Curriculum vitæ

Federico Becca

Date and place of Birth:	14 January 1972, Roma (Italy)
Nationality:	Italian
Address:	Dipartimento di Fisica, Università di Trieste
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Education

- October 1990 - December 1995: Undergraduate studies in Physics, University "La Sapienza", Roma (Italy).
- January 1996: Degree in Physics 110/110 *cum laude*, University "La Sapienza", Roma (Italy). *Charge instabilities in strongly correlated electron systems*, Supervisor: Prof. C. di Castro.
- October 2000: "Doctor Philosophiæ" *cum laude*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). *Electronic properties from strong correlation*, Supervisor: Prof. S. Sorella.

Employments

- November 2000 - August 2002: Post-doctoral research assistant at Institut de Physique Théorique, University of Lausanne (Switzerland).
- September 2002 - October 2004: Research associate position at Istituto Nazionale per la Fisica della Materia (INFM), Trieste (Italy).
- November 2004 - March 2008: Tenure-track position at the INFM DEMOCRITOS National Simulation Center, Trieste (Italy).
- April 2008 - December 2018: Researcher at Consiglio Nazionale delle Ricerche (CNR), Istituto Officina dei Materiali, Trieste (Italy).
- January 2019 - September 2021: Assistant professor (RTDb) in Theoretical Condensed-Matter Physics, University of Trieste (Italy).
- Since October 2021: Associate professor in Theoretical Condensed-Matter Physics, University of Trieste (Italy).

Academic Habilitation

- November 2010: Idoneous as associate professor in Condensed-Matter Physics (FIS/03). Never appointed.
- October 2014: Italian habilitation for full professor in Theoretical Condensed-Matter Physics (02/B2), valid until October 2024.
- August 2018: Italian habilitation for full professor in Theoretical Condensed-Matter Physics (02/B2), valid until August 2028.

Professional Services

- April 2010 - December 2018: Member of the Council at Istituto Officina dei Materiali, Consiglio Nazionale delle Ricerche (CNR).
- January 2013 - December 2016: Member of the Board of Directors for the Centre Européen de Calcul Atomique et Moléculaire (CECAM), Lausanne (Switzerland).
- Referee for Physical Review Letters, Physical Review A, B, E, and X, Science, Nature Physics, Nature Communications, Scientific Reports, New Journal of Physics, and others. Outstanding Referee of the American Physical Society (2015).
- Referee for grant applications to the American National Science Foundation (NSF), the Department of Energy (DoE), and the European Research Council (ERC).

Professional Services at the University of Trieste

- Since November 2019: Member of the Academic Board of the Ph.D. in Physics.
- Since September 2021: Internal referee for the Research Evaluation Commission (CVR).
- Since January 2022: Member of the Teaching Commission for the master's degree.

Research Appointments (see Annex I)

- Invited scientist for several collaborations in different universities.
- Invited scientist for several programs at the Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California).

Teaching Experience (see Annex II)

- November 2002 - December 2018: Courses for the Ph.D. at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).
- Since October 2019: Courses for the Master's degree at the University of Trieste (Italy).
- Since May 2020: Courses for the Ph.D. in Physics at the University of Trieste (Italy).

Supervision of Undergraduate and Ph.D. Students (see Annex III)

- 8 Master students, among them:
  Cedric Weber, King's College, London.
- 13 Ph.D. students, among them:
  Michel Ferrero, École Polytechnique, Paris.
  Juan Carrasquilla, Vector Institute, Toronto.
  Giuseppe Carleo, École Polytechnique Fédérale de Lausanne.
  Yasir Iqbal, Indian Institute of Technology, Chennai.
  Luca Tocchio, Politecnico di Torino.

Organization of Schools and Workshops (see Annex IV)

- 13 workshops and school organized, including 6 editions of the CECAM School on "Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics".

Invited Talks and Seminars (see Annex V)

- About 50 invited talks (including 3 at the American Physical Society and 1 at the IUPAP Conference on Computational Physics) and 50 seminars at research institutes and universities.
- Short courses at international schools.

Publications (see Annex VI)

- About 100 papers in international referred journals, among which 1 Science, 1 Scientific Report (Nature Publishing), 16 Physical Review Letters, 2 Physical Review X, and 83 Physical Review A, B, E, and Research (19 Rapid Communications and Letters).
- One book (286 pages), published by Cambridge University Press (November 2017).

Research Interests

I am a condensed matter theorist and my main research interests lie in the study of strongly correlated materials. These are systems where the many-body interactions play a crucial role and lead to novel phenomena that cannot be explained by independent-particle theories. Examples include Mott insulators, spin liquids, and topological phases. Current efforts are devoted to the identification of spin-liquid phases with gapless excitations or topological degeneracy in Mott insulators with magnetic frustration; I am also investigating superconducting phases emerging from strong electron-electron correlations in d orbitals. By using mainly numerical methods (quantum Monte Carlo and exact diagonalizations), I work on problems related to charge and spin instabilities in strongly-correlated systems, frustrated magnetic systems, and metal-insulator or superfluid-insulator transitions.

Citations indexed on Web of Science: more than 4000.

H-index: 37.

Source: `https://www.webofscience.com/wos/author/record/2381`

Citations indexed on Google Scholar: more than 6000.

H-index: 44.

Source: `http://scholar.google.com/citations?user=3u-o5PQAAAAJ`

Annex I: Research Appointments

1. May 2004 (one month): École Polytechnique Fédérale de Lausanne (Switzerland), in the group of Prof. F. Mila.

2. May 2005 (two weeks): University "Pierre et Marie Curie" Paris VI (France), in the group of Prof. C. Lhuillier.

3. September - November 2005 (three months): Centre National de la Recherche Scientifique (CNRS) at the University of Toulouse "Paul Sabatier" (France), in the group of Prof. D. Poilblanc.

4. June 2006 (one month): École Polytechnique Fédérale de Lausanne (Switzerland), in the group of Prof. F. Mila.

5. October 2007 (five weeks): Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California) for the program "Moments and Multiplets in Mott Materials".

6. May and November 2008 (two months): École Polytechnique Fédérale de Lausanne (Switzerland), in the group of Prof. F. Mila.

7. November 2009 (one month): University of Toulouse "Paul Sabatier" (France), in the group of Prof. D. Poilblanc.

8. November 2010 (five weeks): Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California) for the program "Disentangling Quantum Many-body Systems: Computational and Conceptual Approaches" (also in the Advisory Board).

9. May 2012 (one month): University of Toulouse "Paul Sabatier" (France), in the group of Prof. D. Poilblanc.

10. September-October 2012 (seven weeks): Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California) for the program "Frustrated Magnetism and Quantum Spin Liquids: From Theory and Models to Experiments", also local participant for the program "Quantum Dynamics in Far from Equilibrium Thermally Isolated Systems".

11. May 2014 (two weeks): Perimeter Institute for Theoretical Physics, Waterloo (Canada).

12. September 2015 (one month): Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California) for the program "New Phases and Emergent Phenomena in Correlated Materials with Strong Spin-Orbit Coupling".

13. May 2016 (two weeks): Nordic Institute for Theoretical Physics (Nordita), Stockholm (Sweden) for the program "From Quantum Field Theories to Numerical Methods".

14. September 2016 (two weeks): Rice University, Houston (Texas), in the group of Prof. Q. Si.

15. June 2018 (two weeks): Institut de Physique Théorique, Saclay (France) for the program "Topological Phases of Matter: from the Quantum Hall Effect to Spin Liquids".

16. September 2018 (two weeks): Kavli Institute for Theoretical Science (KITS) and Institute of Physics (IOP), Beijing (China) for the program "Quantum magnetism: Frustration, Low-dimensionality, Topology".

17. February 2019 (one month): Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California) for the program "Machine Learning for Quantum Many-Body Physics".

18. September 2019 (three weeks): Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California) for the program "Topological Quantum Matter: Concepts and Realizations".

19. December 2020 (three weeks): Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California) for the program "Correlated Systems with Multicomponent Local Hilbert Spaces". The program did not take place because of Covid-19.

Annex II: Teaching Experience

Undergraduate courses (bachelor level)

1. March 2020 - June 2020: teaching assistant for "Computational Laboratory" for the bachelor's degree in Physics (32 hours), University of Trieste (Italy).
2. March 2021 - June 2021: teaching assistant for "Computational Laboratory" for the bachelor's degree in Physics (30 hours), University of Trieste (Italy).
3. March 2022 - June 2022: teaching assistant for "Computational Laboratory" for the bachelor's degree in Physics (50 hours), University of Trieste (Italy).

Undergraduate courses (master level)

1. October 2019 - November 2019: "Introduction to Modern Physics" for the master's degree in Materials Engineering (24 hours for a course of 48 hours in total), University of Trieste (Italy).
2. October 2019 - December 2019: "Introduction to Quantum Many-Body Systems" for the master's degree in Physics (48 hours), University of Trieste (Italy).
3. November 2020 - December 2020: "Introduction to Materials Physics" for the master's degree in Materials Engineering (24 hours for a course of 48 hours in total), University of Trieste (Italy).
4. October 2020 - December 2020: "Introduction to Quantum Many-Body Systems" for the master's degree in Physics (48 hours), University of Trieste (Italy).
5. November 2021 - December 2021: "Introduction to Materials Physics" for the master's degree in Materials Engineering (24 hours for a course of 48 hours in total), University of Trieste (Italy).
6. October 2021 - December 2021: "Introduction to Quantum Many-Body Systems" for the master's degree in Physics (48 hours), University of Trieste (Italy).
7. March 2022 - June 2022: "Non-conventional electronic states in low dimensionality" for the master's degree in Physics (48 hours), University of Trieste (Italy).

Graduate courses (Ph.D. level)

1. November 2002 - April 2011: Lecturer for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 20 hours every year), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).
2. November - December 2011: Series of lectures on "Introduction to Monte Carlo methods" for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 40 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).
3. November - December 2012: Series of lectures on "Introduction to Monte Carlo methods" for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 40 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).
4. November - December 2013: Series of lectures on "Introduction to Monte Carlo methods" for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 40 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

5. January - February 2015: Series of lectures on "Exact diagonalizations, density-matrix renormalization group, and simple tensor networks" for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 40 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

6. November 2015 - February 2016: Series of lectures for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 50 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

7. April 2016: Series of lectures for Master and Ph.D. courses on "Monte Carlo approaches for strongly-correlated systems" (about 20 hours plus 20 hours of tutorial), Politecnico di Torino (Italy).

8. November 2016 - February 2017: Series of lectures for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 50 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

9. November 2017 - February 2018: Series of lectures for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 40 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

10. March 2018: Series of lectures for the Ph.D. course on "Monte Carlo approaches for strongly-correlated systems" (about 20 hours, together with L.F. Tocchio), Politecnico di Torino (Italy).

11. November 2018 - December 2018: Series of lectures for the Ph.D. course on "Numerical methods for strongly correlated systems" (about 20 hours), Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

12. April - May 2020: Series of lectures for the Ph.D. course on "Low-temperature physics: quantum fluids and superconductivity" (16 hours), University of Trieste (Italy).

13. June 2021: Series of lectures for the Ph.D. course on "Low-temperature physics: quantum fluids and superconductivity" (20 hours), University of Trieste (Italy).

14. September 2022 - October 2022: Series of lectures for the Ph.D. course on "Low-temperature physics: quantum fluids and superconductivity" (20 hours), University of Trieste (Italy).

Annex III: Supervised Undergraduate and Ph.D. Students

Ph.D. Students

1. October 2006: M. Capello, *Variational study of the Mott insulators*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with S. Sorella and M. Fabrizio).

2. October 2006: M. Ferrero, *Competing mechanisms in strongly correlated systems close to a Mott transition*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with M. Fabrizio).

3. October 2007: M. Lugas, *d-wave Superconductivity and antiferromagnetism in strongly correlated systems by a new variational approach*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with S. Sorella).

4. October 2008: L.F. Tocchio, *A new variational wave function with backflow correlations for frustrated Hubbard models*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with S. Sorella).

5. October 2008: M.E. Pezzoli, *Disorder and interaction: ground-state properties of the disordered Hubbard model*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with M. Fabrizio).

6. October 2010: J. Carrasquilla, *The Bose-Hubbard model with disorder in low-dimensional lattices*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with M. Fabrizio).

7. October 2011: G. Carleo, *Spectral and dynamical properties of strongly-correlated systems: methods and applications*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with S. Baroni and S. Moroni).

8. September 2012: Y. Iqbal, *Spin liquids in quantum antiferromagnetic models on two-dimensional frustrated lattices*, University of Toulouse "Paul Sabatier" (France). (Internal supervisor: D. Poilblanc).

9. September 2013: W.-J. Hu, *Unconventional phases in doped or frustrated quantum antiferromagnets: a systematic quantum Monte Carlo study*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with S. Sorella).

10. November 2013: M.Z. Asadzadeh, *Interplay of superconductivity and magnetism in the two-dimensional Kondo lattice model*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with M. Fabrizio).

11. October 2018: C. de Franco, *Magnetism and superconductivity in the two-band Hubbard model: variational Monte Carlo perspective*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy). (Together with L.F. Tocchio).

12. October 2019: F. Ferrari, *Static and dynamical properties of frustrated spin models*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

13. October 2019: J. Hasik, *Towards next-generation methods to optimize two-dimensional tensor networks: Algorithmic differentiation and applications to quantum magnets*, Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

Master Students

1. March 2002: M. Ferrero, *Dynamical properties of the Heisenberg antiferromagnet on a trimerized Kagomé lattice: a classical Monte Carlo study*, École Polytechnique Fédérale de Lausanne (Switzerland). (Together with F. Mila).

2. March 2003: C. Weber, *Study of the classical Heisenberg antiferromagnet model on the square lattice with nearest and next-nearest neighbor couplings*, École Polytechnique Fédérale de Lausanne (Switzerland). (Together with F. Mila).

3. August 2013: T. Comparin, *Numerical study of the trapped and extended Bose-Hubbard models*, University of Utrecht (Netherlands). (Internal supervisor: C. de Morais Smith).

4. April 2015: F. Arrigoni, *Variational Monte Carlo study of the two-band Hubbard model*, University of Milano (Italy). (Internal supervisor: N. Manini).

5. August 2016: L. Testa, *Variational Monte Carlo investigation of SU(N) Heisenberg models on the square and triangular lattices*, École Polytechnique Fédérale de Lausanne (Switzerland). (Internal supervisor: F. Mila).

6. October 2021: L. Viteritti, *Neural-network quantum states for frustrated Heisenberg models*, University of Trieste (Italy).

7. October 2022: K. Chahine *Charge and spin instabilities in the kagome lattice extended Hubbard model*, University of Trieste (Italy).

8. October 2022: M. Bernardinetti *Study of bosonic systems with the Quantum Variational Monte Carlo method in two-dimensional lattices*, University of Trieste (Italy).

Bachelor students

1. July 2020: K. Chahine, *Studio di semplici modelli elettronici nei solidi: isolanti di banda e isolanti topologici*, University of Trieste (Italy).

2. July 2020: C. Zerba, *Simulazioni Monte Carlo per sistemi bidimensionali interagenti*, University of Trieste (Italy).

3. July 2021: N. Baù, *Simulazioni su computers classici e quantistici del modello di Heisenberg*, University of Trieste (Italy).

4. September 2021: L. Broglio, *Simulazioni Monte Carlo per il modello di Ising in due dimensioni*, University of Trieste (Italy).

Annex IV: Organization of Workshops and Schools

1. Director of the "School and Workshop on Highly Frustrated Magnets and Strongly Correlated Systems: From Non-Perturbative Approaches to Experiments" (30 July – 17 August 2007) with F. Essler, F. Mila, S. Shastry, and A. Tsvelik. Held at the International Center of Theoretical Physics (ICTP), Trieste (Italy).

2. Director of the workshop on "Emergence of New States of Matter in Magnetic Systems and Beyond" (5 – 9 July 2010) with M. Kiselev, B. Kumar, and F. Mila. Held at the International Center of Theoretical Physics (ICTP), Trieste (Italy).

3. Scientific Advisor for the KITP program on "Disentangling Quantum Many-body Systems: Computational and Conceptual Approaches" (18 October – 17 December 2010). Held at the Kavli Institute for Theoretical Physics (KITP), Santa Barbara (California).

4. Scientific Advisor for the "First Conference of Condensed Matter and Computational Materials" at the Dipartimento dei Materiali e Dispositivi del CNR (21 – 22 February 2011). Held at the CNR, Roma (Italy).

5. Director of the 2^{nd} CECAM School on "Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics" (11 – 29 July 2011) with S. de Gironcoli, A. Laio, and C. Micheletti. Held at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

6. Director of the CECAM School on "Quantum Monte Carlo Methods at Work for Novel Phases of Matter" (23 January – 3 February 2012) with S. Moroni, M. Mueller, and S. Sorella. Held at the International Center of Theoretical Physics (ICTP), Trieste (Italy).

7. Director of the 3^{rd} CECAM School on "Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics" (9 – 27 July 2012) with S. de Gironcoli, A. Laio, and S. Piccinin. Held at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

8. Director of the 4^{th} CECAM School on "Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics" (8 – 26 July 2013) with G. Bussi, S. Piccinin, and A. Rosa. Held at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

9. Director of the CECAM School on "Quantum Spin Liquids: from Theory to Numerical Simulations" (9 – 20 September 2013) with G. Misguich and D. Poilblanc. Held at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

10. Director of the 5^{th} CECAM School on "Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics" (30 June – 18 July 2014) with G. Bussi, S. Piccinin, and A. Rosa. Held at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

11. Director of the Workshop on "Current Trends in Frustrated Magnetism" (9 – 13 February 2015) with M. Kiselev, B. Kumar, and S. Patnaik. Held at the Jawaharlal Nehru University (JNU), New Delhi (India).

12. Director of the 6^{th} CECAM School on "Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics" (6 – 24 July 2015) with G. Bussi, S. de Gironcoli, and A. Rosa. Held at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

13. Director of the 7^{th} CECAM School on "Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics" (5 – 22 July 2016) with A. Laio, and A. Rosa. Held at Scuola Internazionale Superiore di Studî Avanzati, Trieste (Italy).

Annex V: Invited Talks and Seminars

Invited Talks

1. March 2000: *Ferromagnetism and superconductivity in the strong coupling Hubbard model*, XIX Convegno di Fisica Teorica e Struttura della Materia, Fai della Paganella (Italy).

2. October 2001: *Heisenberg systems coupled to phonons*, Swiss Workshop on Materials with Novel Electronic Properties, Les Diablerets (Switzerland).

3. March 2003: $SrCu_2(BO_3)_2$*: A remarkable spin-gapped spin system*, XXII Convegno di Fisica Teorica e Struttura della Materia, Fai della Paganella (Italy).

4. August 2003: *The chiral spin liquid and the Lieb-Schultz-Mattis theorem*, Conference on Highly Frustrated Magnetism, Grenoble (France).

5. September 2003: *Spin-phonon coupling in highly-frustrated magnetic systems*, LXXXIX Convegno Nazionale della Società Italiana di Fisica, Parma (Italy).

6. June 2004: *Ising transition driven by frustration in a 2D classical model with continuous symmetry*, IX Convegno Nazionale di Fisica Statistica, Parma (Italy).

7. November 2005: *An improved variational phase diagram for the* J_1-J_2 *model on the square lattice*, Conference on Highly Frustrated Magnetism, La Londe Les Maures (France).

8. October 2005: *Improved variational approach to strongly correlated systems: the RVB paradigm at work*, Conference on Concepts in Electron Correlation, Hvar (Croatia).

9. October 2005: *Is it possible to understand the metal-insulator transition from a variational approach?*, Conference on Gutzwiller Wave Functions and Related Slave-Boson Mean-Field Theories, Marburg (Germany).

10. March 2006: *Variational approach to magnetic systems: the* J_1-J_2 *model on the square lattice*, CECAM Conference on Novel Theoretical Aspects of Frustrated Spin Systems, Lyon (France).

11. September 2006: *An improved variational approach for strongly correlated models: Metal-insulator transition and frustrated spin systems*, XCII Convegno Nazionale della Società Italiana di Fisica, Torino (Italy).

12. January 2007: *Dynamics of a dimer liquid*, Workshop on Mobile Fermions and Bosons on Frustrated Lattices, Dresden (Germany).

13. August 2007: *Variational description of Mott insulators with charge fluctuations*, Workshop on Highly Frustrated Magnets and Strongly Correlated Systems: From Non-Perturbative Approaches to Experiments, Trieste (Italy).

14. October 2007: *Variational description of spin liquids in frustrated magnets* (blackboard discussion), KITP program on Moments and Multiplets in Mott Materials, Santa Barbara (California).

15. June 2008: *Magnetism and superconductivity in the* $t-t'-J$ *model*, Conference on Entanglement in Spin and Orbital Systems, Cracow (Poland).

16. September 2008: *Metal-insulator transition and spin-liquid phases in the triangular lattice*, Conference on Highly-Frustrated Magnetism, Braunschweig (Germany).

17. November 2008: *Variational description of correlated systems: Mott insulators and spin liquids*, Conference on Monte Carlo Methods, Sardagna (Italy).

18. May 2009: *Spin-1/2 Heisenberg model on the anisotropic triangular lattice: from magnetism to 1D spin liquid*, Joint European-Japanese Conference: Frustration in condensed matter, Lyon (France).

19. October 2009: *Spin-liquid and magnetic phases in the anisotropic triangular lattice: the case of k-$(ET)_2X$*, Conference Magnet 09, Roma (Italy).

20. June 2010: *Metal-insulator transition and spin-liquid phases in the anisotropic triangular lattice*, Conference on New Trends in Quantum Magnetism, Orsay (France).

21. August 2010: *Metal-insulator transition and Fermi surface evolution in frustrated triangular-based lattice*, Conference on Highly-Frustrated Magnetism, Baltimore (Maryland).

22. October 2010: *Metal-insulator transition and Fermi surface evolution in frustrated triangular-based lattice*, Conference on Emerging Trends in Advanced Correlated Materials, Anacapri (Italy).

23. November 2010: *Metal-insulator transition and Fermi surface evolution in frustrated triangular-based lattice*, KITP program on Disentangling Quantum Many-body Systems: Computational and Conceptual Approaches, Santa Barbara (California).

24. August 2012: *Localization and glassy dynamics of many-body quantum systems*, Workshop on Complex Quantum Systems: Non-Ergodicity, Glassiness and Localization, Trieste (Italy).

25. September 2012: *Projected wave functions for frustrated spin models*, KITP program on Frustrated Magnetism and Quantum Spin Liquids: From Theory and Models to Experiments, Santa Barbara (California).

26. September 2012: *Can a Jastrow wave function describe Mott insulators?* (blackboard discussion), KITP program on Frustrated Magnetism and Quantum Spin Liquids: From Theory and Models to Experiments, Santa Barbara (California).

27. October 2012: *Improved variational wave functions for the Heisenberg model on the Kagome lattice*, Conference on Exotic Phases of Frustrated Magnets, Santa Barbara (California).

28. September 2013: *Light-cone effects and Lieb-Robinson bounds in one and two dimensions*, XCIX Convegno Nazionale della Società Italiana di Fisica, Trieste (Italy).

29. October 2013: *Gapless spin liquids in frustrated antiferromagnets*, Workshop on Mott Physics Beyond the Heisenberg Model, Ascona (Switzerland).

30. April 2014: *Gapless spin liquids in the Kagome antiferromagnet*, International Symposium on Novel States in Correlated Condensed Matter: from Model Systems to Real Materials, Königstein (Germany).

31. June 2014: *Jastrow and backflow terms for correlated electrons on the lattice*, CECAM Workshop on What about U? Strong Correlations from First Principles, Lausanne (Switzerland).

32. June 2014: *Gapless spin liquids in frustrated Heisenberg models*, Symposium on New Horizon of Strongly Correlated Physics, Kashiwa (Japan).

33. August 2014: *Variational wave functions for strongly-correlated models*, XXVI IUPAP Conference on Computational Physics, Boston (Massachusetts).

34. September 2014: *What can we describe frustrated spin systems by using resonating-valence bond states? Gapped and gapless quantum spin liquids*, Colloquium at the International Workshop and Seminar on Quantum Spin Dynamics: From Exotic Excitations to Novel Transport and Non-Equilibrium Phenomena, Dresden (Germany).

35. March 2015: *Gapless and gapped spin liquids in frustrated spin-1/2 models: a variational approach*, American Physical Society March Meeting, San Antonio (Texas).

36. September 2015: *Frustrated magnets: a trip around the world of variational wave functions*, CECAM Workshop on Topological Phases in Condensed Matter and Cold Atoms Systems, Cargèse (France).

37. October 2015: *Dirac spin liquids in frustrated Heisenberg models: kagome and triangular lattices*, KITP program on New Phases and Emergent Phenomena in Correlated Materials with Strong Spin-Orbit Coupling, Santa Barbara (California).

38. February 2016: *Frustrated magnets: triangular and kagome lattices*, CECAM Workshop on Entanglement in Strongly Correlated Systems, Benasque (Spain).

39. September 2016: *A gapless spin liquid in the frustrated Heisenberg model on the triangular lattice*, Workshop on Recent Progress in Low-dimensional Quantum Magnetism, Lausanne (Switzerland).

40. February 2017: *The frustrated Heisenberg model on the honeycomb lattice*, Workshop on Entanglement in Strongly Correlated Systems, Benasque (Spain).

41. November 2017: *Variational wave functions for multiband Hubbard models*, Workshop on Frontiers in Two-Dimensional Quantum Systems, Trieste (Italy).

42. June 2018: *Dynamical structure factor of frustrated spin models: A variational Monte Carlo approach*, Workshop on Trends in Quantum Magnetism, Bad Honnef (Germany).

43. June 2018: *Dynamical structure factor of frustrated spin models: A variational Monte Carlo approach*, Workshop on Exotic Interactions in Quantum Correlated Materials, Cracow (Poland).

44. June 2018: *Spectral signatures of fractionalization in the frustrated Heisenberg model on the square lattice*, Workshop on Topological phases of matter: from the quantum Hall effect to spin liquids, Saclay (France).

45. July 2018: *Dynamical structure factor of frustrated spin models: a variational Monte Carlo approach*, International Conference on Highly Frustrated Magnetism, Davis (California).

46. September 2018: *Dynamical structure factor of frustrated spin models: a variational Monte Carlo approach*, KITS Workshop on Quantum Magnetism: Frustration, Low-dimensionality, Topology, Beijing (China).

47. October 2018: *Frustrated spin models: a variational Monte Carlo approach for the dynamical structure factor*, CECAM Workshop on Topological Phases in Condensed Matter and Cold Atoms Systems, Cargèse (France).

48. February 2019: *Variational wave functions for frustrated spin models: from traditional methods to neural networks... and back*, KITP program on Machine Learning for Quantum Many-Body Physics, Santa Barbara (California).

49. March 2019: *Dynamical spin structure factor from a variational Monte Carlo perspective*, American Physical Society March Meeting, Boston (Massachusetts).

50. September 2019: *Dynamical structure factor of frustrated spin models: a variational Monte Carlo approach*, KITP program on Topological Quantum Matter: Concepts and Realizations, Santa Barbara (California).

51. February 2020: *A variational Monte Carlo approach for triplet and singlet low-energy states in frustrated magnets* CECAM Workshop on Entanglement in Strongly Correlated Systems, Benasque (Spain).

52. June 2020: *Low-energy spectrum of frustrated spin models (from a human-learning process)* Flatiron workshop on Machine Learning for Quantum Simulation, New York (New York). Virtual talk given because of Covid-19.

53. November 2020: *Variational wave functions for quantum phonons coupled to spins*, KITP program on Correlated Systems with Multicomponent Local Hilbert Spaces, Santa Barbara (California). Virtual talk given because of Covid-19.

54. March 2022: *Variational wave functions for spin models with phonons and anisotropic-exchange couplings*, American Physical Society March Meeting, Chicago (Illinois).

55. July 2022: *Accuracy of restricted Boltzmann machines in frustrated spin models* Workshop on Variational Learning for Quantum Matter, Lausanne (Switzerland).

56. September 2022: *Variational wave functions for spin models with anisotropic-exchange couplings or spin-phonon coupling* Flatiron workshop on Quantum Monte Carlo in the Next Decade, New York (New York).

Lectures for Schools

1. July 2011: *Introduction to Monte Carlo methods* (10 hours plus 15 of tutorial), 2^{nd} School on Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics, Trieste (Italy).

2. June 2012: *Introduction to quantum spin liquids* (2 hours), LOTHERM summer school, Ljubljana (Slovenia).

3. July 2012: *Introduction to Monte Carlo methods* (9 hours plus 15 of tutorial), 3^{rd} School on Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics, Trieste (Italy).

4. July 2013: *Introduction to numerical methods (integration, derivation, and differential equations)* and *Introduction to Monte Carlo methods* (13 hours plus 21 of tutorial), 4^{th} School on Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics, Trieste (Italy).

5. April 2014: *Quantum spin liquids: basic definitions and general properties* (3 hours), International School on Probing Macroscopic Quantum Phenomena, Königstein (Germany).

6. July 2014: *Introduction to Monte Carlo methods* (9 hours plus 15 of tutorial), 5^{th} School on Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics, Trieste (Italy).

7. February 2015: *Introduction to quantum spin liquids: definitions and examples* and *Beyond the Kitaev model: slave particles, gauge fields, and fractional excitations* (2 hours), Tutorial for the workshop on Current Trends in Frustrated Magnetism, New Delhi (India).

8. July 2015: *Introduction to Monte Carlo methods* (9 hours plus 15 of tutorial), 6^{th} School on Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics, Trieste (Italy).

9. July 2016: *Introduction to numerical methods (integration, derivation, and differential equations)* and *Introduction to Monte Carlo methods* (8 hours plus 15 of tutorial), 7^{th} School on Atomistic Simulation Techniques for Material Science, Nanotechnology, and Biophysics, Trieste (Italy).

10. September 2019: *Variational wave functions for strongly-correlated fermionic systems* (2 hours), 9^{th} Autumn School on Correlated Electrons: Many-Body Methods for Real Materials, Jülich (Germany).

11. July 2020: *Projected fermionic states* (3 hours), Variational Methods for Quantum Many-Body Systems, Lyon (France). Virtual Lectures given because of Covid-19.

Seminars

1. November 2000: *Stability of d-wave superconductivity in the $t-J$ model*, University of Lausanne (Switzerland).

2. February 2001: *Superconductivity and stripes in the $t-J$ model*, University of Lausanne (Switzerland).

3. October 2001: *Ground-state properties of the 2D $t-J$ model: superconductivity vs stripes*, University of Fribourg (Switzerland).

4. December 2001: *Ground-state properties of the 2D $t-J$ model: a quantum Monte Carlo study*, University of Toulouse "Paul Sabatier" (France).

5. May 2002: *Lattice effects in the* $1/8$ *magnetization plateau of* $SrCu_2(BO_3)_2$, University of Pavia (Italy).

6. February 2003: *Peierls-like transition induced by frustration in a two-dimensional antiferromagnet*, University of Como (Italy).

7. May 2004: *A first step toward the variational description of Mott insulators*, Eidgenossische Technische Hochschule Zurich (Switzerland).

8. May 2004: *A first step toward the variational description of Mott insulators*, University of Fribourg (Switzerland).

9. May 2004: *A first step toward the variational description of Mott insulators*, École Polytechnique Fédérale de Lausanne (Switzerland).

10. March 2005: *Zero-temperature properties of the quantum dimer model on the triangular lattice*, Oak Ridge National Laboratories (Tennessee).

11. May 2005: *The resonating valence bond wave function in quantum antiferromagnets*, University "Pierre et Marie Curie" Paris VI, (France).

12. July 2005: *Critical behavior of the two-dimensional metal-insulator transition*, Massachusetts Institute of Technology (Massachusetts).

13. September 2005: *Unconventional metal-insulator transition in the two-dimensional*, University of Toulouse "Paul Sabatier" (France).

14. November 2005: *An improved variational phase diagram for the J_1-J_2 model on the square lattice*, University of Toulouse "Paul Sabatier" (France).

15. March 2007: *Variational description of the Mott transition*, Istituto dei Sistemi Complessi (CNR), Roma (Italy).

16. November 2008: *Metal-insulator transition and spin-liquid phases in the triangular lattice*, École Polytechnique Fédérale de Lausanne (Switzerland).

17. November 2008: *Metal-insulator transition and spin-liquid phases in the triangular lattice*, University of Fribourg (Switzerland).

18. December 2008: *Variational description of bosonic Mott insulators*, University of Trento (Italy).

19. June 2009: *Variational wave functions for Mott insulators*, University of Frankfurt (Germany).

20. October 2009: *Strongly-correlated bosons: from superfluidity to Mott insulators*, European Laboratory for Non-linear Spectroscopy (Italy).

21. November 2009: *Metal-insulator transition and spin-liquid phases in the anisotropic triangular lattice*, University of Paris Sud Orsay (France).

22. November 2009: *Interplay between disorder and interaction in the Bose-Hubbard model*, University of Toulouse "Paul Sabatier" (France).

23. March 2010: *A review on the variational wave functions for correlated systems*, Rutgers University (New Jersey).

24. June 2010: *The Bose-glass phase in disordered systems*, University of Frankfurt (Germany).

25. September 2010: *The Bose-glass phase in disordered systems*, University of Toulouse "Paul Sabatier" (France).

26. April 2011: *Quantum quenches and the approach to equilibrium: the variational perspectives*, University of Frankfurt (Germany).

27. November 2011: *Localization and glassy dynamics of many-body quantum systems*, University of Frankfurt (Germany).

28. March 2012: *Localization and glassy dynamics of many-body quantum systems*, Georgetown University (Washington DC).

29. April 2012: *Variational description of real-time dynamics*, University of Toulouse "Paul Sabatier" (France).

30. May 2012: *Localization and glassy dynamics of many-body quantum systems*, University of Trento (Italy).

31. November 2012: *Possible many-body localization in the dynamics of correlated quantum systems*, University of Padova (Italy).

32. February 2013: *Possible many-body localization in the dynamics of correlated quantum systems*, École Polytechnique Fédérale de Lausanne (Switzerland).

33. April 2013: *Gapless spin liquids in frustrated antiferromagnets*, University of Frankfurt (Germany).

34. May 2013: *Quantum quenches in one-dimensional gapless systems*, Scuola Internazionale Superiore di Studî Avanzati (Italy).

35. May 2014: *Gapless spin liquids in frustrated Heisenberg models*, Perimeter Institute for Theoretical Physics (Canada).

36. February 2015: *Backflow correlations and Lanczos steps to reach the ground state of correlated systems*, Simons Foundation (New York).

37. March 2015: *Variational wave functions for correlated electron systems*, Jožef Stefan Institut (Slovenia).

38. April 2015: *Gapless and gapped spin liquids in frustrated spin-1/2 models: a variational approach*, University of Frankfurt (Germany).

39. December 2015: *Jastrow and backflow terms for correlated electrons on the lattice*, University of Würzburg (Germany).

40. January 2017: *Variational wave functions and Monte Carlo methods for strongly-correlated systems on the lattice: from ground state properties to the real-time dynamics*, King's College London (England).

41. May 2017: *The frustrated Heisenberg model on the honeycomb lattice*, University of Würzburg (Germany).

42. September 2017: *Variational wave functions for multiband Hubbard models*, Rice University (Texas).

43. December 2018: *Dynamical structure factor of frustrated spin models: a variational Monte Carlo approach*, Technische Universität München (Germany).

44. April 2019: *Dynamical structure factor of frustrated spin models: a variational Monte Carlo approach*, Jožef Stefan Institut (Slovenia).

45. July 2020: *Dynamical structure factor of frustrated spin models: a variational Monte Carlo approach*, The Ohio State University (Ohio). Virtual talk given because of Covid-19.

46. October 2020: *Low-energy spectrum of frustrated spin models from a variational Monte Carlo perspective*, University of Tokyo (Japan). Virtual talk given because of Covid-19.

47. April 2021: *Spin-phonon coupling in frustrated Heisenberg models: Peierls distortions in spin liquids and valence-bond crystals*, Northeastern University (Massachusetts). Virtual talk given because of Covid-19.

48. September 2021: *Spin-phonon coupling in frustrated Heisenberg models: Peierls distortions in spin liquids and valence-bond crystals*, Universidade Federal do Rio Grande do Norte (Brazil). Virtual talk given because of Covid-19.

49. September 2021: *Spin-phonon coupling in frustrated Heisenberg models: Peierls distortions in spin liquids and valence-bond crystals*, Universidade Federal do Rio de Janeiro (Brazil). Virtual talk given because of Covid-19.

Dissemination seminars

1. April 2012: *La Superconduttività*, "Master in Comunicazione della Scienza", Scuola Internazionale Superiore di Studî Avanzati (Italy).

2. February 2013: *La Superconduttività*, "Master in Comunicazione della Scienza", Scuola Internazionale Superiore di Studî Avanzati (Italy).

Annex VI: Publications

Books

1. F. Becca and S. Sorella, *Quantum Monte Carlo Approaches for Correlated Systems*, Cambridge University Press (2017), ISBN: 9781107129931.

Papers

1. F. Becca, M. Tarquini, M. Grilli, and C. di Castro, *Charge-density-waves and superconductivity as an alternative to phase separation in the infinite-U Hubbard-Holstein model*, Physical Review B **54**, 12443 (1996).

2. F. Becca, F. Bucci, and M. Grilli, *The incommensurate charge-density-wave instability in the extended three-band Hubbard model*, Physical Review B **57**, 4382 (1998).

3. M. Calandra, F. Becca, and S. Sorella, *Charge fluctuations close to phase separation in the two dimensional $t-J$ model*, Physical Review Letters **81**, 5185 (1998).

4. G. Seibold, F. Becca, F. Bucci, C. Castellani, C. di Castro, and M. Grilli, *Spectral properties of incommensurate charge-density wave systems*, European Physical Journal B **13**, 87 (2000).

5. F. Becca, A. Parola, and S. Sorella, *Ground-state properties of the Hubbard model by Lanczos diagonalizations*, Physical Review B **61**, 16287 (2000). Rapid Communication.

6. F. Becca, M. Capone, and S. Sorella, *Spatially homogeneous ground-state of the two-dimensional Hubbard model*, Physical Review B **62**, 12700 (2000).

7. F. Becca, L. Capriotti, S. Sorella, and A. Parola, *Exact bounds on the ground-state energy of the infinite-U Hubbard model*, Physical Review B **62**, 15277 (2000).

8. M. Capone, L. Capriotti, F. Becca, and S. Caprara, *The Mott metal-insulator transition in the half-filled Hubbard model on the triangular lattice*, Physical Review B **63**, 085104 (2001).

9. F. Becca and S. Sorella, *Nagaoka ferromagnetism in the two-dimensional infinite-U Hubbard model*, Physical Review Letters **86**, 3396 (2001).

10. L. Capriotti, F. Becca, A. Parola, and S. Sorella, *Resonating valence bond wave functions for strongly frustrated spin systems*, Physical Review Letters **87**, 097201 (2001).

11. F. Becca, L. Capriotti, and S. Sorella, *Stripes and spin incommensurabilities are favored by lattice anisotropies*, Physical Review Letters **87**, 167005 (2001).

12. L. Capriotti and F. Becca, *Quantum phase transition in coupled spin ladders*, Physical Review B **65**, 092406 (2002).

13. S. Sorella, G.B. Martins, F. Becca, C. Gazza, L. Capriotti, A. Parola, and E. Dagotto, *Superconductivity in the two-dimensional $t-J$ model*, Physical Review Letters **88**, 117002 (2002).

14. F. Becca and F. Mila, *Peierls-like transition induced by frustration in a two dimensional antiferromagnet*, Physical Review Letters **89**, 037204 (2002).

15. L. Capriotti, F. Becca, S. Sorella, and A. Parola, *Comment on "Phase diagram of an asymmetric spin ladder"*, Physical Review Letters **89**, 149701 (2002).

16. K. Kodama, M. Takigawa, M. Horvatic, C. Berthier, H. Kageyama, Y. Ueda, S. Miyahara, F. Becca, and F. Mila, *Magnetic superstructure in the two-dimensional quantum antiferromagnet $SrCu_2(BO_3)_2$*, Science **298**, 395 (2002).

17. S. Sorella, A. Parola, F. Becca, L. Capriotti, C. Gazza, E. Dagotto, and G. Martins, *Reply to comment on "Superconductivity in the two dimensional $t-J$ model"*, Physical Review Letters **89**, 279703 (2002).

18. G. Seibold, F. Becca, and J. Lorenzana, *Inhomogeneous Gutzwiller approximation with random phase fluctuations for the Hubbard model*, Physical Review B **67**, 085108 (2003).

19. L. Capriotti, F. Becca, S. Sorella, and A. Parola, *Ground state of a Heisenberg chain with next-nearest-neighbor bond alternation*, Physical Review B **67**, 172404 (2003).

20. L. Capriotti, F. Becca, A. Parola, and S. Sorella, *Suppression of dimer correlations in the two-dimensional J_1-J_2 Heisenberg model: An exact diagonalization study*, Physical Review B **67**, 212402 (2003).

21. S. Miyahara, F. Becca, and F. Mila, *Theory of spin-density profile and lattice distortion in the magnetization plateaus of $SrCu_2(BO_3)_2$*, Physical Review B **68**, 024401 (2003).

22. F. Becca, F. Mila, and D. Poilblanc, *Tetramerization of a frustrated spin-1/2 chain*, Physical Review Letters **91**, 067202 (2003).

23. C. Weber, L. Capriotti, G. Misguich, F. Becca, M. Elhajal, and F. Mila, *Ising transition driven by frustration in a 2D classical model with continuous symmetry*, Physical Review Letters **91**, 177202 (2003).

24. S. Sorella, L. Capriotti, F. Becca, and A. Parola, *A chiral spin liquid wave function and the Lieb-Schultz-Mattis theorem*, Physical Review Letters **91**, 257005 (2003).

25. M. Ferrero, F. Becca, and F. Mila, *Freezing and large time scales induced by geometrical frustration*, Physical Review B **68**, 214431 (2003).

26. G. Seibold, F. Becca, P. Rubin, and J. Lorenzana, *Time-dependent Gutzwiller theory of magnetic excitations in the Hubbard model*, Physical Review B **69**, 155113 (2004).

27. M. Capello, F. Becca, M. Fabrizio, S. Sorella, and E. Tosatti, *Variational description of Mott insulators*, Physical Review Letters **94**, 026406 (2005).

28. E. Plekhanov, F. Becca, and S. Sorella, *d-wave pairing in lightly doped Mott insulators*, Physical Review B **71**, 064511 (2005).

29. A. Ralko, M. Ferrero, F. Becca, D. Ivanov, and F. Mila, *Zero-temperature properties of the quantum dimer model on the triangular lattice*, Physical Review B **71**, 224109 (2005).

30. J. Dorier, F. Becca, and F. Mila, *Quantum compass model on the square lattice*, Physical Review B **72**, 024448 (2005).

31. C. Weber, F. Becca, and F. Mila, *Finite-temperature properties of frustrated classical spins coupled to the lattice*, Physical Review B **72**, 024449 (2005).

32. M. Capello, F. Becca, S. Yunoki, M. Fabrizio, and S. Sorella, *From Luttinger liquid to Mott insulator: the correct low-energy description of the one-dimensional Hubbard model by an unbiased variational approach*, Physical Review B **72**, 085121 (2005).

33. M. Ferrero, F. Becca, M. Fabrizio, and M. Capone, *Dynamical behavior across the Mott transition of two bands with different bandwidths*, Physical Review B **72**, 205126 (2005).

34. L. Spanu, F. Becca, and S. Sorella, *Theoretical constraints for the magnetic-dimer transition in two-dimensional spin models*, Physical Review B **73**, 134429 (2006).

35. M. Capello, F. Becca, S. Yunoki, and S. Sorella, *Unconventional metal-insulator transition in two dimensions*, Physical Review B **73**, 245116 (2006).

36. D. Poilblanc, F. Alet, F. Becca, A. Ralko, F. Trousselet, and F. Mila, *Doping quantum dimer models on the square lattice*, Physical Review B **74**, 014437 (2006).

37. F. Vernay, A. Ralko, F. Becca, and F. Mila, *Identification of an RVB liquid phase in a quantum dimer model with competing kinetic terms*, Physical Review B **74**, 054402 (2006).

38. A. Ralko, M. Ferrero, F. Becca, D. Ivanov, and F. Mila, *Dynamics of the quantum dimer model on the triangular lattice: Soft modes and local resonating valence-bond correlations*, Physical Review B **74**, 134301 (2006).

39. M. Lugas, L. Spanu, F. Becca, and S. Sorella, *Finite compressibility in the low-doping region of the two-dimensional $t-J$ model*, Physical Review B **74**, 165122 (2006).

40. S. Bissola, V. Lante, A. Parola, and F. Becca, *Magneto-elastic effects and magnetization plateaus in two dimensional systems*, Physical Review B **75**, 184444 (2007).

41. F. Becca, L. Capriotti, A. Parola, and S. Sorella, *Exotic gapless spectrum induced by frustration in quantum antiferromagnets*, Physical Review B **76**, 060401 (2007). Rapid Communication.

42. M. Capello, F. Becca, M. Fabrizio, and S. Sorella, *Superfluid to Mott-insulator transition in Bose-Hubbard models*, Physical Review Letters **99**, 056402 (2007).

43. A. Ralko, M. Ferrero, F. Becca, D. Ivanov, and F. Mila, *Crystallization of the resonating valence bond liquid as vortex condensation*, Physical Review B **76**, 140404 (2007). Rapid Communication.

44. G. Seibold, F. Becca, and J. Lorenzana, *Theory of antibound states in partially filled narrow band systems*, Physical Review Letters **100**, 016405 (2008).

45. L. Spanu, M. Lugas, F. Becca, and S. Sorella, *Magnetism and superconductivity in the $t-t'-J$ model*, Physical Review B **77**, 024510 (2008).

46. M. Capello, F. Becca, M. Fabrizio, and S. Sorella, *Mott transition in bosonic systems: Insights from the variational approach*, Physical Review B **77**, 144517 (2008).

47. L.F. Tocchio, F. Becca, A. Parola, and S. Sorella, *Role of backflow correlations for the non-magnetic phase of the $t-t'$ Hubbard model*, Physical Review B **78**, 041101 (2008). Rapid Communication.

48. G. Seibold, F. Becca, and J. Lorenzana, *Time-dependent Gutzwiller theory of pairing fluctuations in the Hubbard model*, Physical Review B **78**, 045114 (2008).

49. A. Ralko, F. Becca, and D. Poilblanc, *Magnetic field induced transition in a quantum magnet described by the quantum dimer model*, Physical Review Letters **101**, 117204 (2008).

50. M.E. Pezzoli, F. Becca, M. Fabrizio, and G.E. Santoro, *Local moments and magnetic order in the two-dimensional Anderson-Mott transition*, Physical Review B **79**, 033111 (2009).

51. D. Heidarian, S. Sorella, and F. Becca, *Spin-1/2 Heisenberg model on the anisotropic triangular lattice: From magnetism to a one-dimensional spin liquid*, Physical Review B **80**, 012404 (2009).

52. L. Tocchio, A. Parola, C. Gros, and F. Becca, *Spin-liquid and magnetic phases in the anisotropic triangular lattice: the case of κ-(ET)$_2$X*, Physical Review B **80**, 064419 (2009).

53. M.E. Pezzoli and F. Becca, *Ground-state properties of the disordered Hubbard model in two dimensions*, Physical Review B **81**, 075106 (2010).

54. L. Tocchio, F. Becca, and C. Gros, *Interaction-induced Fermi-surface renormalization in the t_1-t_2 Hubbard model close to the Mott-Hubbard transition*, Physical Review B **81**, 205109 (2010).

55. J. Carrasquilla, F. Becca, A. Trombettoni, and M. Fabrizio, *Characterization of the Bose-glass phase in low-dimensional lattices*, Physical Review B **81**, 195129 (2010). Selected for the Virtual Journal of Atomic Quantum Fluids, Vol. **2**, Issue **6**.

56. G. Carleo, F. Becca, S. Moroni, and S. Baroni, *Reptation quantum Monte Carlo for lattice Hamiltonians with a directed-update scheme*, Physical Review E **82**, 046710 (2010).

57. J. Carrasquilla and F. Becca, *Extracting the Mott gap from energy measurements in trapped atomic gases*, Physical Review A **82**, 053609 (2010).

58. G. Carleo, S. Moroni, F. Becca, and S. Baroni, *Itinerant ferromagnetic phase of the Hubbard model*, Physical Review B **83**, 060411 (2011). Rapid Communication.

59. Y. Iqbal, F. Becca, and D. Poilblanc, *Valence-bond crystal in the extended kagome spin-1/2 quantum Heisenberg antiferromagnet: A variational Monte Carlo approach*, Physical Review B **83**, 100404 (2011). Rapid Communication.

60. D. Rossini, V. Lante, A. Parola, and F. Becca, *Phase diagram of hard-core bosons on a zigzag ladder*, Physical Review B **83**, 155106 (2011).

61. L. Tocchio, F. Becca, and C. Gros, *Backflow correlations in the Hubbard model: An efficient tool for the study of the metal-insulator transition and the large-U limit*, Physical Review B **83**, 195138 (2011).

62. J. Carrasquilla, F. Becca, and M. Fabrizio, *Bose-glass, superfluid, and rung-Mott phases of hard-core bosons in disordered two-leg ladders*, Physical Review B **83**, 245101 (2011).

63. Y. Iqbal, F. Becca, and D. Poilblanc, *Projected wave function study of Z_2 spin liquids on the kagome lattice for the spin-1/2 quantum Heisenberg antiferromagnet*, Physical Review B **84**, 020407 (2011). Rapid Communication, selected as Editor's Suggestion.

64. G. Carleo, F. Becca, M. Schiro, and M. Fabrizio, *Localization and glassy dynamics of many-body quantum systems*, Scientific Reports (Nature Publishing Group) **2**, 243 (2012).

65. W.-J. Hu, F. Becca, and S. Sorella, *Absence of static stripes in the two-dimensional $t-J$ model by an accurate and systematic quantum Monte Carlo approach*, Physical Review B **85**, 081110 (2012). Rapid Communication.

66. L. Tocchio, F. Becca, and C. Gros, *Strong renormalization of the Fermi-surface topology close to the Mott transition*, Physical Review B **86**, 035102 (2012).

67. T. Li, F. Becca, W.-J. Hu, and S. Sorella, *Gapped spin liquid phase in the J_1-J_2 Heisenberg model by a bosonic resonating valence-bond ansatz*, Physical Review B **86**, 075111 (2012).

68. Y. Iqbal, F. Becca, and D. Poilblanc, *Valence-bond crystals in the kagomé spin-1/2 Heisenberg antiferromagnet: Symmetry classification and projected wave function study*, New Journal of Physics **14**, 115031 (2012). Invited paper for the focus issue on *Quantum spin Liquids*.

69. L.F. Tocchio, H. Feldner, F. Becca, R. Valenti, and C. Gros, *Spin-liquid versus spiral-order phases in the anisotropic triangular lattice*, Physical Review B **87**, 035143 (2013).

70. E. Coira, F. Becca, and A. Parola, *Quantum quenches in one-dimensional gapless systems*, European Physical Journal B **86**, 55 (2013).

71. Y. Iqbal, F. Becca, S. Sorella, and D. Poilblanc, *Gapless spin-liquid phase in the kagome spin-1/2 Heisenberg antiferromagnet*, Physical Review B **87**, 060405 (2013). Rapid Communication.

72. M.Z. Asadzadeh, F. Becca, and M. Fabrizio, *Variational Monte Carlo approach to the two-dimensional Kondo lattice model*, Physical Review B **87**, 205144 (2013).

73. W.-J. Hu, F. Becca, A. Parola, and S. Sorella, *Direct evidence for a gapless Z_2 spin liquid by frustrating Néel antiferromagnetism*, Physical Review B **88**, 060402 (2013). Rapid Communication, selected as Editor's Suggestion.

74. J. Carrasquilla, A. Di Ciolo, F. Becca, V. Galitski, and M. Rigol, *Nature of the phases in the frustrated XY model on the honeycomb lattice*, Physical Review B **88**, 241109 (2013). Rapid Communication.

75. Y. Iqbal, D. Poilblanc, and F. Becca, *Vanishing spin gap in a competing spin-liquid phase in the kagome Heisenberg antiferromagnet*, Physical Review B **89**, 020407 (2014). Rapid Communication.

76. A. Di Ciolo, J. Carrasquilla, F. Becca, V. Galitski, and M. Rigol, *Spiral antiferromagnets beyond the spin-wave approximation: Frustrated XY and Heisenberg models on the honeycomb lattice*, Physical Review B **89**, 094413 (2014).

77. G. Carleo, F. Becca, L. Sanchez-Palencia, S. Sorella, and M. Fabrizio, *Light-cone effect and supersonic correlations in one- and two-dimensional bosonic superfluids*, Physical Review A **89**, 031602 (2014). Rapid Communication.

78. L.F. Tocchio, C. Gros, R. Valenti, and F. Becca, *One-dimensional spin liquid, collinear, and spiral phases from uncoupled chains to the triangular lattice*, Physical Review B **89**, 235107 (2014).

79. M.Z. Asadzadeh, M. Fabrizio, and F. Becca, *Superconductivity from spoiling magnetism in the Kondo lattice model*, Physical Review B **90**, 205113 (2014).

80. Y. Iqbal, D. Poilblanc, and F. Becca, *Spin-1/2 Heisenberg J_1-J_2 antiferromagnet on the kagome lattice*, Physical Review B **91**, 020402 (2015). Rapid Communication.

81. W.-J. Hu, W. Zhu, Y. Zhang, S. Gong, F. Becca, and D.N. Sheng, *Variational Monte Carlo study of a chiral spin liquid in the extended Heisenberg model on the kagome lattice*, Physical Review B **91**, 041124 (2015). Rapid Communication.

82. W.-J. Hu, S. Gong, F. Becca, and D.N. Sheng, *Variational Monte Carlo study of a gapless spin liquid in the spin-1/2 XXZ antiferromagnetic model on the kagome lattice*, Physical Review B **92**, 201105 (2015). Rapid Communication.

83. J.P.F. LeBlanc, A.E. Antipov, F. Becca, I.W. Bulik, G. Kin-Lic Chan, C.-M. Chung, Y. Deng, M. Ferrero, T.M. Henderson, C.A. Jimenez-Hoyos, E. Kozik, X.-W. Liu, A.J. Millis, N.V. Prokof'ev, M. Qin, G.E. Scuseria, H. Shi, B.V. Svistunov, L.F. Tocchio, I.S. Tupitsyn, S.R. White, S. Zhang, B.-X. Zheng, Z. Zhu, and E. Gull, *Solutions of the two-dimensional Hubbard model: benchmarks and results from a wide range of numerical algorithms*, Physical Review X **5**, 041041 (2015).

84. E. Ghorbani, L.F. Tocchio, and F. Becca, *Variational wave functions for the $S = 1/2$ Heisenberg model on the anisotropic triangular lattice: spin liquids and spiral orders*, Physical Review B **93**, 085111 (2016). Selected as Editor's Suggestion.

85. L.F. Tocchio, F. Arrigoni, S. Sorella, and F. Becca, *Assessing the orbital selective Mott transition with variational wave functions*, Journal of Physics: Condensed Matter **28**, 105602 (2016).

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