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Stellar archaeology in the M31 halo: variable stars and stellar populations in the And XIX dwarf spheroidal galaxy

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Abstract. We present results on the study of the Andromeda XIX (And XIX) dwarf spheroidal companion of M31, based on time-series photometry obtained with the Large Binocular Telescope (LBT). The LBT-based CMD of And XIX reaches $V \sim 26.5$ mag. We have identified 35 variables in the galaxy, they include 24 RR Lyrae stars, 8 Anomalous Cepheids, 2 binaries, and 1 SX-Phoenicis candidate.

Key words. Galaxies: dwarf, Local Group — Galaxies: individual(AndXIX) — stars: distances —stars:variables:other—techniques photometric

1. Introduction

The discovery in recent years of several new companions around the Andromeda (M31) and the Milky Way (MW) spirals allow us to investigate the role played by satellites in the formation of the two largest galaxies of the Local Group. We have analyzed And XIX, one of the brightest and the most extended of the M31 new satellites, (see Figure 1 of Clementini et al. 2012). The galaxy is located at about 187 kpc projected distance from the center of M31. Its distance modulus is (m-M) = 24.85 ± 0.13 mag (McConnachie et al. 2008).

2. Observations and data reduction

B, V time-series photometry of a $23' \times 23'$ area centered on And XIX was obtained with the blue camera of the LBT in October and December 2010. PSF photometry of the data was performed using the DAOPHOT-ALLSTAR-ALLFRAME packages (Stetson 1987, 1994). Candidate variables were identified using the variability index in DAOMASTER (Stetson 1994).

3. Results and future developments

We have identified 8 Anomalous Cepheids (AC), 24 RR Lyrae stars, 2 binary systems,

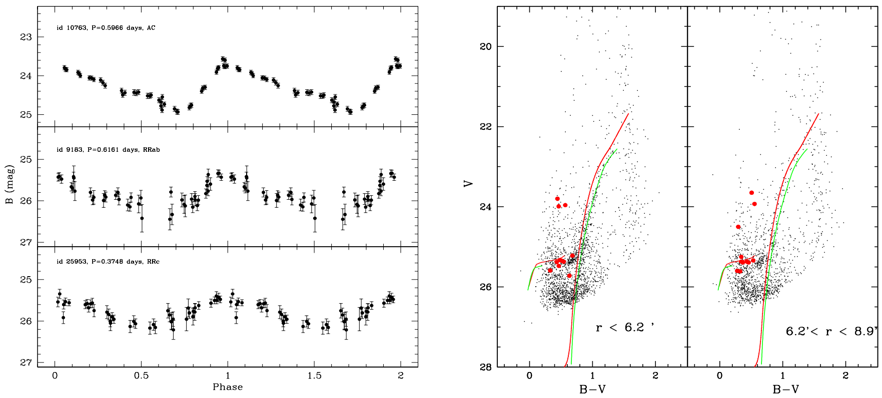

Fig. 1. *Left*: *B*-band light curves of an AC (top), a fundamental-mode (RRab; middle), and a first-overtone (RRc; bottom) RR Lyrae star in And XIX. *Right*: CMD of the stars inside And XIX's r_h (on the left), and in an external equivalent area (on the right). The variable stars are marked by red dots. Red and the green lines are the ridge lines of M68 and NGC4147, respectively.

and 1 SX-Phoenicis candidate in the galaxy. Examples of the *B*-band light curves are shown in the left panel of Fig. 1.

The V vs. $B - V$ CMD of And XIX is shown in the right panel of Fig. 1. The CMD was compared to the mean ridge lines of the Galactic globular clusters (GCs) M68 (red line, from Walker (1994), $[Fe/H] = -2.27$ dex) and NGC 4147 (green line, from Stetson (2005), $[Fe/H] = -1.80$ dex). These GCs well bracket the metallicity of And XIX ($[Fe/H] = -1.9$ dex, from McConnachie et al. 2008). Fig. 2 shows the period-amplitude diagram for the RR Lyrae stars in our sample. Their distribution in Fig. 2 suggests an Oo-Intermediate (Oo-Int) classification for And XIX. The average period of the RRab stars, 0.61 ± 0.04 days, also confirms the Oo-Int classification of this M31 satellite.

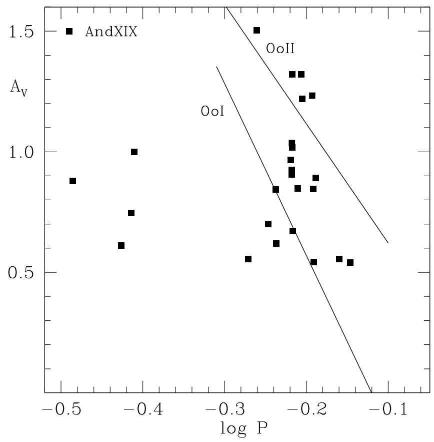

Fig. 2. *V*-band period-amplitude diagram of And XIX RR Lyrae stars (filled squares). The solid lines show the positions of OoI and OoII Galactic GCs from Clement & Rowe (2000).

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