Exploring the Rich Physics of Triangular Lattice Antiferromagnets with Neutron Scattering

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In geometrically frustrated magnets, the spatial arrangement of magnetic moments on a lattice prevents competing magnetic interactions from being simultaneously satisfied, often leading to exotic magnetic behavior. The canonical example of geometrical frustration consists of antiferromagnetically coupled spins populating a triangular lattice. Here, we explore the compound $TmMgGaO_4$, which hosts Ising-like Tm^{3+} magnetic moments on a perfect triangular lattice. Using magnetic pair distribution function analysis of neutron scattering data, we study the short-range magnetic correlations present at low temperatures. The results suggest a surprising connection to a topological Kosterlitz-Thouless transition at low temperature, showcasing the rich behavior observed in geometrically frustrated magnets.