its initial "physics-first" orientation, and that it adheres to a problematic notion of objectivity as freedom from value judgements. Together, these undermine its ability to provide usable information. We develop the notion of usability using work from the literature on adaptation, but our argument applies to all of climate science. We illustrate the tension between usability and the objective, physics-first orientation of climate science with an example about model development practices in climate science. For solutions, we draw on two frameworks for science which responds to societal challenges: post-normal science and mandated science. We generate five recommendations for adapting the practice of climate science, to produce more usable information and thereby respond more directly to the social challenge of climate change. These are: 1) integrated cross-disciplinarity, 2) wider involvement of stakeholders throughout the lifecycle of a climate study, 3) a new framing of the role of values in climate science, 4) new approaches to uncertainty management, and 5) new approaches to uncertainty communication.

- Drouet, Isabelle, Andler, Daniel, Barberousse, Anouk & Jebeile, Julie. Expert reports by large multidisciplinary groups: the case of the International Panel on Climate Change, *Synthese*, **2021**, vol. 199, 14491-14508, 18 p. doi:10.1007/s11229-021-03430-y

  Recent years have seen a notable increase in the production of scientific expertise by large multidisciplinary groups. The issue we address is how reports may be written by such groups in spite of their size and of formidable obstacles: complexity of subject matter, uncertainty, and scientific disagreement. Our focus is on the International Panel on Climate Change (henceforth IPCC), unquestionably the best-known case of such collective scientific expertise. What we show is that the organization of work within the IPCC aims to make it possible to produce documents that are indeed expert reports. To do so, we first put forward the epistemic norms that apply to expert reports in general, that is, the properties that reports should have in order to be useful and to help decision-making. Section 2 claims that these properties are: intelligibility, relevance and accuracy. Based on this analysis, section 3 points to the difficulties of having IPCC reports indeed satisfying these norms. We then show how the organization of work within the IPCC aims at and to a large extent secures intelligibility, relevance and accuracy, with the result that IPCC reports can be relied on for decision-making. Section 4 focuses on the fundamentals of IPCC's work organization–that is, division of labour within the IPCC–while section 5 investigates three frameworks that were introduced over the course of the functioning of the IPCC: the reviewing procedure of IPCC reports, the language

that IPCC authors use to express uncertainty and the Coupled Model Intercomparison Project (CMIP). Concluding remarks are offered in section 6.

- Jebeile, Julie & Crucifix, Michel. Value management and model pluralism in climate science, *Studies in History and Philosophy of Science Part A*, **2021**, vol. 88, August, 120-127, 8 p. doi:10.1016/j.shpsa.2021.06.004

  Non-epistemic values pervade climate modelling, as is now well documented and widely discussed in the philosophy of climate science. Recently, Parker and Winsberg have drawn attention to what can be termed "epistemic inequality": this is the risk that climate models might more accurately represent the future climates of the geographical regions prioritised by the values of the modellers. In this paper, we promote value management as a way of overcoming epistemic inequality. We argue that value management becomes a serious possibility as soon as the value-free ideal and inductive risk arguments commonly used to frame the discussions of value influence in climate science are replaced by alternative social accounts of objectivity. We consider objectivity in Longino's sense as well as strong objectivity in Harding's sense to be relevant options here, because they offer concrete proposals that can guide scientific practice in evaluating and designing so-called multi-model ensembles and, *in fine*, improve their capacity to quantify and express uncertainty in climate projections.

- Jebeile, Julie & Barberousse, Anouk. Model spread and progress in climate modelling, *European Journal for the Philosophy of Science*, **2021**, vol. 11, no. 3, 19 p. doi:10.1007/s13194-021-00387-0

  Convergence of model projections is often considered by climate scientists to be an important objective in so far as it may indicate the robustness of the models' core hypotheses. Consequently, the range of climate projections from a multi-model ensemble, called "model spread", is often expected to reduce as climate research moves forward. However, the successive Assessment Reports of the Intergovernmental Panel on Climate Change indicate no reduction in model spread, whereas it is indisputable that climate science has made improvements in its modelling. In this paper, after providing a detailed explanation of the situation, we describe an epistemological setting in which a steady (and even slightly increased) model spread is not doomed to be seen as negative, and is indeed compatible with a desirable evolution of climate models taken individually. We further argue that, from the perspective of collective progress, as far as the improvement of the products of a multi-model ensemble (e.g. means) is concerned, reduction of model spread is of lower priority than model independence.

- Ardourel, Vincent & Jebeile, Julie. Numerical instability and dynamical systems, *European Journal for the Philosophy of Science*, **2021**, vol. 11, no. 49, 21 p. doi:10.1007/s13194-021-00372-7

  In philosophical studies regarding mathematical models of dynamical systems, instability due to sensitive dependence on initial conditions, on the one side, and instability due to sensitive dependence on model structure, on the other, have by now been extensively discussed. Yet there is a third kind of instability, which by contrast has thus far been rather overlooked, that is also a challenge for model predictions about dynamical systems. This is the *numerical instability* due to the employment of numerical methods involving a discretization process, where discretization is required to solve the differential equations of dynamical systems on a computer. We argue that the criteria for numerical *stability*, as usually provided by numerical analysis textbooks, are insufficient, and, after mentioning the promising development of backward analysis, we discuss to what extent, in practice, numerical instability can be controlled or avoided.

- Jebeile, Julie, Lam, Vincent & Räz, Tim. Understanding Climate Change with Statistical Downscaling and Machine Learning, *Synthese*, **2020**, vol. 199, 1877–1897, 21 p. doi:10.1007/s11229-020-02865-z

  Machine learning methods have recently created high expectations in the climate modelling context in view of addressing climate change, but they are often considered as non-physics-based 'black boxes' that may

not provide any understanding. However, in many ways, understanding seems indispensable to appropriately evaluate climate models and to build confidence in climate projections. Relying on two case studies, we compare how machine learning and standard statistical techniques affect our ability to understand the climate system. For that purpose, we put five evaluative criteria of understanding to work: intelligibility, representational accuracy, empirical accuracy, coherence with background knowledge, and assessment of the domain of validity. We argue that the two families of methods are part of the same continuum where these various criteria of understanding come in degrees, and that therefore machine learning methods do not necessarily constitute a radical departure from standard statistical tools, as far as understanding is concerned.

- Jebeile, Julie. The Kac ring or the art of making idealisations, *Foundations of Physics*, **2020**, 50:10, 1152-1170, 19 p. doi:10.1007/s10701-020-00373-1

  In 1959, mathematician Mark Kac introduced a model, called the Kac ring, in order to elucidate the classical solution of Boltzmann to the problem of macroscopic irreversibility. However, the model is far from being a realistic representation of something. How can it be of any help here? In philosophy of science, it is often argued that models can provide explanations of the phenomenon they are said to approximate, in virtue of the truth they contain, and in spite of the idealisations they are made of. On this view, idealisations are not supposed to contribute to any explaining, and should not affect the global representational function of the model. But the Kac ring is a toy model that is only made of idealisations, and is still used trustworthily to understand the treatment of irreversible phenomena in statistical mechanics. In the paper, my aim is to argue that each idealisation ingeniously designed by the mathematician maintains the representational function of the Kac ring with the general properties of macroscopic irreversibility under scrutiny. Such an active role of idealisations in the representing has so far been overlooked and reflects the art of modelling.

- Jebeile, Julie & Crucifix, Michel. Multi-model ensembles in climate science: mathematical structures and expert judgements, *Studies in History and Philosophy of Science Part A*, **2020**, vol. 83, October, pp. 44-52, 9 p. doi:10.1016/j.shpsa.2020.03.001

  Projections of future climate change cannot rely on a single model. It has become common to rely on multiple simulations generated by Multi-Model Ensembles (MMEs), especially to quantify the uncertainty about what would constitute an adequate model structure. But, as Parker points out (2018), one of the remaining philosophically interesting questions is: "How can ensemble studies be designed so that they probe uncertainty in desired ways?" This paper offers two interpretations of what General Circulation Models are and how MMEs should be designed. In the first interpretation, models are combinations of modules and parameterisations; an MME is obtained by "plugging and playing" with interchangeable modules and parameterisations. In the second interpretation, models are aggregations of expert judgements that result from a history of epistemic decisions made by scientists about the choice of representations; an MME is a sampling of expert judgements from modelling teams. We argue that, while the two interpretations involve distinct philosophical tools, they both could be used in a complementary manner in order to explore ways of designing better MMEs.

- Jebeile, Julie. Values and objectivity in the Intergovernmental Panel on Climate Change, *Social Epistemology*, **2020**, 34:5, 453-468, 16 p. doi:10.1080/02691728.2020.1779380

  The assessments issued by the Intergovernmental Panel on Climate Change (IPCC) aim to provide policymakers with an objective source of information about the various causes of climate change, the projected consequences for the environment and human affairs, and the options for adaptation and mitigation. But what, in this context, is meant by "objective"? In practice, in an effort to address internal and external criticisms, the IPCC has regularly revised its methodological procedures; some of these procedures seem to meet the requirements of objectivity, at least as understood in a specific sense, but the relationship between objectivity and value-neutrality requires further investigation. The aim of this paper is to offer an

appropriate philosophical account of objectivity, reconcilable with the fact that the IPCC is not value-free. I argue that Sandra Harding's notion of strong objectivity is particularly well suited to this goal, and I examine the extent to which the current IPCC procedures match her account.

- Jebeile, Julie & Ardourel, Vincent. Verification & Validation of simulations against holism, *Minds and Machines*, **2019**, doi:10.1007/s11023-019-09493-8

  It has been argued that the Duhem problem is renewed with computational models since model assumptions having a representational aim and computational assumptions cannot be tested in isolation. In particular, while the Verification & Validation methodology is supposed to prevent such holism, Winsberg (2009, 2010) argues that verification and validation cannot be separated in practice. Morrison (2015) replies that Winsberg overstates the entanglement between the steps. The paper aims at arbitrating these two positions, by stressing their respective validity in relation to domains of application. It importantly argues for an increasing use of formal methods in verification, that makes disentanglement possible.

- Jebeile, Julie. Collaborative scientific practice, epistemic dependence and opacity: the case of space telescope data processing, *Philosophia Scientiae*, **2018**, no. 22(2), pp. 59–78, 20 p. doi:10.4000/philosophiascientiae.1483

  Wagenknecht recently introduced a conceptual (yet nonexhaustive) distinction between translucent and opaque epistemic dependence in order to better describe the diversity of the relations of epistemic dependence between scientists in collaborative research practice. In line with her analysis, I will further elaborate on the different kinds of expertise that are specific to instrument- and computer-assisted practices, and will identify potential sources of opacity. To achieve this, I focus on a contemporary case of scientific knowledge creation, i.e., space telescope data processing.

- Jebeile, Julie. Explaining with simulations. Why visual representations matter, *Perspectives on Science*, **2018**, vol. 26, no. 2, March-April, pp. 213-238, 26 p. doi:10.1162/POSC_a_00273

  Computer simulations are often expected to provide explanations about target phenomena. However there is a gap between the simulation outputs and the underlying model, which prevents users finding the relevant explanatory components within the model. I contend that visual representations which adequately display the simulation outputs can nevertheless be used to get explanations. In order to do so, I elaborate on the way graphs and pictures can help one to explain the behavior of a flow past a cylinder. I then specify the reasons that make more generally visual representations particularly suitable for explanatory tasks in a computer-assisted context.

- Jebeile, Julie. Computer simulation, experiment, and novelty, *International Studies in the Philosophy of Science*, **2017**, 31:4, 379-395, 17 p. doi:10.1080/02698595.2019.1565205

  It is often said that computer simulations generate new knowledge about the empirical world in the same way experiments do. My aim is to make sense of such a claim. I first show that the similarities between computer simulations and experiments do not allow them to generate new knowledge but at least contribute in framing a similar context of discovery in both cases. I contend that, nevertheless, computer simulations and experiments yield new knowledge under the same epistemic conditions, independently of any features they may share.

- Ardourel, Vincent & Jebeile, Julie. On the presumed superiority of analytical solutions over numerical methods, *European Journal for the Philosophy of Science*, **2017**, issue 7, pp. 201–220, 20p. doi:10.1007/s13194-016-0152-2

  An important task in mathematical sciences is to make quantitative predictions, which is often done via the solution of differential equations. In this paper, we investigate why, to perform this task, scientists sometimes choose to use numerical methods instead of analytical solutions. Via several examples, we argue that the choice for numerical methods can be explained by the fact that, while making quantitative

predictions seems at first glance to be facilitated with analytical solutions, this is actually often much easier with numerical methods. Thus we challenge the alleged superiority of analytical solutions over numerical methods.

- Jebeile, Julie. Les simulations sont-elles des expériences numériques ?, in *Dialogue: Canadian Philosophical Review/Revue canadienne de philosophie*, volume 55, issue 01, **2016**, pp. 59-86, 28p. doi:10.1017/S0012217315001122

  Some philosophers see an analogy between simulation and experiment. But, once we acknowledge some similarities between computer simulations and experiments, can we conclude from them that simulations generate empirical knowledge, as experiments do? In this paper, I argue that the similarities between simulation and experiment give the scientist at most the illusion that she is conducting an experiment, but cannot seriously ground the analogy. However, it does not follow that experiments are always epistemologically superior to simulations. I analyze the cases when simulations and experiments equally yield new empirical knowledge.

- Jebeile, Julie & Barberousse, Anouk. Empirical agreement in model validation, *Studies in History and Philosophy of Science Part A*, volume 56, april **2016**, pp 168–174, 7p. doi:10.1016/j.shpsa.2015.09.006

  Empirical agreement is often used as an important criterion when assessing the validity of scientific models. However, it is by no means a sufficient criterion as a model can be so adjusted as to fit available data even though it is based on hypotheses whose plausibility is known to be questionable. Our aim in this paper is to investigate into the uses of empirical agreement within the process of model validation.

- Jebeile, Julie & Kennedy, Ashley. Explaining with models: the role of idealizations, *International Studies in the Philosophy of Science*, **2015**, volume 29, number 4, pp. 383-392, 10p. doi:10.1080/02698595.2015.1195143

  Because they contain idealizations, scientific models are often considered to be misrepresentations of their target systems. An important question is therefore how models can explain the behaviors of these systems. Most of the answers to this question are representationalist in nature. Proponents of this view are generally committed to the claim that models are explanatory if they represent their target systems to some degree of accuracy; in other words, they try to determine the conditions under which idealizations can be made without jeopardizing the representational function of models. In this paper we first outline several forms of this representationalist view. We then argue that this view, in each of these forms, omits an important role of idealizations: that of facilitating the identification of the explanatory components within a model. Via examination of a case study from contemporary astrophysics, we show that one way in which idealizations can do this is by creating a comparison case which serves to highlight the relevant features of the target system.

Articles in peer-reviewed collective volumes

- Jebeile, Julie. Objectivité du GIEC, in: Israel-Jost, V. (ed.), *Objectivité(s)*, Collection "Science, éthique et société", Academia, l'Harmattan, **2021**, pp. 127-151, 25p. link

- Barberousse, Anouk & Jebeile, Julie. How do the validations of simulations and experiments compare?, in: Beisbart, C. & Saam, N. J. (eds.), *Computer Simulation Validation – Fundamental Concepts, Methodological Frameworks, and Philosophical Perspectives*, Cham: Springer, **2019**, pp. 925-942, 18p. doi:10.1007/978-3-319-70766-2_38

  Whereas experiments and computer simulations seem very different at first view because the for-mer, but not the latter, involve interactions with material properties, we argue that this difference is not so important with respect to validation, as far as epistemology is concerned. Major differences remain nevertheless from the methodological point of view. We present and defend this distinction between epistemology (the

domain of scientific operations that are justified by rational principles aiming at improving current knowledge) and methodology (the domain of scientific operations that are governed by rules, not all of which are grounded on rational, explicit principles). We illustrate this distinction and related claims by comparing how experiments and simulations are validated in evolutionary studies, a domain in which both experiments in the lab and computer simulations are relatively new but mutually reinforcing.

- Jebeile, Julie. Idealizations in empirical modeling, in Lenhard, J. and Carrier, M. (eds.) *Mathematics as a tool: Tracing New Roles of Mathematics in the Sciences*, Boston Studies in the Philosophy of Science, Boston Studies in the Philosophy of Science, **2017**, pp. 213-232, 20p. doi:10.1007/978-3-319-54469-4_12

  In empirical modeling, mathematics has an important role in transforming descriptive representations of target system(s) into calculation devices, thus creating useful scientific models. The transformation may be considered the action of tools. In this paper, I assume that model idealizations could be such tools. I then examine whether these idealizations have characteristic properties of tools, i.e. being adapted to the objects on which they apply and being to some extent generic.

- Jebeile, Julie. Centrale nucléaire : notre nouvelle Tour de Babel ?, in Guay, A. and Ruphy, S. (eds.) *Science, philosophie société*, IVe congrès de la SPS, Presses universitaires de France-Comté, collection Sciences : concepts et problèmes, **2017**, pp. 143-158, 16p. link

- Jebeile, Julie. Nuclear power plant: our new Tower of Babel? in C. Luetge and J. Jauernig (eds.), *Business Ethics and Risk Management*, Ethical Economy, Volume 43, Springer Science & Business Media Dordrecht, **2014**, pp 129-143,15p. doi:10.1007/978-94-007-7441-4_9

  On July 5, 2012 the Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of the Tokyo Electric Power Company (TEPCO) issued a final, damning report. Its conclusions show that the human group – constituted by the employees of TEPCO and the control organism – had partial and imperfect epistemic control on the nuclear power plant and its environment. They also testify to a group inertia in decision-making and action. Could it have been otherwise? Is not a *collective of human beings*, even prepared in the best way against nuclear risk, *de facto* prone to epistemic imperfection and a kind of inertia? In this article, I focus on the group of engineers who, in research and design offices, design nuclear power plants and model possible nuclear accidents in order to calculate the probability of their occurrence, predict their consequences, and determine the appropriate countermeasures against them. I argue that this group is prone to epistemic imperfection, even when it is highly prepared for adverse nuclear events.

- Jebeile, Julie. Le tournant computationnel dans les sciences : la fin d'une philosophie de la connaissance, in Varenne, F. and Silberstein, M. (eds.) *Modéliser & simuler. Épistémologies et pratiques de la modélisation et de la simulation*, tome 1, Editions Matériologiques, **2013**, pp.171-189, 19p.

  I argue that the way of justifying analytical models is inefficient in the case of computer simulations. For this purpose, I first identify the procedures of a "traditional" justification of analytical models. Second, I show that each of the procedures fails to apply to simulation models.