



Detection of Variable Stars in BATC M67 field

Hwihyun Kim

Yonsei University, Seoul, KOREA



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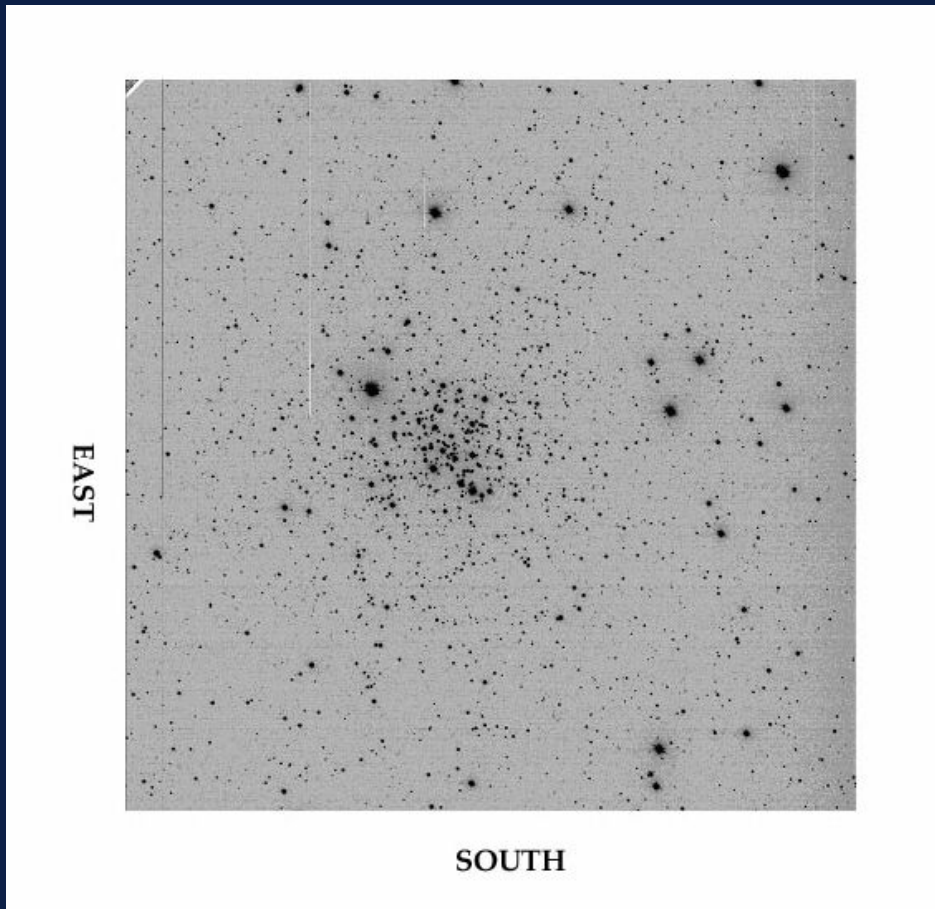


1. INTRODUCTION

Research Goal

- Detect variable stars of any kind
- Estimate efficiency of variability detection techniques
- Identify eclipsing binaries
- Form database for accurate distance measure

2. BATC M67 & Data Selection



M67 image from BATC archive

Selection Criteria

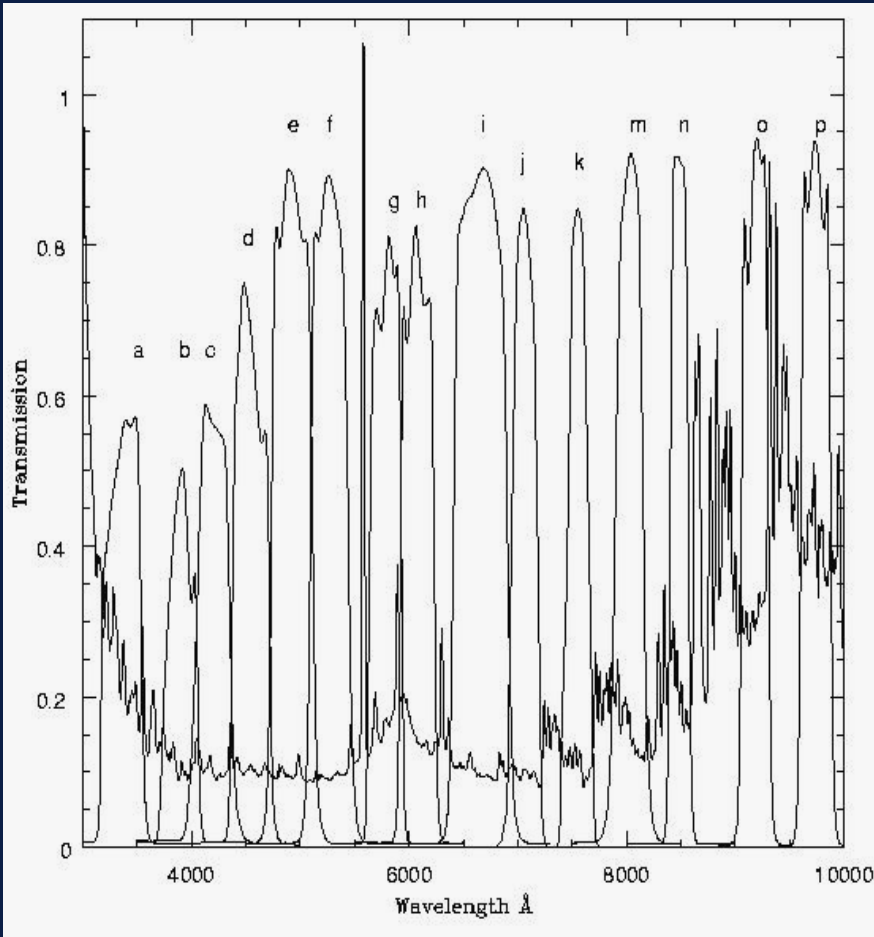
1. Images obtained in consecutive nights
2. FWHM value (< 4.75)
3. Visual inspection for defects

Selected Data frames

- About 350 images in 6660\AA
- Feb. 16 ~ 19 (2001)
- FWHM : 3~4 arcsec

BATC Survey

(Beijing-Arizona-Taipei-Connecticut)



- **Wide Field 15 color survey**
~500 program fields in northern hemisphere
- **Instrument**
 - 60/90cm Schmidt tel.
 - 2K CCD
(FOV=58' x58', 1.7"/pix)
 - **15 intermediate bands**
(3000~10000Å/260~550Å)



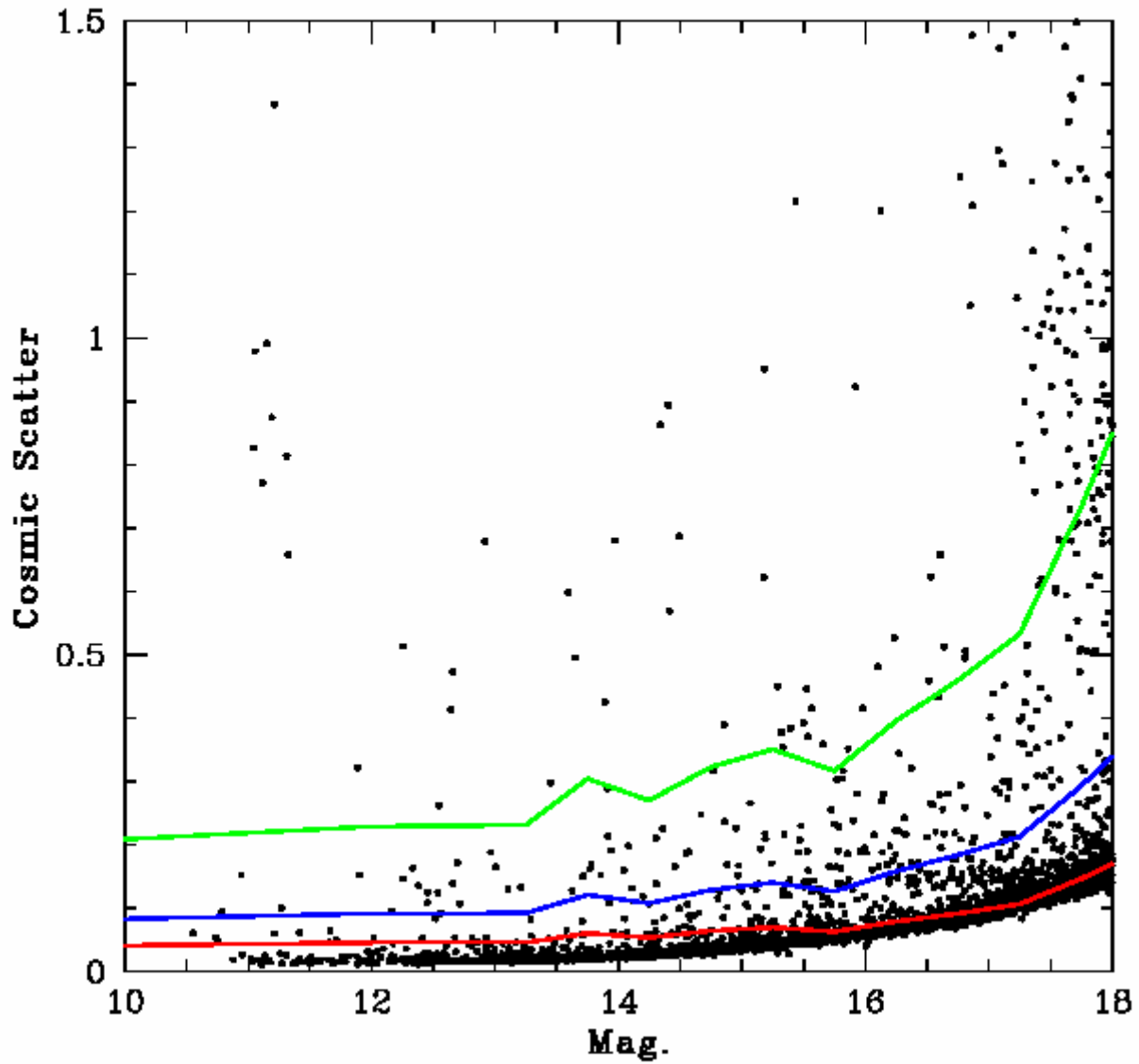
3. Detected Candidates

Data Process

- Selection of a reference image (for standardization)
- Common magnitude system using matched stars
- Derivation of mean mag. and standard deviation for each star

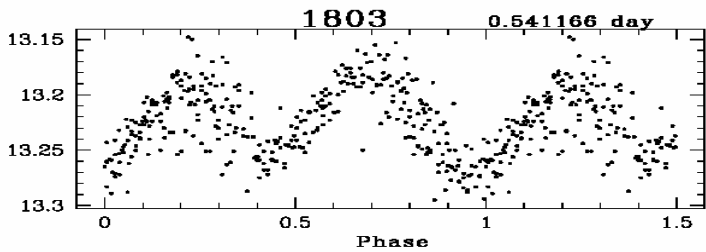
Variable Candidates : Method I & II

- Stars with large deviation (using 2-sigma cut)
- All stars analyzed by PDM method to see the presence of periodic variation

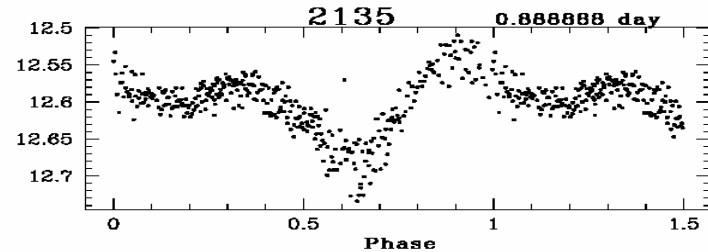


Mag vs. Cosmic scatter for all stars

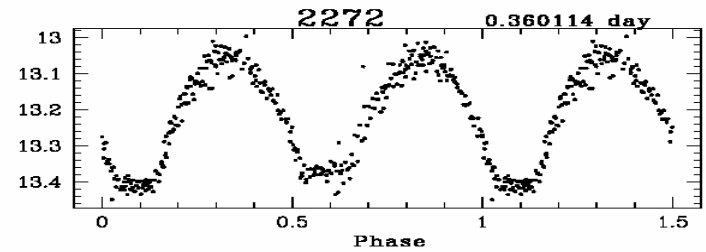
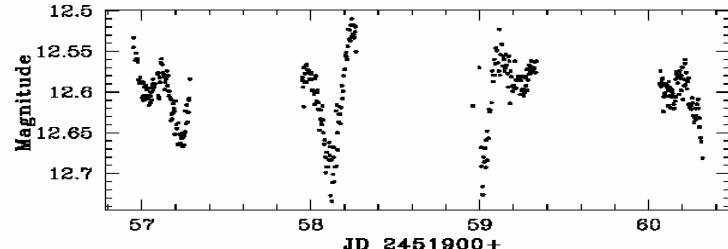
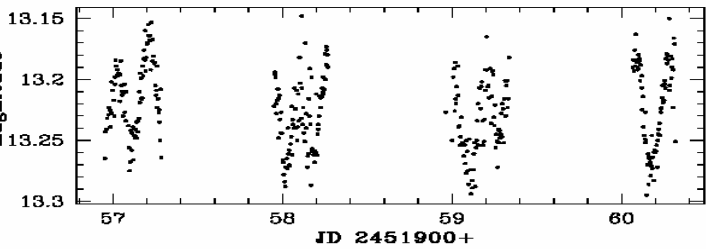
Detected Known Variables



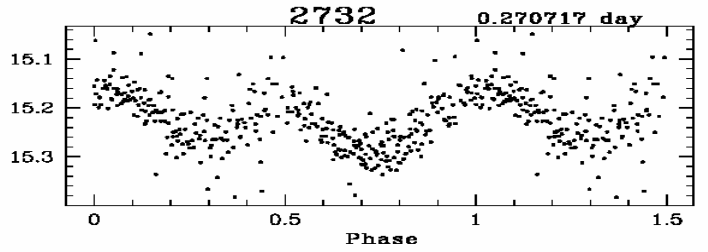
W UMa
(Stassun,
2002)



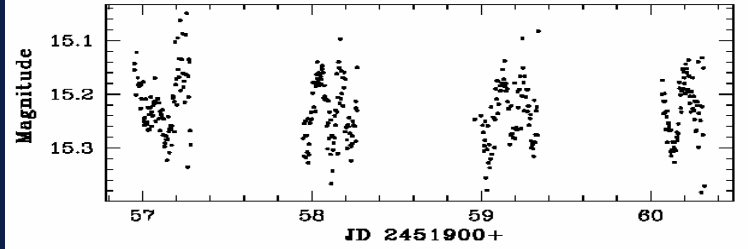
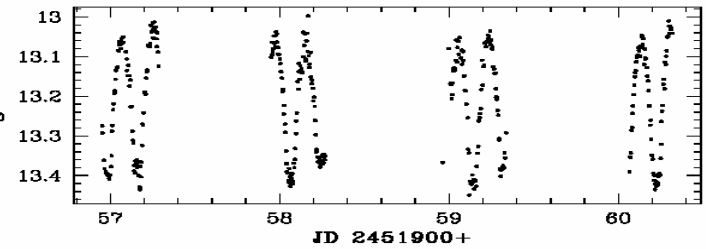
EV Cnc
(Gilliland,
1991)



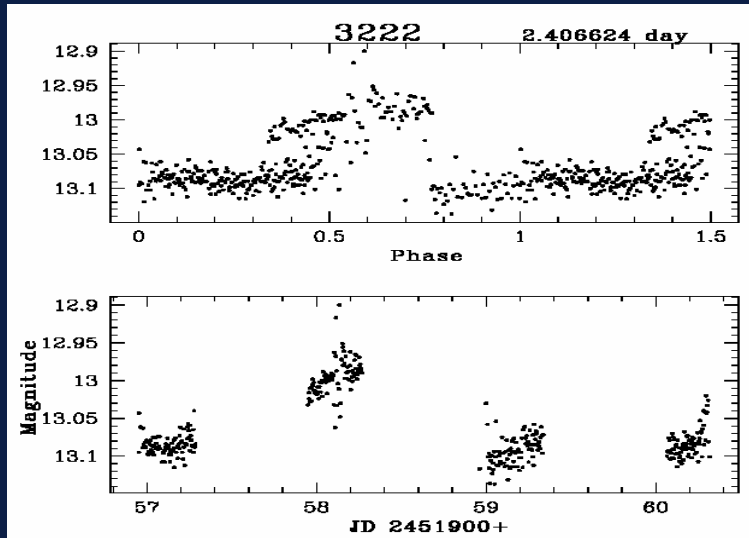
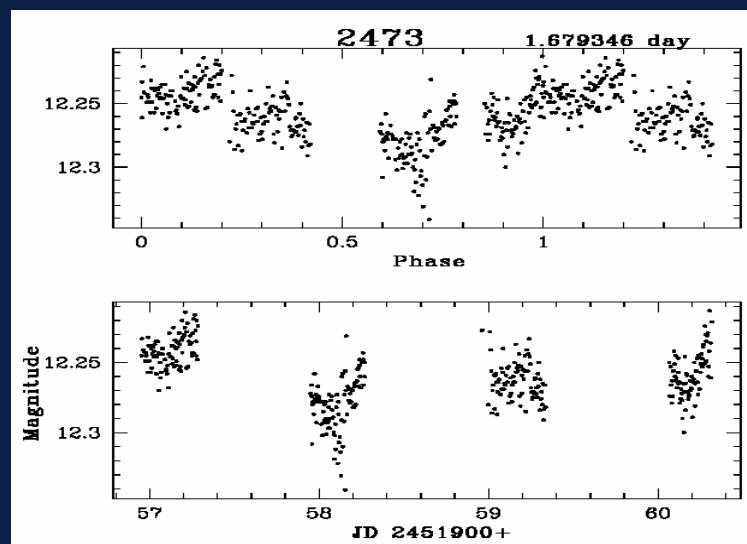
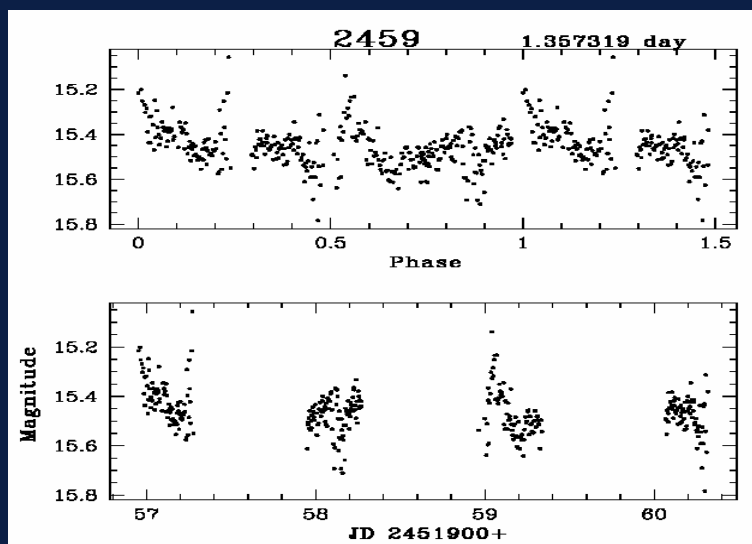
AH Cnc
(Kurochkin
1960)



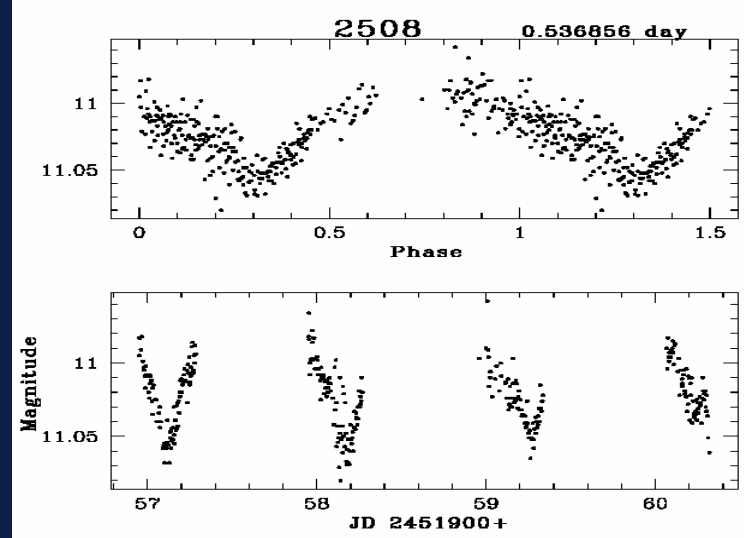
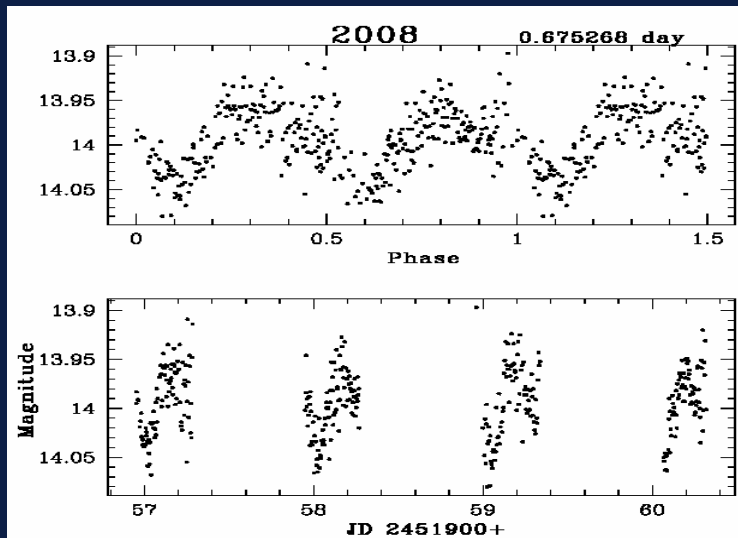
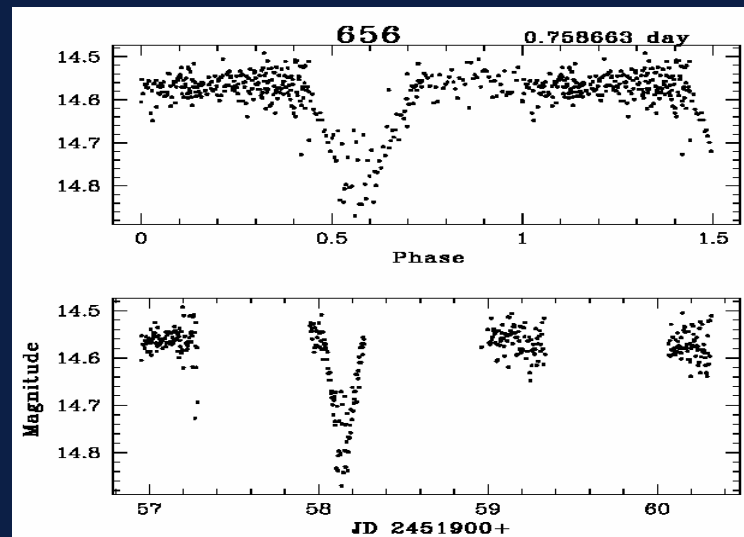
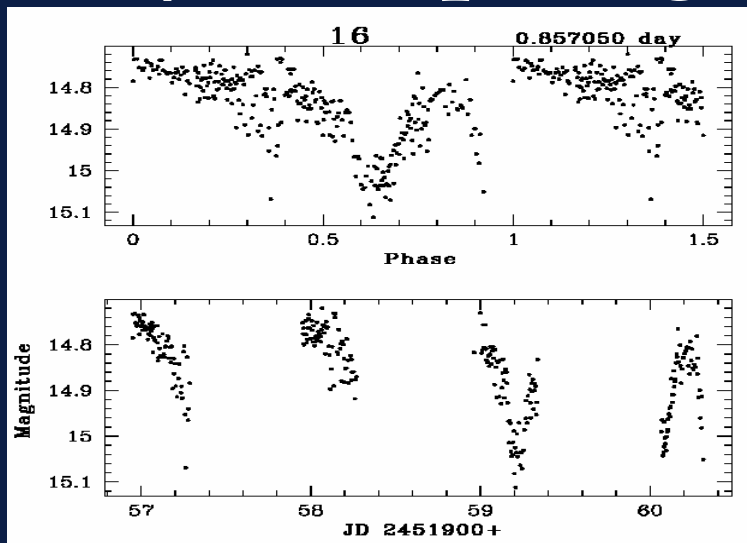
ET Cnc
(Eggen &
Sandage,
1964)



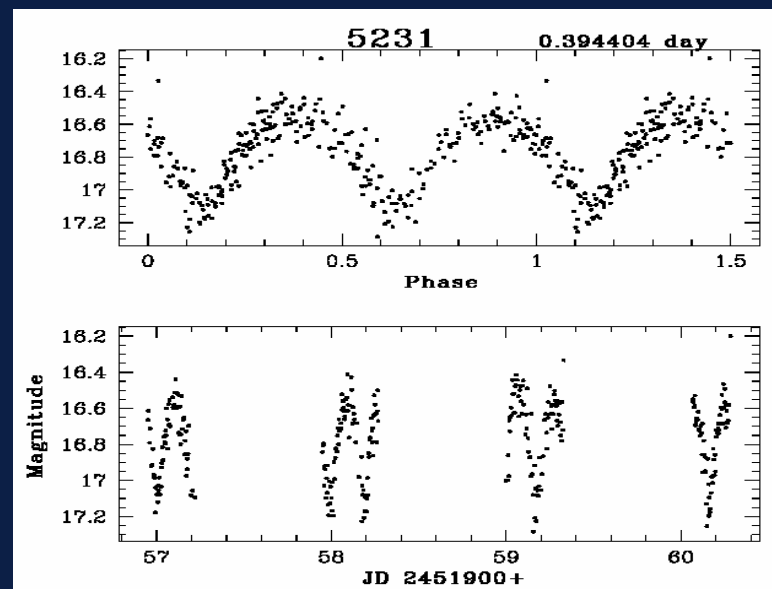
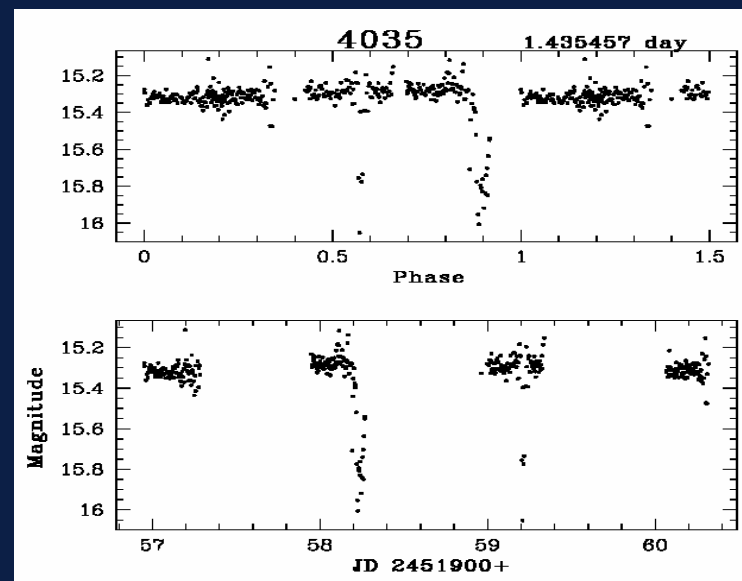
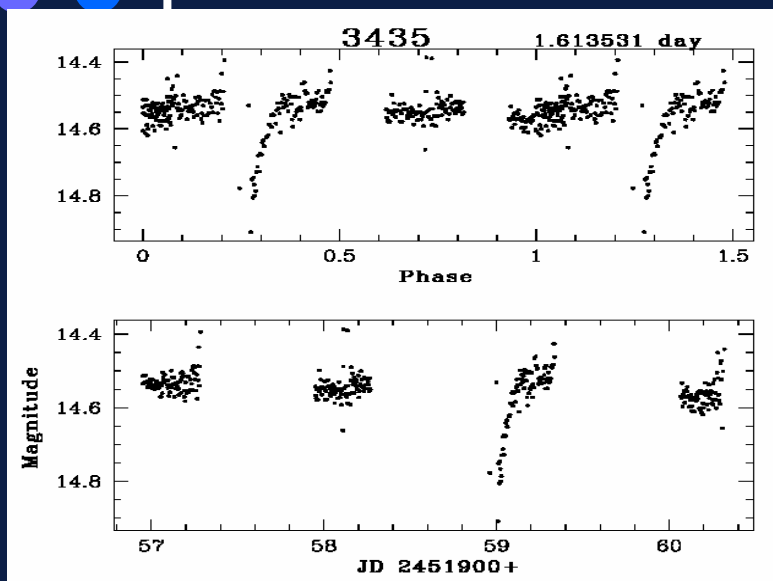
Known Oscillating Blue Stragglers (Stassun et al., 2002, A&A)



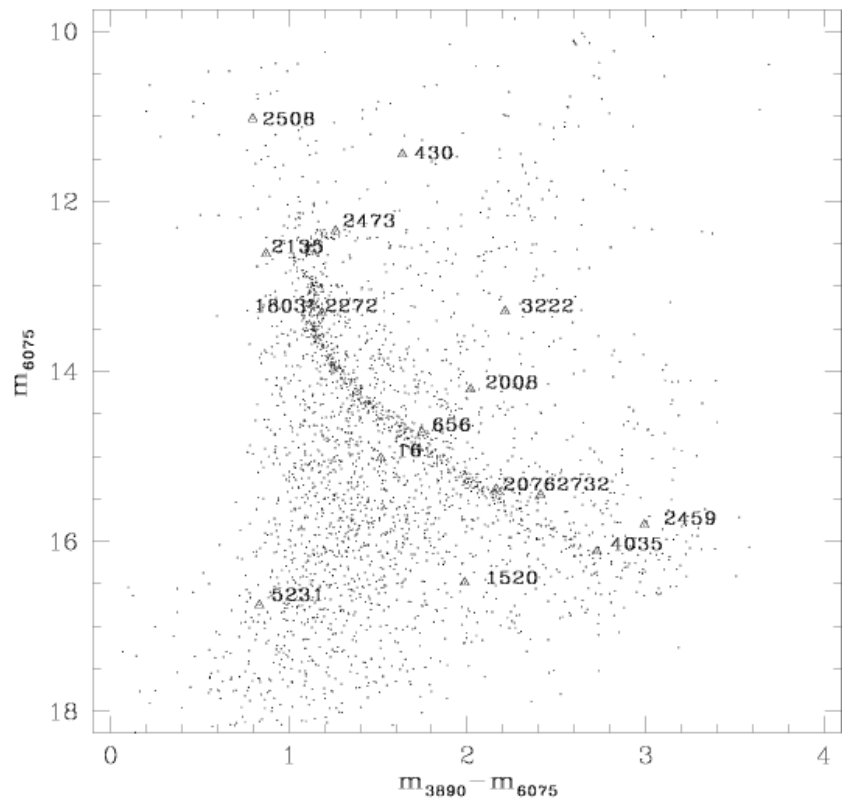
New Variable Stars (Eclipsing)



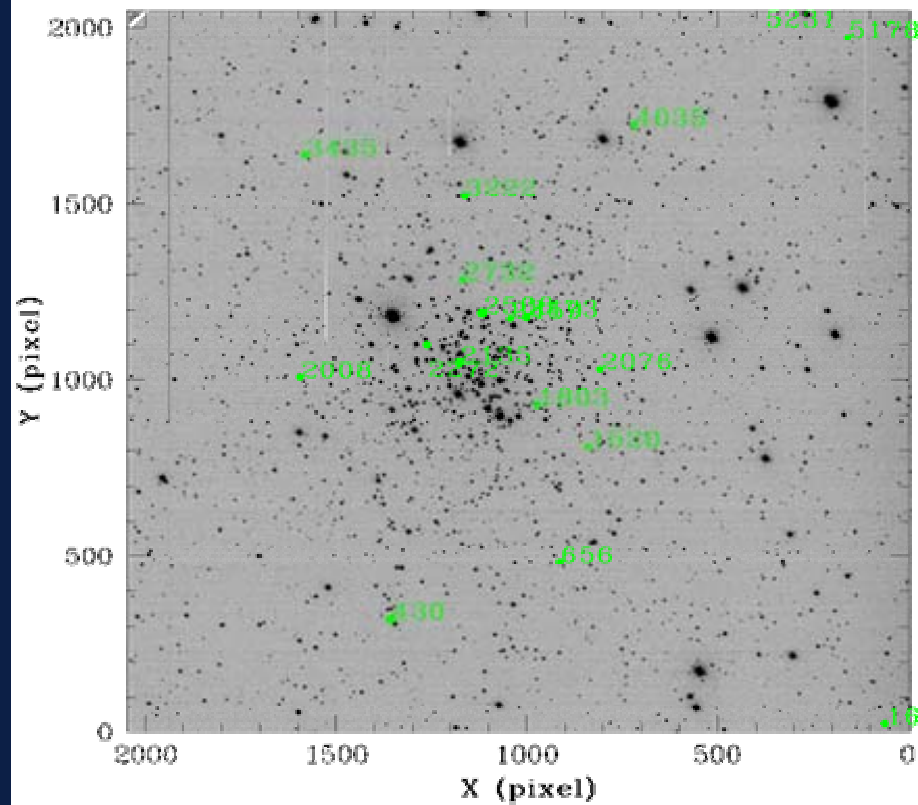
known
X-ray
source



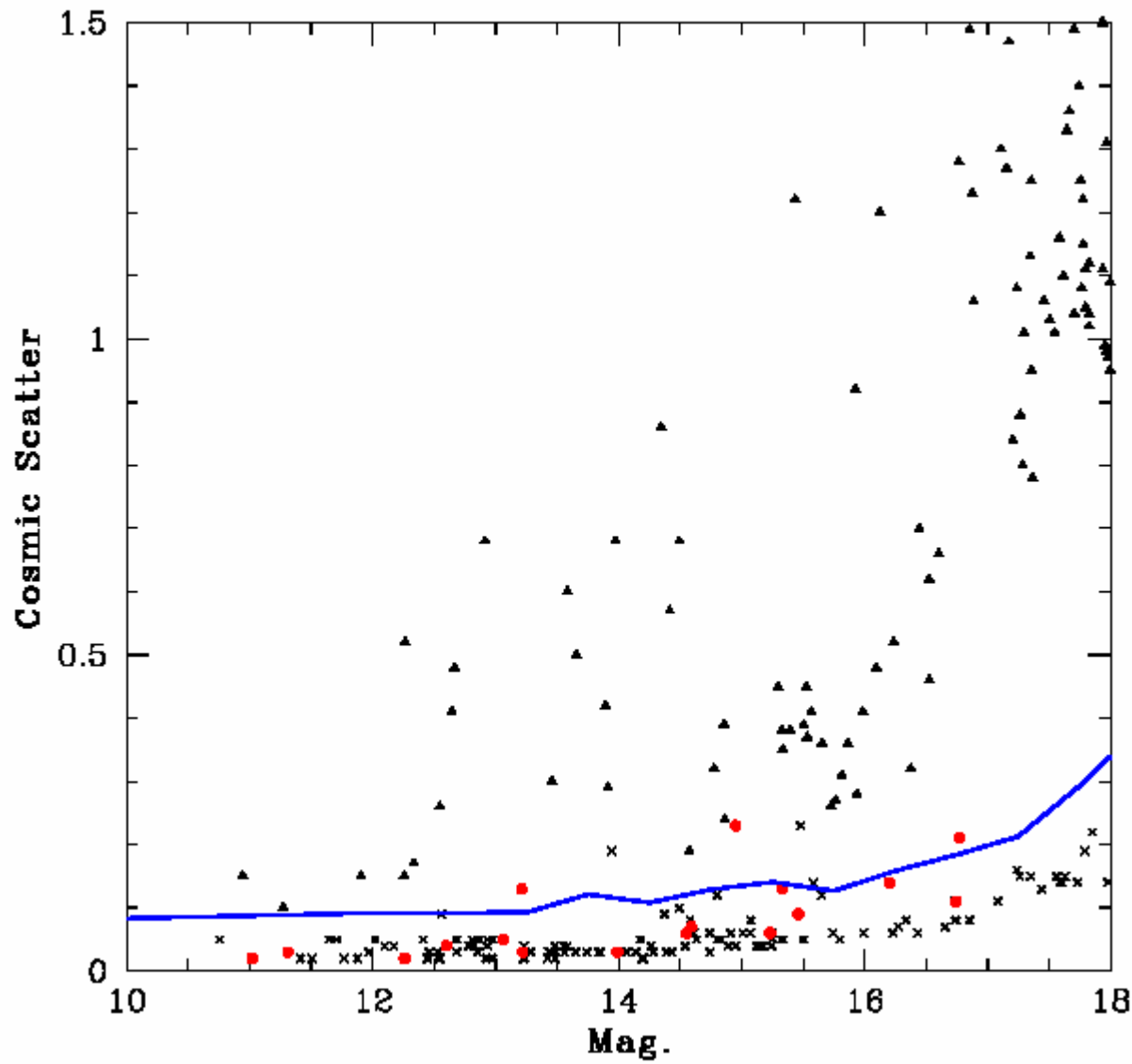
Position of Variable stars in CMD of M67



Detected Variables



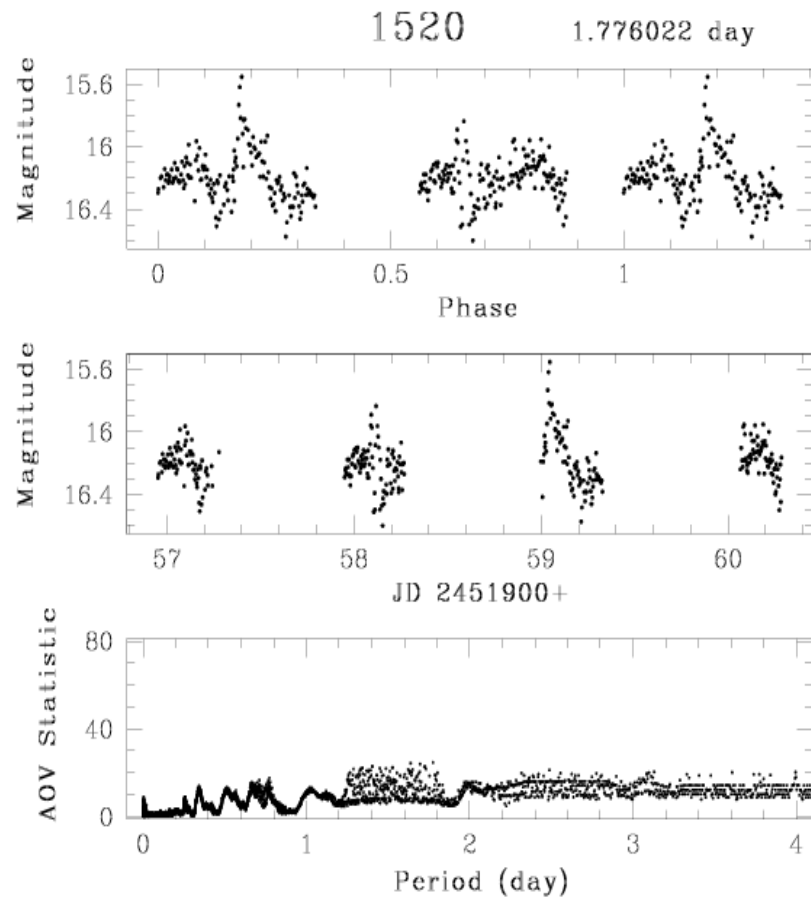
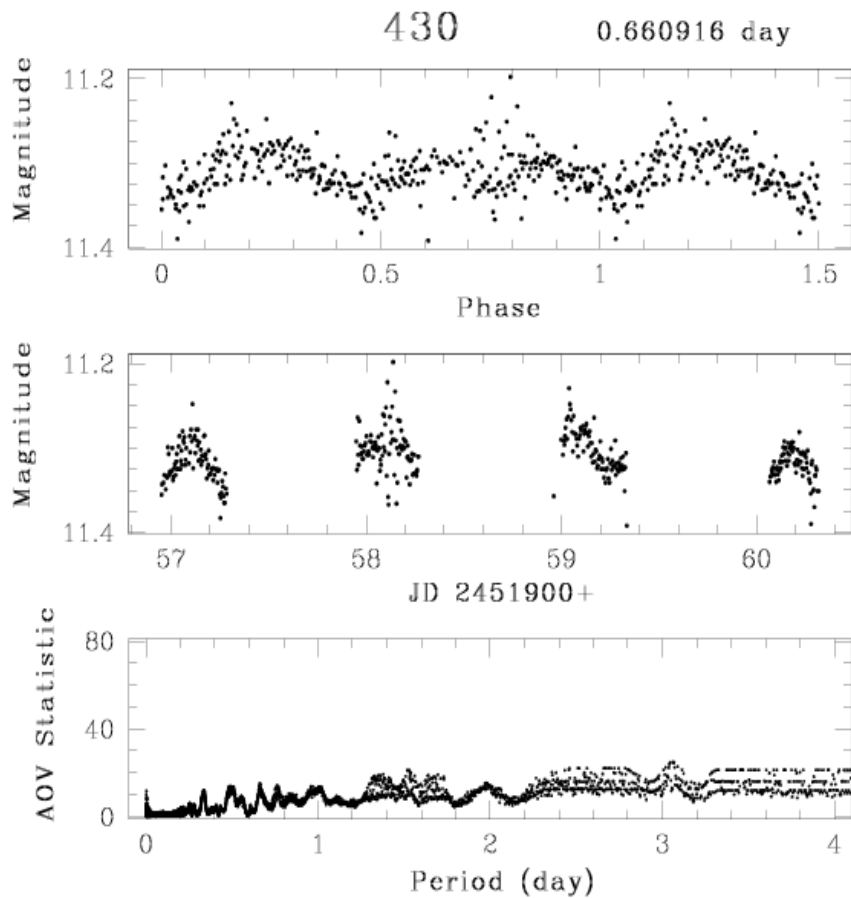
Finding chart



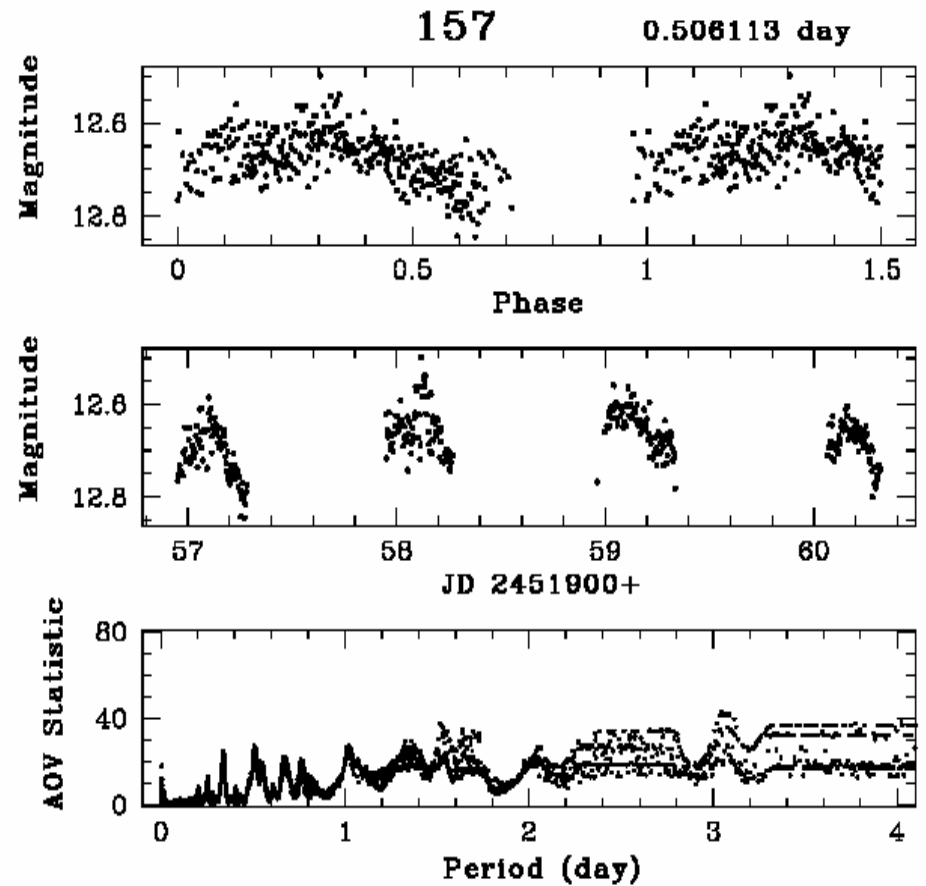
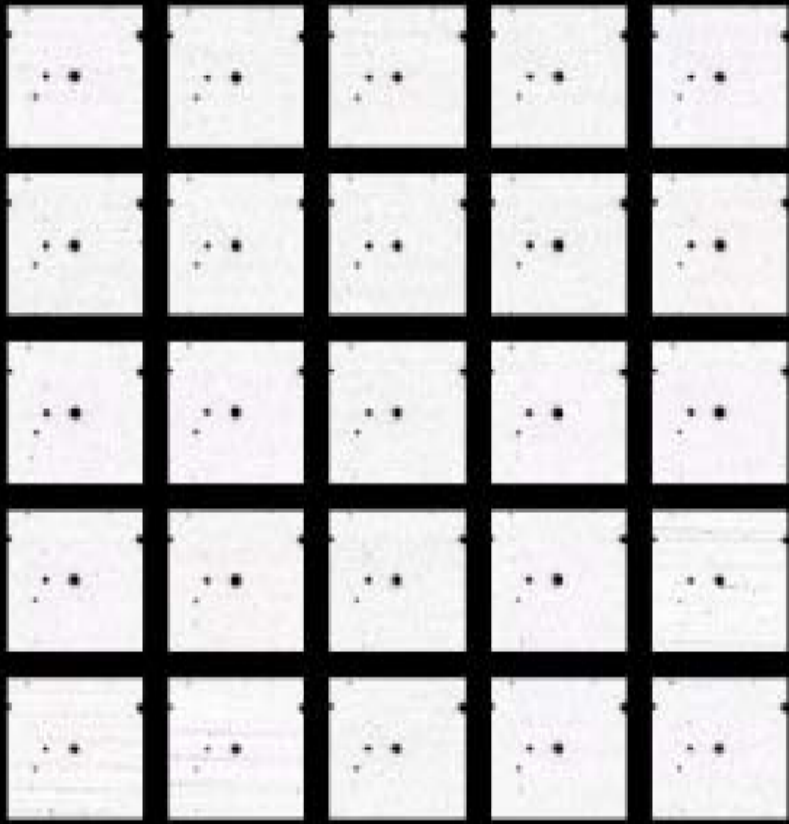
- ▲ : method I
- × : method II
- : Variables

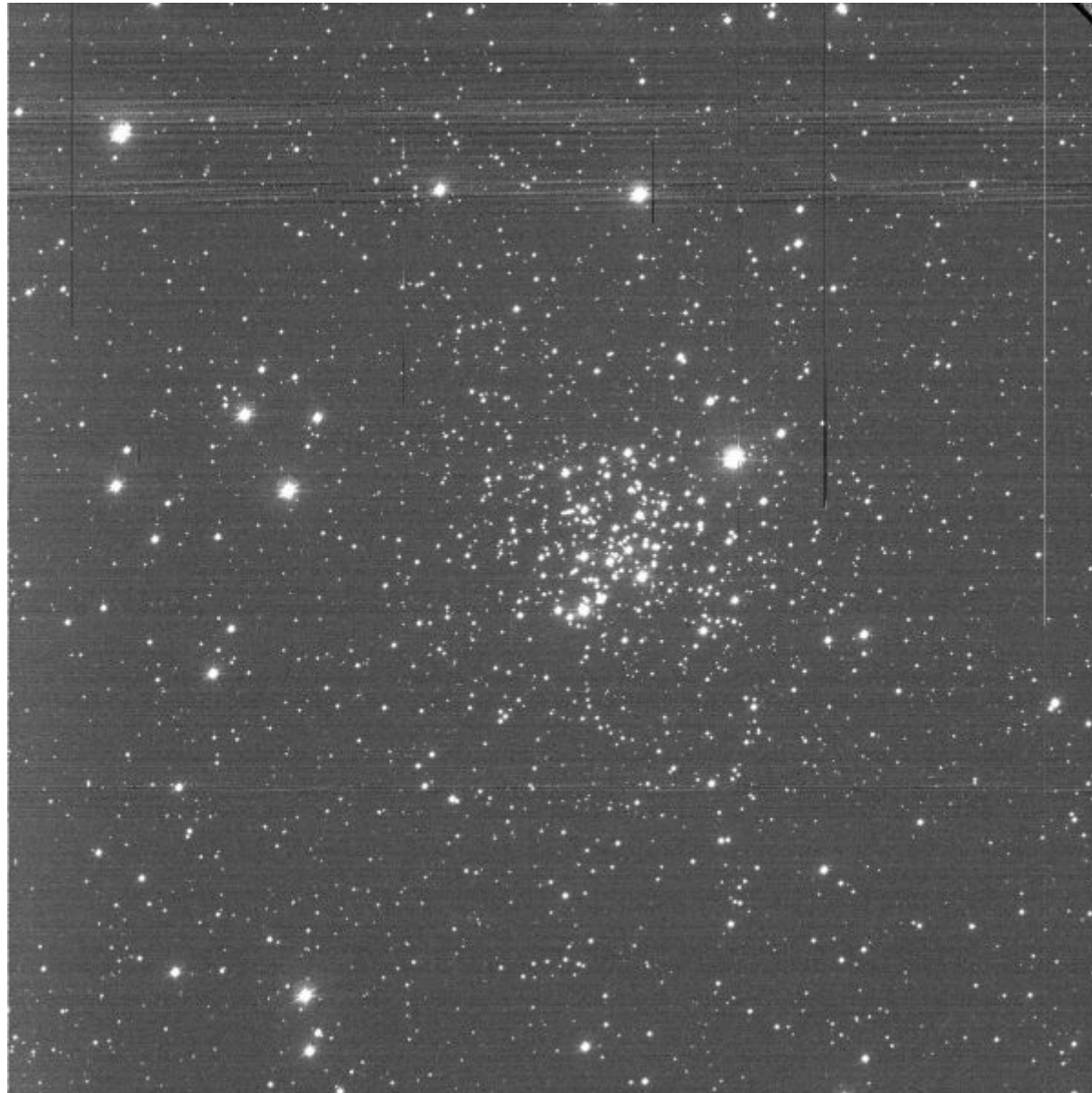
Mag. vs. Cosmic scatter diagram for variable candidates

False Candidates

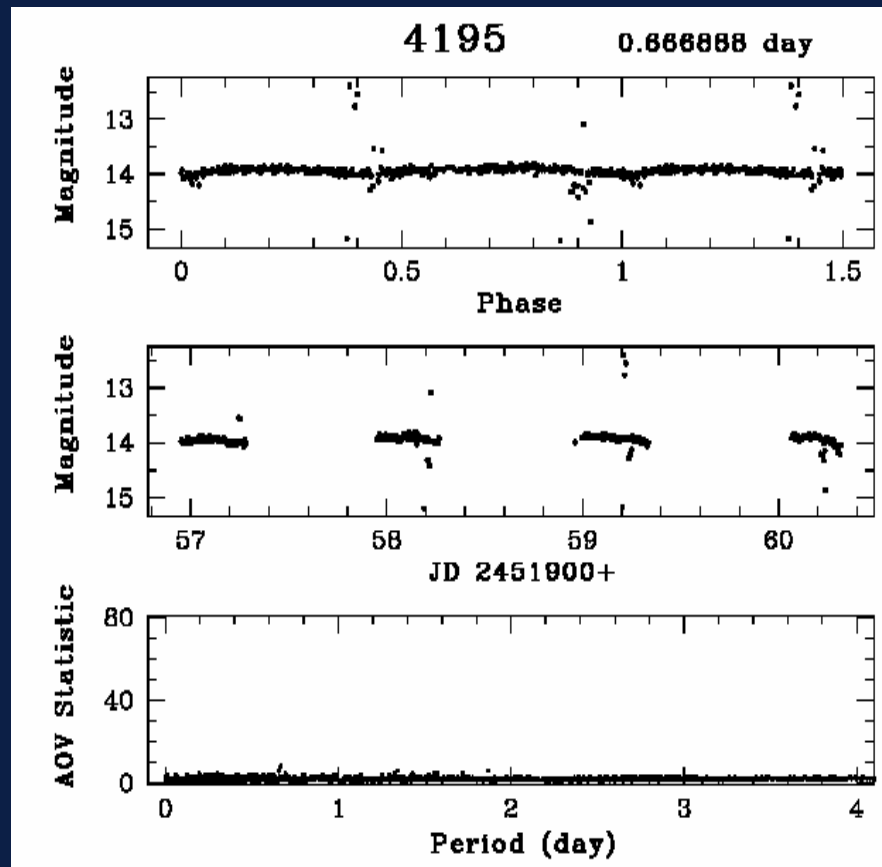
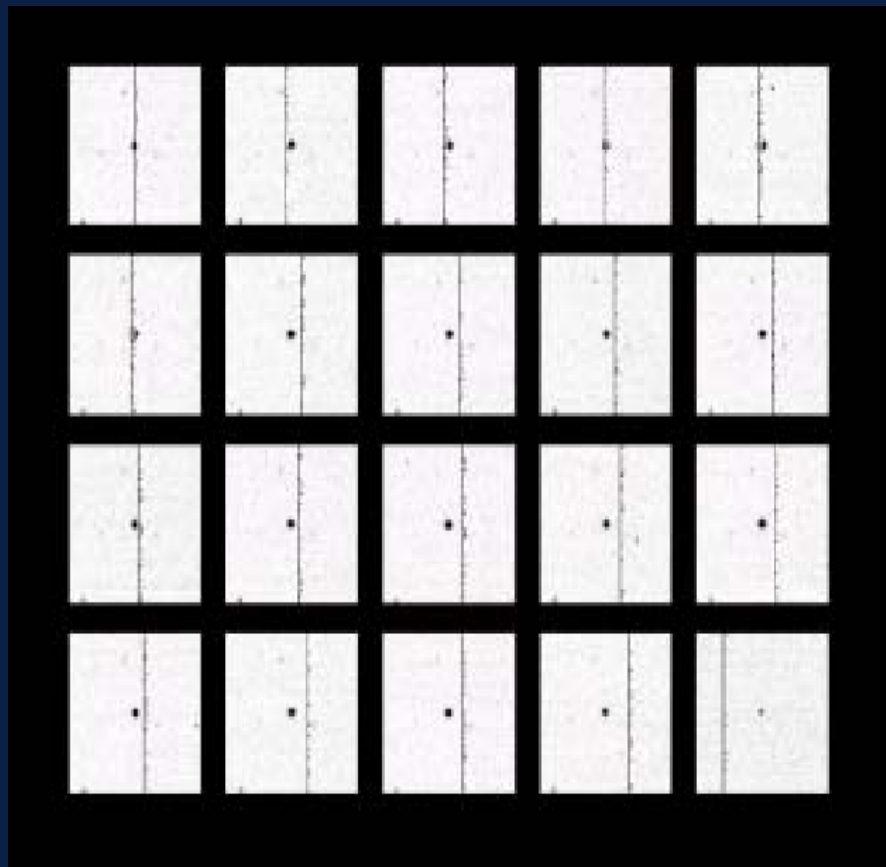


Many false candidates in the region of bright bands





In Some cases, bad columns produce sporadic brightness changes



4. Summary

- **Method II is more efficient than method I in this study**
 - method I : using large deviation
 - method II : using PDM
- about 80% variable candidates were spurious, this is entirely due to the bright-band problem and bad data set
- **18 stars classified to the variables including newly-found 7 eclipsing binaries with 2 W UMa systems**



Thank you,
Any comment and question is
WELCOME!!
hwihyun@galaxy.yonsei.ac.kr