Dear Editors,

We are submitting our manuscript entitled “Global phase diagram and possible quantum spin liquid in the triangular model” for your consideration in Physical Review X.

Frustration plays an important role in various kinds of magnetic systems and may give raise to exotic quantum spin states. The nearest-neighbor antiferromagnetic Heisenberg model on the triangular lattice is a typical example of geometric frustrated system and the concept of quantum spin liquid originated here. The Kitaev model on honeycomb lattice with exchange frustration provides another approach to explore exotic quantum spin states. In fact, the Kitaev and terms can naturally be generalized to the triangular lattice. Previous studies have map out the classical phase diagram of the triangular model, however, the studies on the effects of quantum fluctuations on the global phase diagram are scarce. In particular, since no exact solution has been reported so far for the pure sin-1/2 Kitaev and models on the triangular lattice, it also remains conceptually interesting to investigate whether QSL states could exist as possible ground states due to quantum fluctuations introduced by these exchange-frustrated interactions.

In this paper, we study the global phase diagram and the phase transitions of the triangular lattice model using a combination of exact diagonalization and classical analyses. We identify nine magnetically ordered phases and one possible quantum spin liquid phase near the positive point. We propose the quantum spin liquid to be a gapped quantum spin liquid based on its spin excitation spectrum. On the other hand, although the classical ground states of pure and Kitaev models are highly degenerate, we find that the order-by-disorder mechanism would select specific ordered states as the ground states. For pure model, the ground state is FM states with the moment direction lie in the lattice plane when and perpendicular to the lattice plane when . For the pure antiferromagnetic Kitaev model, stripe states with ordered moment along the *x*, *y* and *z* axis direction are selected out of the nematic states as the ground state. We also provide detailed descriptions of the phase transition between the classical magnetic phases.

We believe this work will draw a broad readership of Physical Review X. We hope you share our excitement in these results and would appreciate your consideration of this manuscript for initiating the peer-review process.

Yours sincerely,

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