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Kitaev materials beyond iridates: order by quantum disorder and Weyl magnons in rare-earth double perovskites FEI-YE LI, Institute of Theoretical Physics, Chinese Academy of Sciences, YAO-DONG LI, YUE YU, GANG CHEN, Dept. of Physics, Fudan Univ. — Motivated by the experiments on the rare-earth double perovskites, we propose a generalized Kitaev-Heisenberg model to describe the generic interaction between the spin-orbit-entangled Kramers doublets of the rare-earth moments. We carry out a systematic analysis of the mean-field phase diagram of this new model. In the phase diagram, there exist large regions with a continuous U(1) or O(3) degeneracy. Since no symmetry of the model protects such a continuous degeneracy, we predict that the quantum fluctuation lifts the continuous degeneracy and favors various magnetic orders in the phase diagram. From this order by quantum disorder mechanism, we further predict that the magnetic excitations of the resulting ordered phases are characterized by nearly gapless pseudo-Goldstone modes. We find that there exist Weyl magnon excitations for certain magnetic orders. We expect our prediction to inspire further study of Kitaev physics, the order by quantum disorder phenomenon and topological spin wave modes in the rare-earth magnets and the systems alike.

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