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Spin-orbital decoupling and orbital order in cubic $5d$ double perovskites[1] CHRISTOPHER SVOBODA, MOHIT RANDERIA, NANDINI TRIVEDI, The Ohio State University — Mott insulating $5d^1$ and $5d^2$ double perovskites $A_2BB'O_6$ (where A is an alkaline earth, B a nonmagnetic metal, and B′ the $5d$ transition metal) are expected to be described by models with $j = 3/2$ and $j = 2$ ions respectively, when spin-orbit coupling dominates. However, this picture is at odds with susceptibility measurements for both cubic and distorted compounds which show effective moments that are too large to be explained by the j_{eff} picture. Motivated by this puzzle, we derive spin-orbital models with unquenched orbital degrees of freedom for $5d^1$ and $5d^2$ double perovskites and analyze them at finite temperature using mean field theory. At high temperatures, the onset of orbital order partially decouples the spin and orbital degrees of freedom leading to enhanced Curie moments, which would be impossible to explain using j_{eff} models. The orbital order that sets in below T_o plays a crucial role in determining the magnetic phases that occur below a T_c, which can be much lower than T_o.

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