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Search for sub-kilometre trans-Neptunian objects using all CoRoT AN1 Light-curves

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Abstract

We present here the analysing results of using all CoRoT (Convection Rotation and Planetary Transits) asteroseismological N1 light-curves with the serendipitous stellar occultation method. We will report our combining result in this meeting, and also the comparisons with other surveys.

1. Introduction

Trans-Neptunian Objects (TNOs) are the witnesses of the formation of the planets during the dynamical and collisional period of our solar system. The population characteristics of sub-kilometer sized TNOs may carry some important clues for the origin of the planets. However, the knowledge of them is far from enough, particularly for those smaller ones, due to very few detections. Nowadays only TNOs larger than about 25 km can be directly observed. For the TNOs not able to be directly observed, searching for serendipitous stellar occultation events is a possible method. Currently, from the literature, only 15 Possible Occultartion Events (POEs) are reported from two serendipitous surveys: 2 POEs are found by Schlichting et al. using the observations taken by the Hubble Space Telescope's Fine Guidance Sensors [1], and the other 13 are found in our previous work using CoRoT data [2].

2. New CoRoT AN1 data sets

We analyzed the rest of CoRoT AN1 data which contains 188 lightcurves from 77 stars monitored within 16 observation runs, in total about 130.4k star-hours, in addition to the 144.4k star-hours we previously dealt with (See Table 1 for more details). Using deviation method [2], we got 12 new outliers. 10 of them might not be related to any instrumental effects after checking raw data by CoRoT team.

Table 1: Comparions of CoRoT data employed in our earlier and current works.

CoRoT AN1 Data	Liu2015	New
# 1-sec Bins	519869933	469411359
Exposure (star-hours)	144.4×10^3	130.4×10^3
# RunCodes	9	16
# AN1 light-curves	165	188
# Background Stars	79	77
# POEs/Outliers	13/20	10/12

3. Results and Conclusion

We got 23 POEs from analyzing total CoRoT asteroseismology observations which is about 274.8k star-hours. The minimal sizes of these possible occultors orbiting beyond Neptune are ranging from 0.4 to 1.5 km. The new combining result will help us to refine our earlier estimate of TNO size distribution as shown in Figure 1.

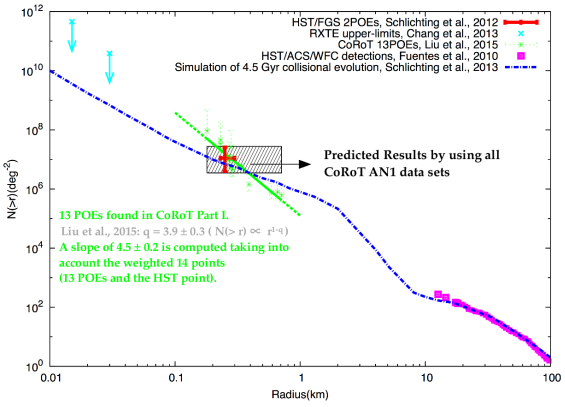

Figure 1: A possible result on size distribution of the sub-kilometre TNOs using all CoRoT AN1 data. Results, Upper-limits from other surveys and a possible modle are also plotted.

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References

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