Towards a phase diagram for the Kagome antiferromagnet with Dzyaloshinskii-Moriya interactions?

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With the recent discovery of a magnetic compound that does not order down to the lowest temperatures, the question of a putative "spin-liquid" phase has resurfaced. The herberthsmithite $ZnCu_3(OH)_6Cl_3$ is a model compound of strongly interacting spins S=1/2 that has the geometry of the kagome lattice. Is the ground state a spin-liquid (possibly "algebraic") or does it have some hidden long-range order like in a valence bond crystal?

In reality, small corrections of spin-orbit origin -Dzyaloshinskii-Moriya interactions- are inevitably present (and allow to test -at least theoretically- the stability of the above mentioned phases). I will show that such an interaction destroys the moment-free phase and induces Néel order above a finite quantum critical point. In fact on the basis of Schwinger boson mean-field theory additional phases are expected, but not seen in exact diagonalization studies.

I will discuss the results in the view of the current theories of the quantum kagome antiferromagnet (RVB, valence bond crystal...) and argue that the magnetic properties of $ZnCu_3(OH)_6Cl_3$ could be controlled by the proximity to this critical point. However, the nature of the moment-free phase (spin-liquids, valence bond crystals?) is still debated and I will show that it is in principle possible to look for such hidden symmetries using Raman scattering.