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Quantum Kagome Ice JUAN CARRASQUILLA, Perimeter Inst for Theo Phys, ZHIHAO HAO, University of Waterloo, ROGER MELKO, University of Waterloo and Perimeter Institute — Two-dimensional quantum spin liquids (QSLs) are exotic phases of matter where magnetic moments remain disordered even at extremely low temperatures. Despite ongoing searches, QSLs remain elusive, due to a lack of concrete knowledge of the microscopic mechanisms that inhibit magnetic order in real materials. Here, we study a theoretical model for a broad class of frustrated magnetic rare-earth pyrochlore materials called "quantum spin ices". When subject to an external magnetic field along the [111] crystallographic direction, the resulting spin interactions contain a mix of geometric frustration and quantum fluctuations in decoupled two-dimensional kagome planes. Using large-scale quantum Monte Carlo simulations, we identify a simple set of interactions sufficient to promote a groundstate with no magnetic long-range order, and a gap to excitations, conjectured to be a Z_2 spin liquid phase. This suggests a systematic experimental procedure to search for two-dimensional QSLs within the broader class of three-dimensional pyrochlore quantum spin ice materials.

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