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DMRG Study of the $S \geq 1$ quantum Heisenberg Antiferromagnet on a Kagome-like lattice without loops[1] R. ZACH LAMBERTY, HITESH J. CHANGLANI, CHRISTOPHER L. HENLEY, Cornell University — The Kagome quantum Heisenberg antiferromagnet, for spin up to $S = 1$ and perhaps $S = 3/2$, is a prime candidate to realize a quantum spin liquid or valence bond crystal state, but theoretical or computational studies for $S > 1/2$ are difficult and few. We consider instead the same interactions and $S \geq 1$ on the Husimi Cactus, a graph of corner sharing triangles whose centers are vertices of a Bethe lattice, using a DMRG procedure tailored for tree graphs [1]. Since both lattices are locally identical, properties of the Kagome antiferromagnet dominated by nearest-neighbor spin correlations should also be exhibited on the Cactus, whereas loop-dependent effects will be absent on the loopless Cactus. Our study focuses on the possible transition(s) that must occur with increasing S for the Cactus antiferromagnet. (It has a disordered valence bond state at $S = 1/2$ but a 3-sublattice coplanar ordered state in the large S limit [2]). We also investigate the phase diagram of the $S = 1$ quantum XXZ model with on-site anisotropy, which we expect to have three-sublattice and valence-bond-crystal phases similar to the kagome case [3]. ([1] Changlani et al, arXiv:1208.1773 (2012), [2] Doucot and Simon, J. Phys. A 31, 5855 (1998), [3] Isakov and Kim, Phys. Rev. B 79, 094408 (2009))

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