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Phase diagram and quantum order by disorder in the Kitaev K_1-K_2 honeycomb magnet[1] IOANNIS ROUSOCHATZAKIS, Univ of Minn - Minneapolis, JOHANNES REUTHER, Dahlem Center for Complex Quantum Systems and Fachbereich Physik, Freie Universität Berlin, 14195 Berlin, Germany, RONNY THOMALE, Institute for Theoretical Physics, University of Würzburg, 97074 Würzburg, Germany, STEPHAN RACHEL, Institute for Theoretical Physics, Technische Universität Dresden, 01062 Dresden, Germany, NATALIA PERKINS, Univ of Minn - Minneapolis — We show that the topological Kitaev spin liquid on the honeycomb lattice is extremely fragile against the second neighbor Kitaev coupling K_2, which has been recently identified as the dominant perturbation away from the nearest neighbor model in iridate Na_2IrO_3, and may also play a role in α-$RuCl_3$. This coupling explains naturally the zig-zag ordering and the special entanglement between real and spin space observed recently in Na_2IrO_3. The minimal K_1-K_2 model that we present here holds in addition the unique property that the classical and quantum phase diagrams and their respective order-by-disorder mechanisms are qualitatively different due to their fundamentally different symmetry structure.

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