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Quantum Topological Hall Effect in Kagome Ice YUKITOSHI MOTOME, HIROAKI ISHIZUKA, Dept. of Appl. Phys., Univ. of Tokyo — The quantum Hall state was originally discovered in two-dimensional electron systems associated with the formation of quantized Landau levels in external magnetic field. Later, a quantum anomalous Hall effect without Landau levels was proposed, and the idea has been generalized to topological insulators in the presence of the spin-orbit coupling. Besides, a noncoplanar magnetic order was shown to give rise to the quantum anomalous Hall effect through the Berry phase mechanism. Here, we present yet another example of the quantum anomalous Hall state which emerges in the absence of Landau levels, spin-orbit coupling, and magnetic ordering. The new state is realized in itinerant electrons coupled with local spin textures subject to geometrical frustration of lattice structure. Considering the double-exchange model with spin-ice type Ising spins on a kagome lattice, we numerically show that a local spin correlation called kagome-ice opens a charge gap, resulting in quantization of the Hall conductivity in the absence of magnetic ordering. By Monte Carlo simulation, we discuss the stability of the anomalous Hall insulating region in the magnetic phase diagram.

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