Dear Editors,

We are submitting our manuscript entitled “Comprehensive study of the global phase diagram in the triangular J-K-Г model” for your consideration in Physical Review X.

In recent years, the Kitaev honeycomb model has attract a lot of interest, since it provides an analytically tractable example with an exact quantum spin liquid ground state. Correspondingly, the 4d/5d transition metal materials, in which the Kitaev interaction can be realized, are also of widespread interest. The generic model to describe these real materials is the so called J-K-Г model, which also contains the Heisenberg and off-diagonal Г interactions besides the Kitaev interaction. Thus, in order to understand the exotic physical phenomena observed in the real materials and search for the Kitaev spin liquid, there is growing interest in the J-K-Г model. In fact, the J-K-Г model can naturally be generalized to the triangular lattice. Though a previous study has map out its classical phase diagram, the study on the effects of quantum fluctuations on the global J-K-Г phase diagram is still scarce. In particular, since no exact solution has been reported so far for the pure 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. Moreover, recent experimental progress in the research of triangular-lattice magnetic materials with exchange frustrations also calls for a detailed study of the triangular J-K-Г model.

In this paper, we carry out a comprehensive study of the triangular J-K-Г model using a combination of the exact diagonalization, classical Monte Carlo and analytic methods. We find that there are five quantum phases in the limit of Г=0. Among them, the 120゜ Neel, the dual Neel and one of the stripe phases extend into the region with Г0. However, the other stripe and the ferromagnetic phases are unstable in response to an infinitesimal Г interaction. Due to the introduction of the Г term, five new phases emerge including two ferromagnetic phases, one stripe, one modulated stripe and a possible Z2 quantum spin liquid. We also elaborate that the pure Г model has a ferromagnetic ground state and the antiferromagnetic Kitaev model a stripe ground state, which are selected by the order-by-disorder mechanism from the degenerate classical ground states.

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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