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Peer Review

# Review of: "General Features of the Stellar Matter Equation of State From Microscopic Theory, New Maximum-Mass Constraints, and Causality"

**Omar Benhar**[1]

1. Theory, INFN Sezione di Roma I, Rome, Italy

I find the title of this paper somewhat presumptuous. While it is certainly arguable that combining microscopic nuclear theory and observational constraints may provide new insight into the equation of state (EOS) of neutron star matter, the proposed analysis involves significant limitations that need to be addressed.

The density region in which dynamical models based on chiral effective theory can be reliably used is known to be very narrow, its upper limit lying somewhere below twice the nuclear saturation density. On the other hand, the central density of neutron stars of mass around and above two solar masses is likely to exceed five times the nuclear saturation density. Modeling the EOS in the unconstrained density region with a polytropic extension of the low-density results obviously entails large uncertainties.

That being said, the results reported in the manuscript are interesting enough to deserve publication. However, I urge the authors to make an effort to put their work in a broader context, and discuss alternative implementations of their approach other than that based on the relativistic mean field (RMF) formalism

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briefly touched upon in Section III. For example, the use of purely phenomenological nucleon-nucleon (NN) potentials such as the Argonne models—capable of describing high-momentum nucleon-nucleon interactions—would allow for a significant extension of the region described by microscopic nuclear dynamics.

The impact of expanding the set of high-density constraints with the inclusion of the neutron star radii recently measured by the Neutron Star Interior Composition Explorer (NICER) should also be discussed. These data, pointing to a small difference between the radii of neutron stars of mass ~1.4 and ~2 solar masses, provide important information on the behaviour of the EOS at densities between ~3 and ~5 times the nuclear saturation density.

A revised manuscript, amended to take into account the above remarks, will make a valuable contribution to the field of neutron star physics.

## Declarations

**Potential competing interests:** No potential competing interests to declare.