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ORIGINAL ARTICLE

First results from the POMME survey of M31

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Abstract The POMME survey (Pixel Observations of M31 with MEgacam) monitored two fields in the disc of M31 using MegaCam at CFHT over a timespan of 2.5 months in three filters (g', r', i'). Covering a large fraction of the disc of M31, it yields an unprecedented view on Cepheids, eclipsing binaries and microlensing events in M31. In this contribution we present the first results on the Cepheid populations in M31. Using difference imaging we detect more than 2500 Cepheids in the period range from 2 to 80 days, making the catalogue the largest and most homogeneous database of M31 Cepheids to date. The period distribution peaks at $\log P[\text{day}] \approx 0.63$. We confirm the presence of a second peak in the period distribution at $\log P[\text{day}] \approx 1.13$, consistent with previous findings on smaller samples, and which is also present in Galactic Cepheids, unlike those at the lower metallicities of the LMC. Using the Fourier parameters derived from light curve fitting we identify 200 first overtone pulsators among the POMME Cepheids. On-going work will include the derivation of period-luminosity relations and the extension of the analysis to eclipsing binary systems, yielding an improved distance to M31 and tighter constraints on systematics affecting the period-colour-metallicity-luminosity relations.

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1 Introduction

Optical variability surveys of M31 have a long history, dating back already to the beginning of the last century. A major goal has always been to improve the distance determination to the nearest neighbouring spiral galaxy, primarily making use of Cepheids. Other recent aims have been the detection of eclipsing binaries and microlensing events. Figure 1 gives an overview of major surveys towards M31, showing the field of view and the number of variables identified in the labelled surveys.

The early pioneering works by Hubble (1929) and Baade and Swope (1963) using photographic plates were followed in the mid 1990s by CCD surveys dedicated to obtain distances by improving the understanding of the properties of Cepheids in M31 (e.g. Freedman and Madore 1990; Hodge 1992). Surveys include works by Magnier et al. (1997), the DIRECT collaboration (Kaluzny et al. 1998; Macri 2004), and by Vilardell et al. (2007).

A huge number of variables has also been obtained as a by-product of microlensing surveys towards M31: NMS (Joshi et al. 2003, 2010), AGAPE (Ansari et al. 2004), Point-AGAPE (An et al. 2004), WeCAPP (Fliri et al. 2006). Note however that the majority of the detected sources are Long Period Variables, which are also targeted in the infrared (Mould et al. 2004; Welch et al. 1986). The next generation of surveys like POMME (**P**ixel **O**bservations of **M**31 with **ME**gacam), which is presented here, and the ongoing PAndromeda survey with the Pan-STARRS PS1 telescope (Lee et al. 2012), are obtaining a much more complete census of Cepheids and eclipsing binaries across the entire disc of