Abstract Multiferroics are materials with coexisting magnetic and ferroelectric orders. The cross-coupling between two ferroic orders can result in strong magnetoelectric coupling. Therefore, it is of both fundamental and technological interest to visualize cross-coupled topological defects in multiferroics. Indeed, topological defects with six interlocked structural antiphase and ferroelectric domains merging into a vortex core were revealed in multiferroic hexagonal manganites. Numerous vortices are found to form an intriguing self-organized network, and may be used to test Kibble-Zurek model of early universe. Many emergent phenomena, such