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Title: *"Dynamical evolution of distant TNOs induced by Planet Nine"*

Abstract. The observational census of trans-Neptunian objects with semi-major axes greater than $\sim$ 250AU exhibits unexpected orbital structure that is most readily attributed to gravitational perturbations induced by a yet-undetected, massive planet. Although the capacity of this planet to reproduce the observed clustering of distant orbits in physical space, a coherent theoretical description of the dynamical mechanisms responsible for these effects remains elusive. In this work, we characterize the dynamical processes at play, from semi-analytic grounds. We begin by considering a purely secular model of orbital evolution induced by Planet Nine, and show that it is at odds with the ensuing stability of distant objects. Instead, the long-term survival of the clustered population of long-period KBOs is enabled by a web of mean-motion resonances driven by Planet Nine. Then, by taking a compact-form approach to perturbation theory, we show that it is the secular dynamics embedded within these resonances that regulates the orbital confinement and perihelion detachment of distant Kuiper belt objects. We also consider the effects of the orbital inclination of PL9 and show a simple mechanism confining in libration the longitude of the node of distant TNOs. In light of the developed qualitative understanding of the governing dynamics,we offer an updated interpretation of the current observational dataset within the broader theoretical framework of the Planet Nine hypothesis.

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