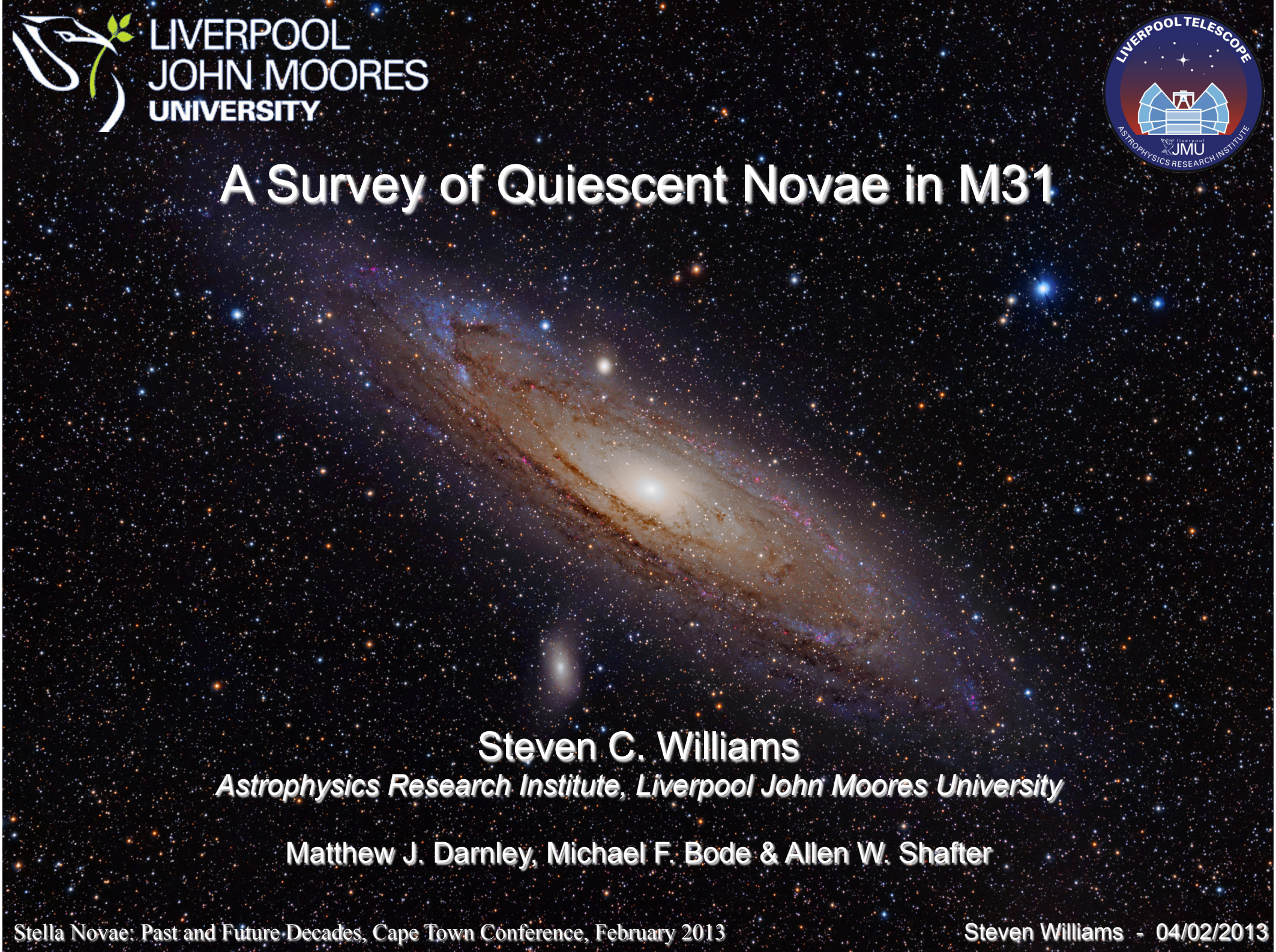


A Survey of Quiescent Novae in M31

Steven C. Williams

Astrophysics Research Institute, Liverpool John Moores University

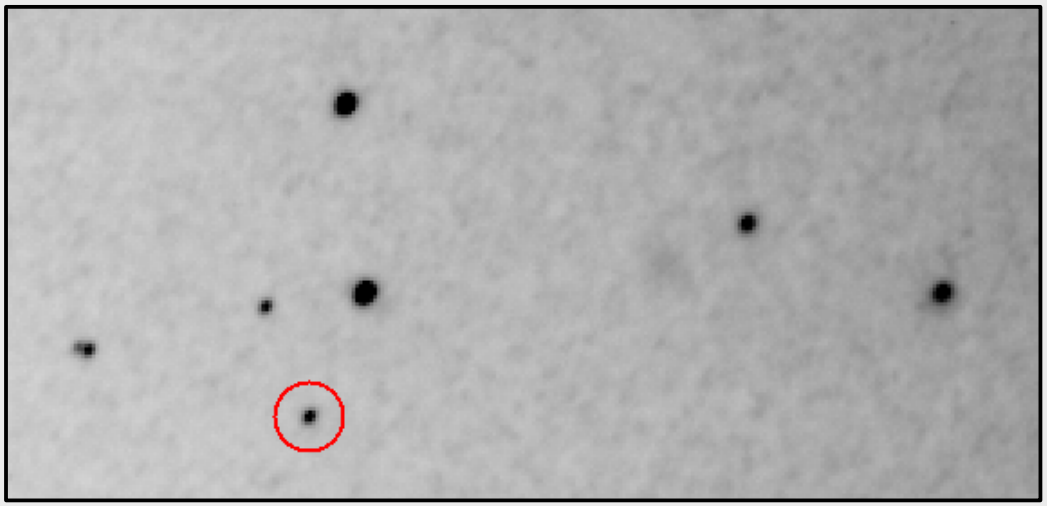
Matthew J. Darnley, Michael F. Bode & Allen W. Shafter

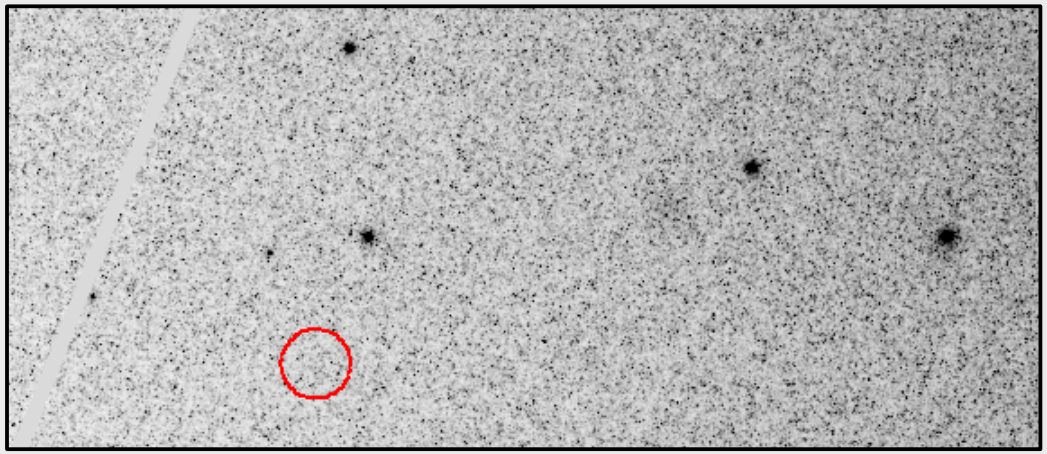
Introduction

- We use Liverpool Telescope (LT) images of novae in outburst to locate the quiescent systems in archival HST images and detect RG novae.
- Based on Bode et al. (2009) detection of M31N 2007-12b.
- Many of LT images of novae taken as part of a photometric and spectroscopic survey of M31 with Hobby-Eberly Telescope (HET) spectra, our catalogue begins in 2006.
- Our survey only used spectroscopically confirmed novae with LT images.
- Of these nova ~70% have HST coverage.

The LT and HST Data

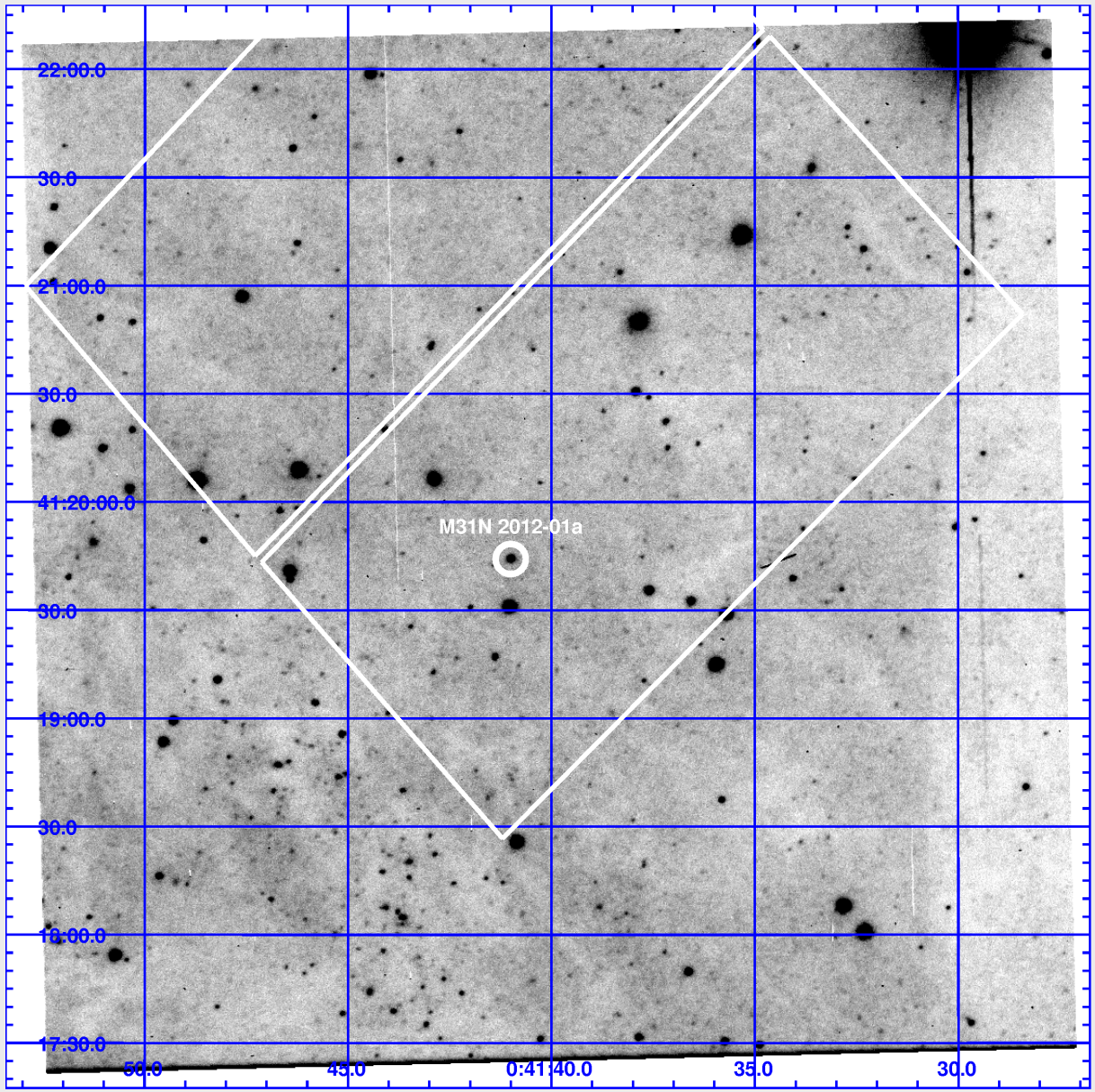
- Liverpool Telescope (LT) images were taken during the outbursts. The images were selected to give the most accurate position, taking into account the brightness and seeing.
- Coincident HST images were selected with a similar filter as possible to the LT images. The HST images were taken on ASC/WFC, WFPC2 or WFC3.



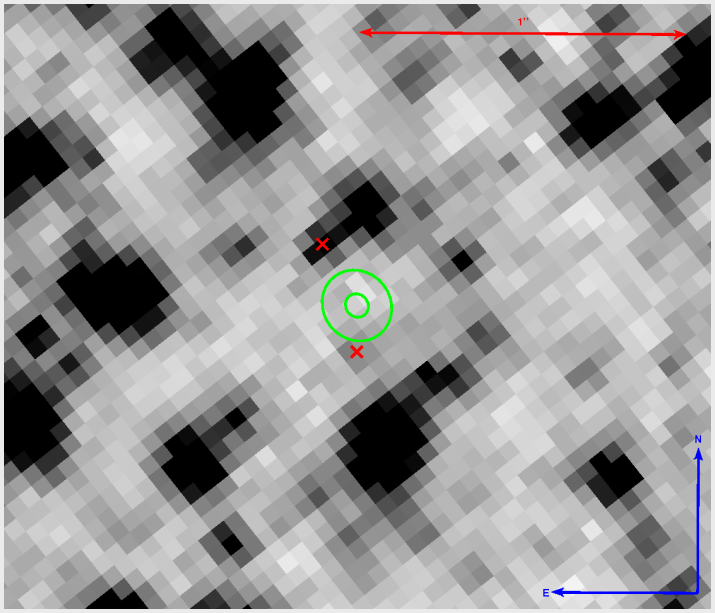


Method

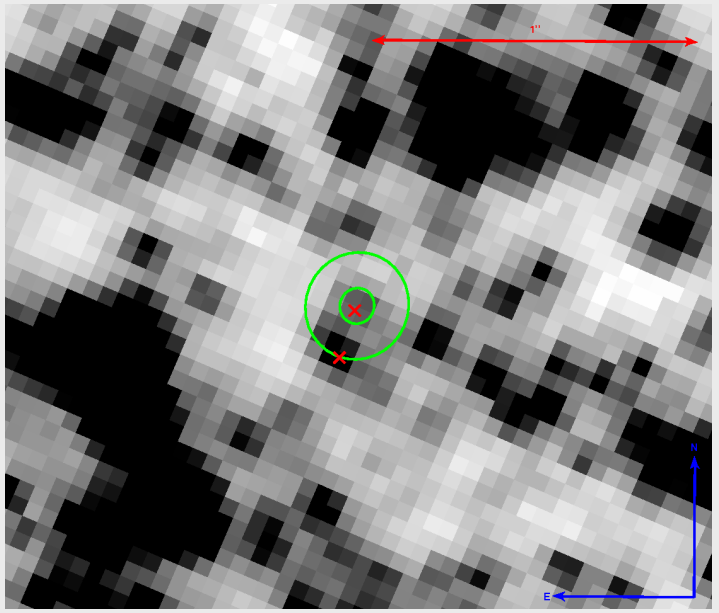
- Best LT images were combined.
- Accurate position defined in combined LT image.
- Position in LT image transformed to archival HST image using bright stars visible in each image.
- Photometry performed on any candidates.



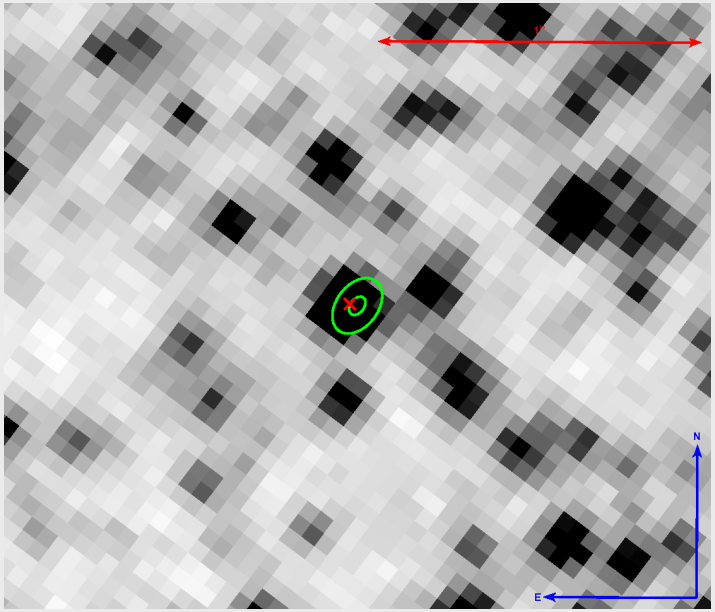
Results of Quiescent Novae Survey



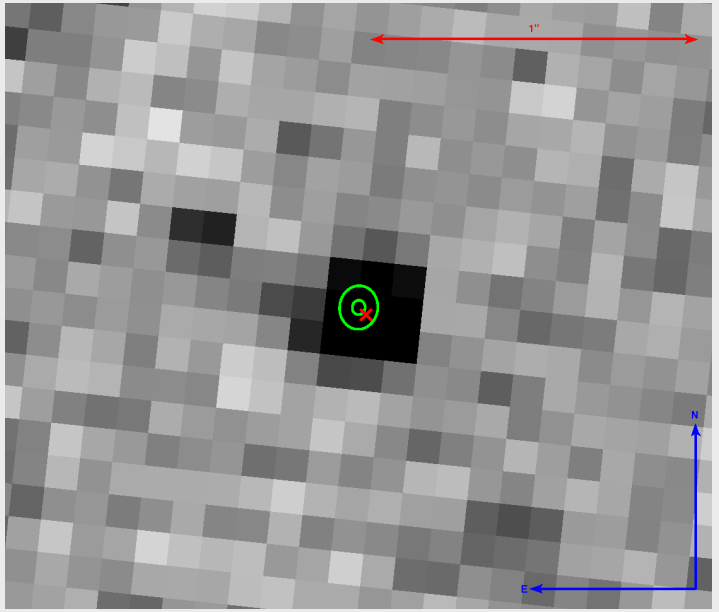
M31N 2006-11a - 58%



M31N 2007-02b - 1.1%

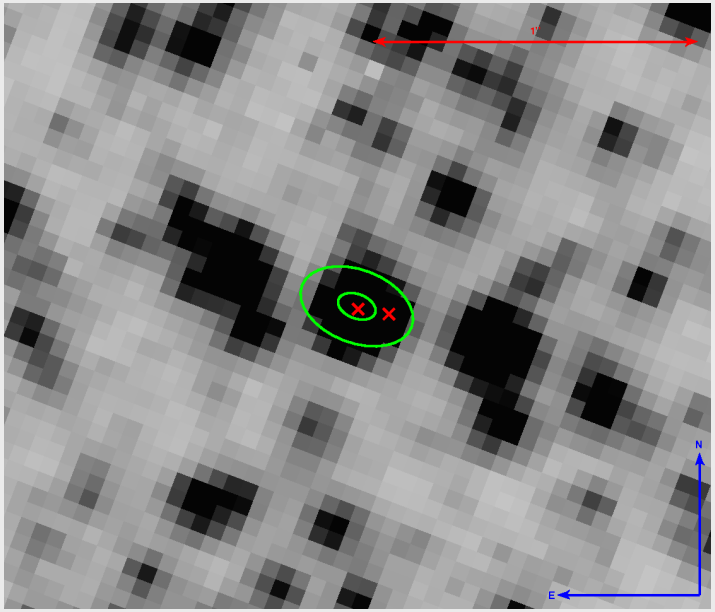


M31N 2007-10a - 2.7%

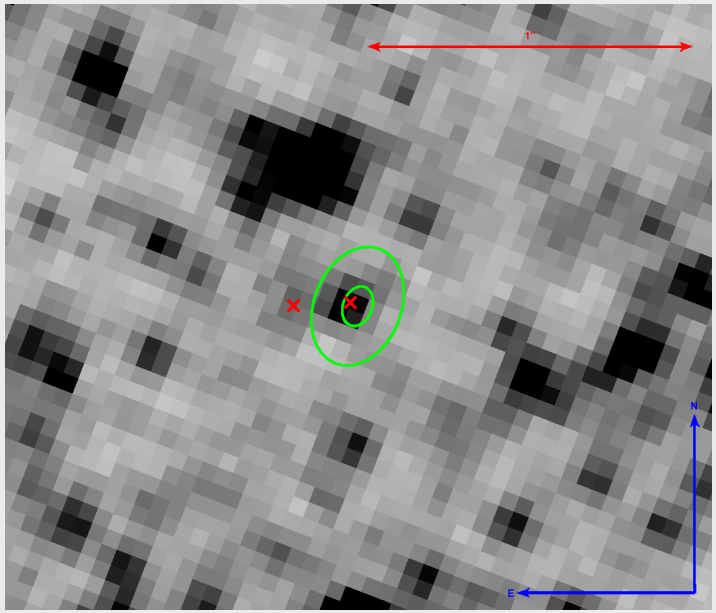


M31N 2007-11b - (*V-I*) = 2.3

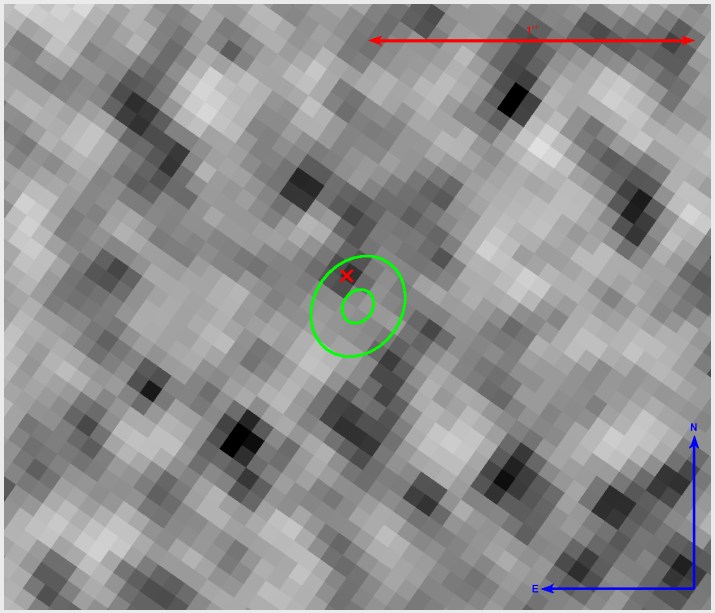
Results of Quiescent Novae Survey



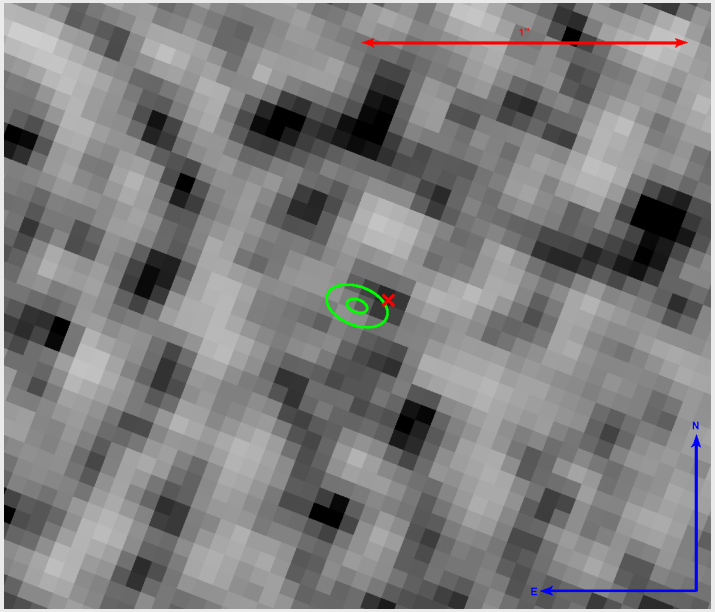
M31N 2007-11d - 0.3% - (*B-I*) = 4.0



M31N 2009-11d - 2.2% - (*B-I*) = 0.7



M31N 2010-05a - 37%

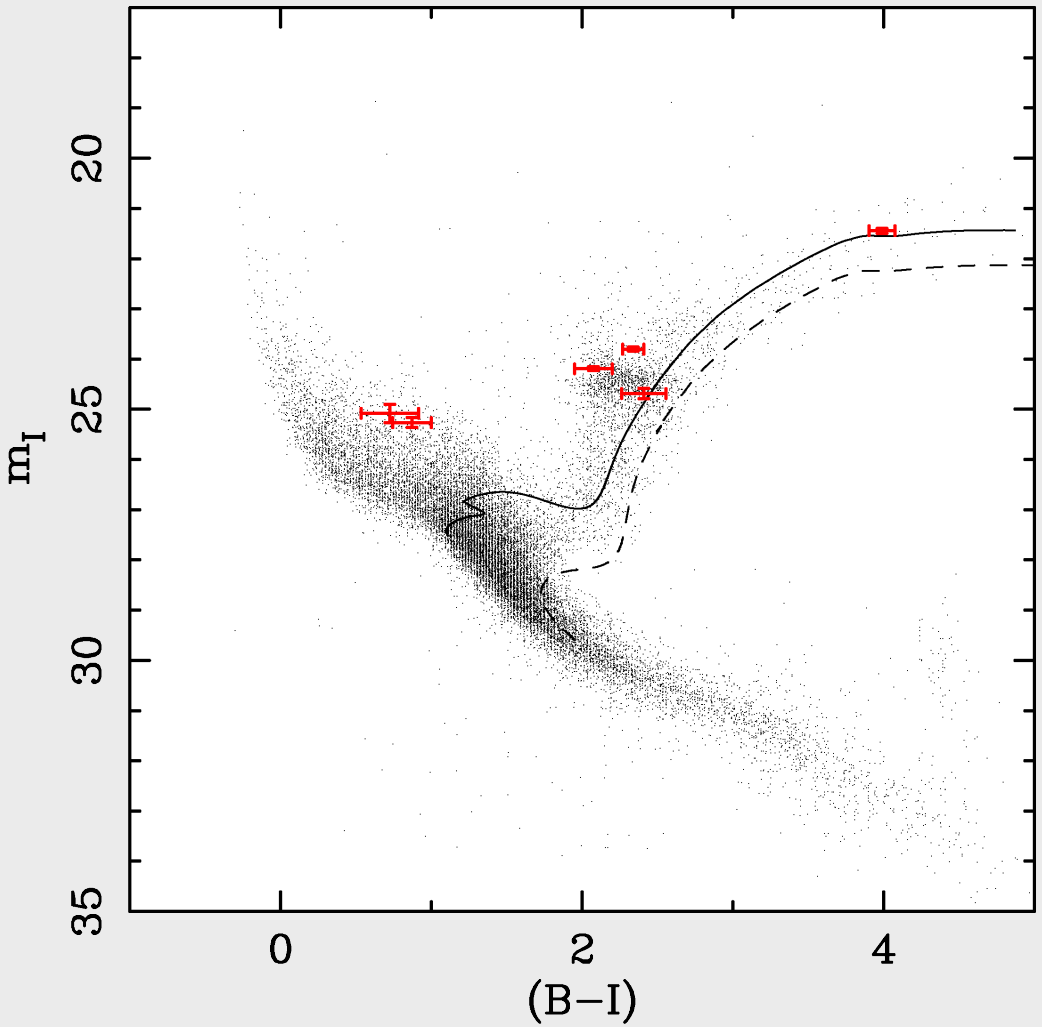


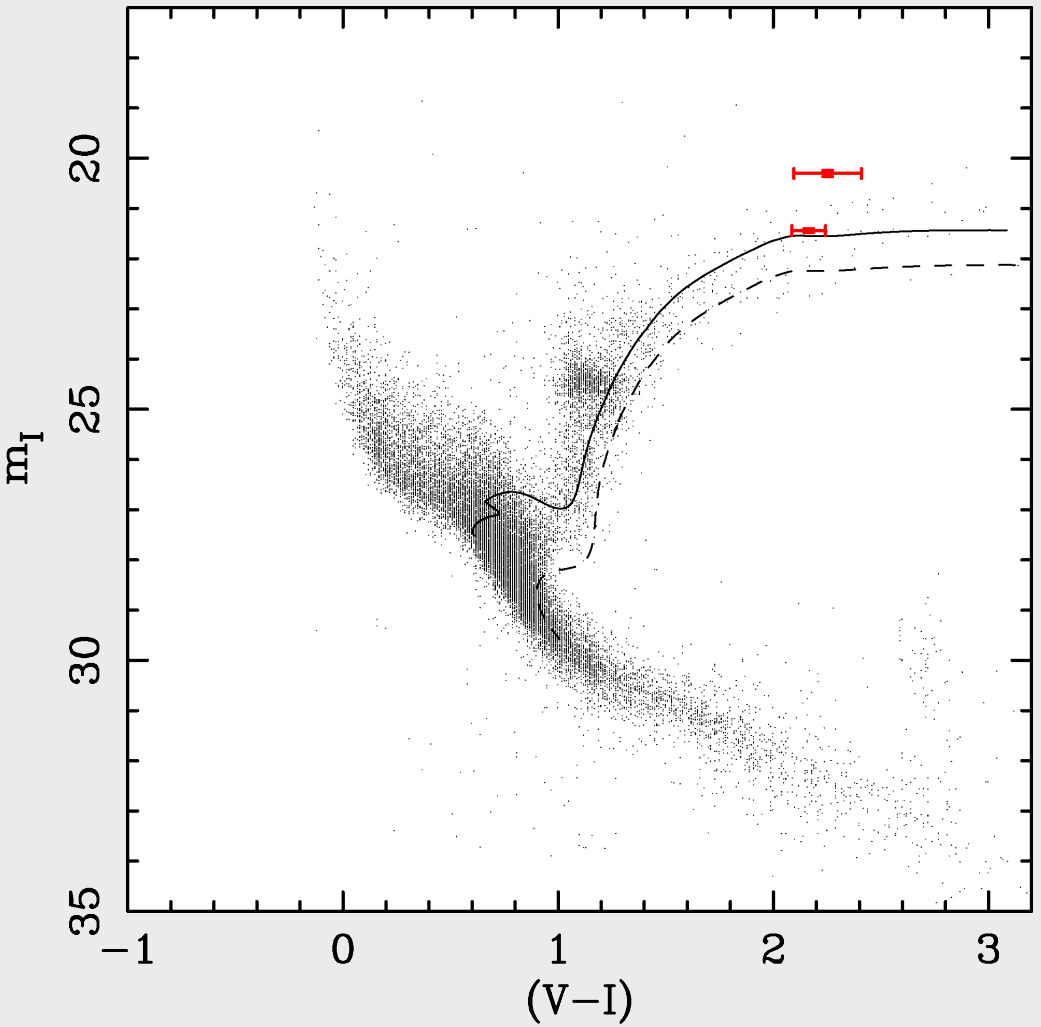
M31N 2012-09a - 33%

Results & Discussion

- We find ten systems (28%) with a resolvable source close enough to be a significant detection.
- By significant we mean closer than would be expected to occur by chance less than 5% of the time.
- Eight of these we have been able to get a colour for. Six have (*B*–*I*) colour greater than 2, with one system having (*B*–*I*) colour 4.0.
- Only nova systems with a confirmed red giant secondary are RS Oph, T CrB, V3890 Sgr and V745 Sco. Darnley et al. (2012) and references therein suggest a couple more.

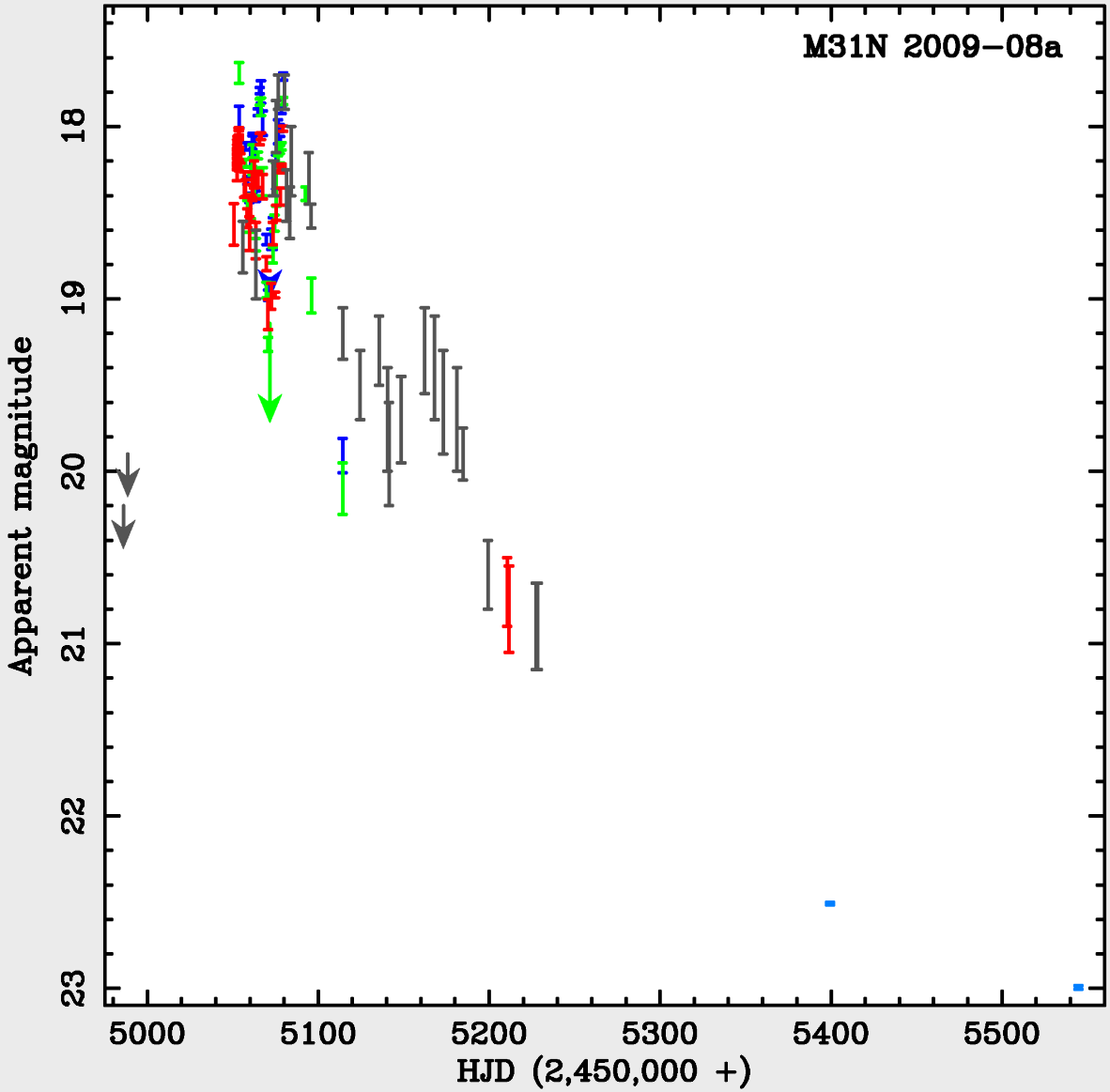
Results of Quiescent Nova Survey





Light Curves with HST Points

- Some novae have HST images taken when they are still fading.
- Light curves from Shafter et al. (2011) can be extended to fainter magnitudes.



Summary & Future Work

- We used LT images to locate the positions of quiescent novae in archival HST images.
- 28% of the systems have a progenitor candidate closer than would be expected occur by chance only 5% of the time.
- Initial results suggest RG nova rate appears to be higher than our Galaxy.
- We also produced deeper light curves for some systems.
- We plan to use the results to produce an estimate of the overall RG-nova population in M31.