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Short-Range Correlations and Cooling of Ultracold Fermions in the Honeycomb Lattice BAOMING TANG, Georgetown University, THEREZA PAIVA, Universidade Federal do Rio de Janeiro, EHSAN KHATAMI, MARCOS RIGOL, Georgetown University — We study experimentally relevant thermodynamic properties and spin correlations of the Hubbard model in the honeycomb lattice by using determinantal quantum Monte Carlo simulations and numerical linked-cluster expansions. We find that the honeycomb lattice exhibits a more pronounced anomalous region in the double occupancy that leads to stronger adiabatic cooling than in the square lattice. We also find that, at half filling and finite temperature, nearest-neighbor spin correlations can be stronger in the honeycomb lattice than in the square lattice, even in regimes where the ground state in the former is a semimetal or a spin liquid while it is an antiferromagnetic Mott insulator in the latter. The implications of these findings for optical experiments are also discussed.

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