

Astrometry and Spectra Classification of Near Earth Asteroids with Lijiang 2.4m Telescope†

X. L. Zhang^{1,2}, B. Yang^{1,2}, and J. M. Bai^{1,2}

¹Yunnan Observatories, Chinese Academy of Sciences, Kunming 650011, China
email: zhangxiliang@ynao.ac.cn

²Key Laboratory of the Structure and Evolution of Celestial Objects, Chinese Academy of Sciences, Kunming 650011, China

Abstract. The Lijiang 2.4m telescope of Yunnan Observatories is located at longitude E100°01'51", latitude N26°42'32" and height 3250m above sea level (IAU code O44). Because of low latitude of the site, long-focus system and planetary tracking mode of telescope, high accuracy positioning and spectral classification of the near Earth objects (NEAs) especially in the Southern Hemisphere can be studied with the Lijiang 2.4m telescope. As a set of observational campaigns organized by the GAIA-FUN-SSO, astrometry of several near Earth asteroids including (367943) Duende and (99942) Apophis were made with Lijiang 2.4m telescope during 2013. From December 12, 2015, spectra of three near earth asteroids were also observed with the YFOSC terminal attached to the Lijiang 2.4m telescope. This paper will give the detailed introduction of Lijiang 2.4m telescope and observational results of near Earth asteroids obtained with it.

Keywords. methods: observational, techniques: astrometry, spectrum classification.

1. Introduction

Knowledge of asteroids and comets, the relic of planet building blocks, directly sheds light on the formation of terrestrial planets, and the origin and evolution of the Solar System. Modern asteroid surveys have greatly enhanced the detectability of small NEAs and distant comets. In the past two decades, the number of known NEAs and comets has increased drastically. Given that the observable windows of newly detected objects are often quite narrow (merely a few days), prompt follow-up observations are critical for orbit determinations well as for the interpretations of the physical properties.

Lijiang 2.4m telescope (Figure 1) is equipped with the Yunnan Faint Object Spectrograph and Camera (YFOSC), which is capable of conducting optical imaging and low-resolution spectroscopy from 300 to 1000 nm, the parameters of grisms often used are given in table 1. Aided with the planetary tracking mode, Lijiang 2.4m telescope is an ideal facility to carry out follow-up physical studies on newly discovered NEAs.

2. Astrometry

As parts of pre-launch training programs organized by the Gaia-FUN-SSO, several NEAs such as (99942) Apophis, (367943) Duende and 2013 TV135, were observed with the Lijiang 2.4m telescope (Zhang *et al.*, 2015; Wang *et al.*, 2015; Thuillot *et al.*, 2015).

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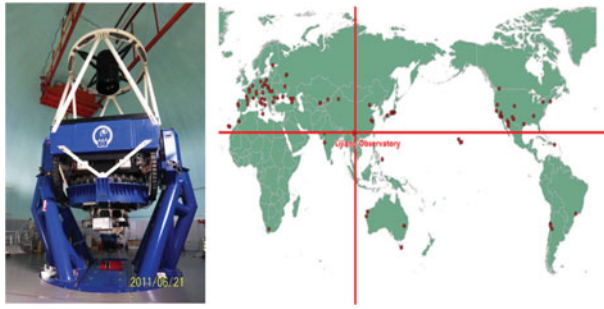


Figure 1. Lijiang 2.4m telescope and its location.

Table 1. Parameters of grisms of YFOSC.

Grisms NO.	λ_c (nm)	λ_{Blaze} (nm)	Grooves (nm/mm)	Dispersion (nm/pixel)	Resolution (@600nm)	Sp.Range (nm)
12	730	700	75	1.1	545	520-980
10	380	390	150	0.79	760	340-980
5	650	700	300	0.46	1300	496-980
15	586	527	300	0.39	1540	410-980
3	390	430	400	0.29	2068	340-910
14	463	428	600	0.17	3520	360-746
8	650	700	600	0.15	4000	510-960

Table 2. Detailed observational information of five newly found near Earth asteroids.

Objects	date (UT)	Δ (AU)	r_\odot (AU)	Φ (Deg)	Airmass
163899	2015-12-19	0.076	0.965	102.5	1.43
363599	2016-04-09	0.056	1.022	67.5	1.05
154244	2016-07-26	0.071	1.044	64.7	1.11
2011 UU106	2016-12-08	0.155	1.070	53.1	1.11
2005 TF	2016-12-09	0.109	1.075	32.3	1.20

3. Optical Spectrum Classification

In table 2, we present the detailed observational information of five NEAs with the Lijiang 2.4m telescope during 2015-16, and their taxonomic types according to the feature-based Bus-taxonomy (Bus *et al.*, 2002) will be given in our follow-up work.

4. Acknowledgments

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