On the Potential Existence of Planet 9: Possible Hints of a Hidden Planet beyond the Kuiper Belt

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We present two arguments made by various authors, notably Batygin, K. & Brown M.E. (2016), on the possibility of an undiscovered 5-8 Earth Mass planet at 500 A.U from the Sun, colloquially termed as "Planet 9"(P9). We detail two major sets of observed phenomena in the Kuiper belt which can be explained by the gravitational effects of P9: (i) the apsidal confinement of 14 Kuiper Belt Objects (KBOs) located at a ≥ 250 A.U, whose clustering indicate the requirement of a gravitational influence by an unobserved massive object, (ii)the clustering of orbital planes of 14 KBOs at a ≥ 250 A.U which require a countering torque to nullify the differential regression of longitude of ascending node(Ω) due to the giant planets. We then show how P9 can explain the above two observations, using secular perturbation theory.

Based on the results of numerical simulations, various authors have shown that Planet 9 can be a viable explanation for the observed phenomena and have reduced the parameter space of Planet 9 to having a mass between approximately 5-8 Earth Mass and located at a= 380 – 670 A.U. We also discuss some possible formation scenarios of P9.