The high-inclination Trans-Neptunian Objects and the possible existence of Vertical TNO belt

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A new high-inclination, retrograde motion TNO, “Niku”, discovered by PS1 survey, and was soon linked with a supposed prograde Centaur, 2011 KT19. This unusual object can be stable for about 0.1Gyr with the 4 outer planets configuration of solar system. We compared 2011 KT19 “Niku” with the other five high-inclination objects, that have distant perihelion distances, and found that all of them have very similar longitudes of the ascending nodes (Ω). This result means the highly inclined, distant objects have common orbital plane, and moreover, the prograde and retrograde objects have opposite orbital axes. Our numerical integration shows that all of the six objects can not preserve the common ascending nodes in neither (1) the current 4 outer planets configuration, nor (2) current 4 outer planets plus the additional Planet Nine; after 1Myrs their ascending nodes will distribute randomly and lose the common orbital plane. Finally, we propose the possible existence of a new TNO, or Centaur belt oriented perpendicular to the ecliptic plane of our solar system. The future solar system object surveys, i.e. HSC and LSST, might be able to find more highly inclined, distant objects with a common orbital plane.

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