Title: Engineering topological phases with a superlattice potential
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Abstract: We propose an externally imposed superlattice potential as a platform for manipulating topological phases, which has both advantages and disadvantages compared to a moiré superlattice. In the first example, we apply the superlattice potential to the 2D surface of a 3D topological insulator. The superlattice potential creates tunable van Hove singularities, which, when combined with strong spin-orbit coupling and Coulomb repulsion give rise to a topological meron lattice spin texture. Thus, the superlattice potential provides a new route to the long sought-after goal of realizing spontaneous magnetic order on the surface of a 3D TI. In the second example, we show that a superlattice potential applied to Bernal-stacked bilayer graphene can generate flat Chern bands, similar to in twisted bilayer graphene, whose bandwidth can be as small as a few meV. The superlattice potential offers flexibility in both lattice size and geometry, making it a promising alternative to achieve designer flat bands without a moiré heterostructure.