

# Abstract

Centaurs, small celestial bodies orbiting in the outer region of the Solar system between Jupiter and Uranus, originated from a population beyond Neptune and were scattered inward. Some of these Centaurs exhibit comet-like activity, even beyond Jupiter's orbit, but the exact source of this activity remains unclear. Despite being too cold for water-ice sublimation to explain their observed activity levels, super-volatiles alone cannot account for the observed activity distances.

Although Centaurs are a significant population of the Solar system, their discoveries have not been systematic, making it challenging to accurately estimate their population size. Additionally, approximately 10% of Centaurs display activity, showing varying dust production rates and activity patterns, with some undergoing outbursts while others exhibit intermittent activity. Notably, no active Centaurs have been identified beyond 13 astronomical units from the Sun, making them one of the most enigmatic small body populations in the solar system.

This study aims to analyze photometric observations of Centaurs to characterize their activity based on their orbital parameters and physical properties. Given the chaotic orbits of Centaurs and their constant gravitational interaction with large planets, it is crucial to investigate their past evolutionary history. This analysis can help determine whether Centaurs are new to their current region and whether they have experienced sudden orbital changes.

*keywords: Centaurs, comets, photometry, dynamical evolution*