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Atomic Fermi superfluids in a honeycomb optical lattice: Supercurrents and dynamical instabilities SHUNJI TSUCHIYA, Department of Physics, Tokyo University of Science, RAMACHANDRAN GANESH, ARUN PARAMEKANTI, Department of Physics, University of Toronto — Cold Fermi and Bose atoms on a honeycomb lattice have been of great recent interest given the possibility to simulate graphene physics and to realize interesting topological phases of matter.^{1,2,3} We study the attractive Hubbard model of fermions on the honeycomb lattice in order to explore the strongly correlated superfluid state in this lattice geometry. We calculate the superfluid order parameter and collective modes in the presence of a superfluid flow in order to investigate the superflow stability. We find that the superfluid order parameter and density fluctuations exhibit non-trivial dependence on the flow, and these collective modes lead to novel dynamical instabilities.

¹A. H. Castro Neto et al., Rev. Mod. Phys. 81, 109 (2009).

²C. L. Kane and E. J. Mele, Phys. Rev. Lett, 95, 226801 (2005).

³A. Kitaev, Ann. Phys. (N.Y.) 321, 2 (2006).

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