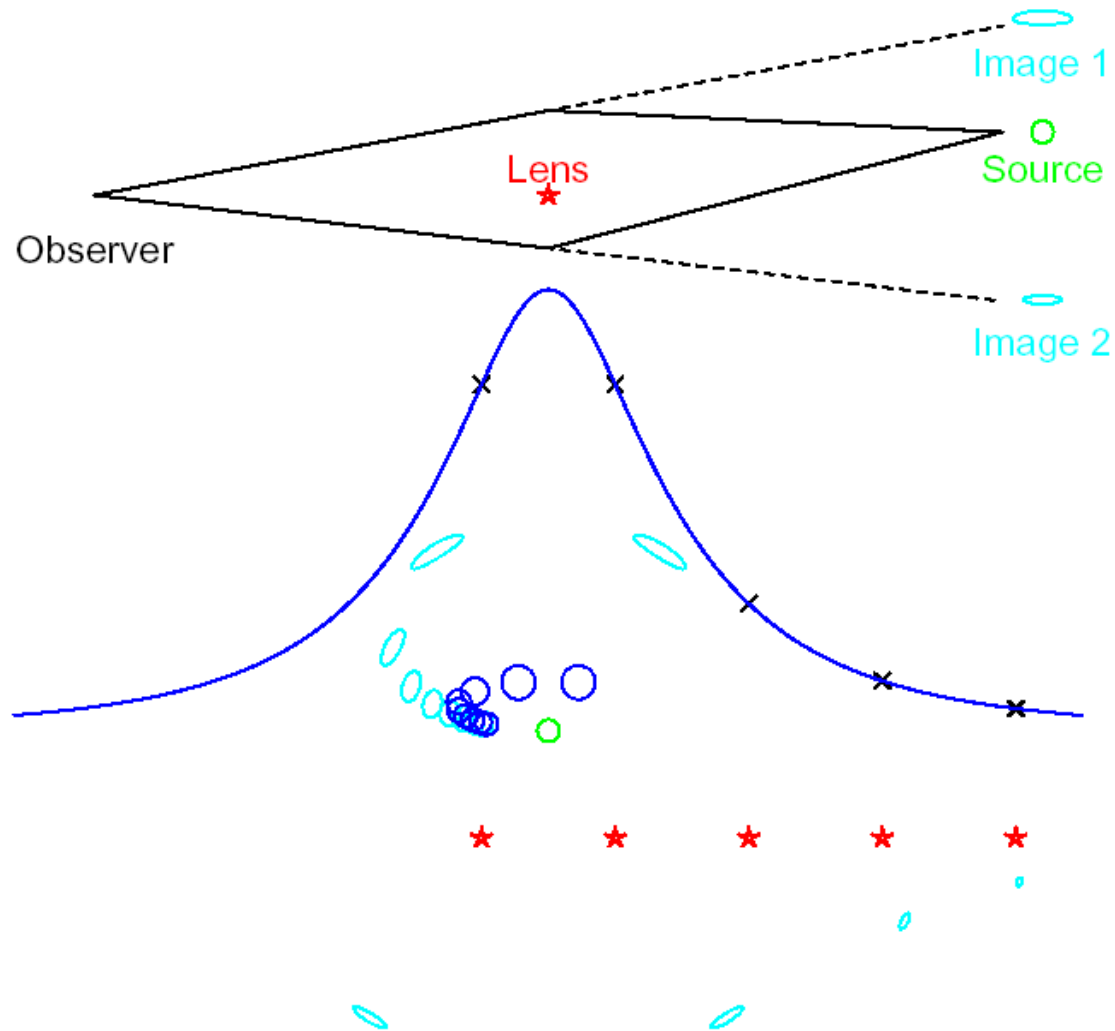


# M31 Microlensing

## A New Dimension in Planet Hunting

Andy Gould (Ohio State)



# Gould & Loeb

## 1992

### DISCOVERING PLANETARY SYSTEMS THROUGH GRAVITATIONAL MICROLENSSES

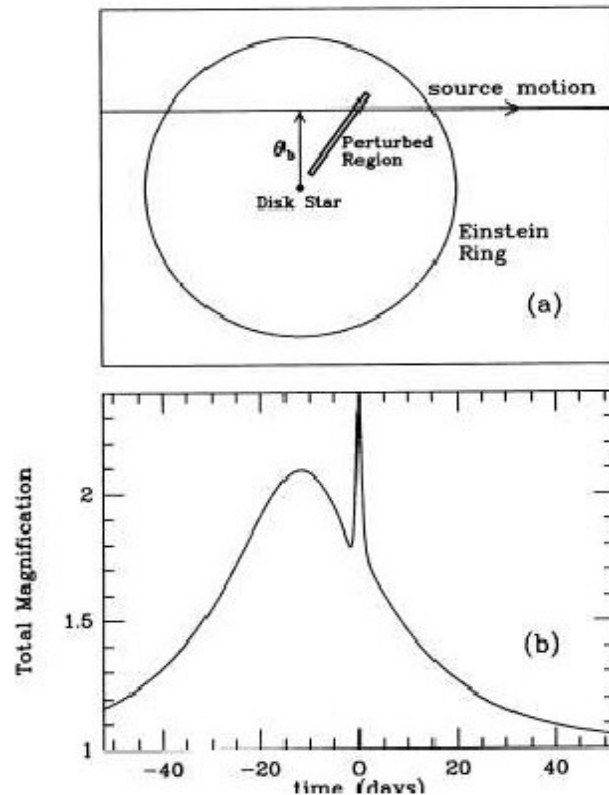
ANDREW GOULD AND ABRAHAM LOEB  
Institute for Advanced Study, Princeton, NJ 08540  
*Received 1991 December 26; accepted 1992 March 9*

#### 5. OBSERVATIONAL REQUIREMENTS

Two distinct steps are required to observe a planetary system by microlensing. First, one must single out a disk star which happens to be microlensing a bulge star. Second, one must observe this star often enough to catch the deviation in the light curve due to the planet. The first step involves the observation of millions of bulge stars on the order of once per day. The second step involves the observation of a handful of stars many times per day. In the following we give a rough outline of what is required for each of these steps.

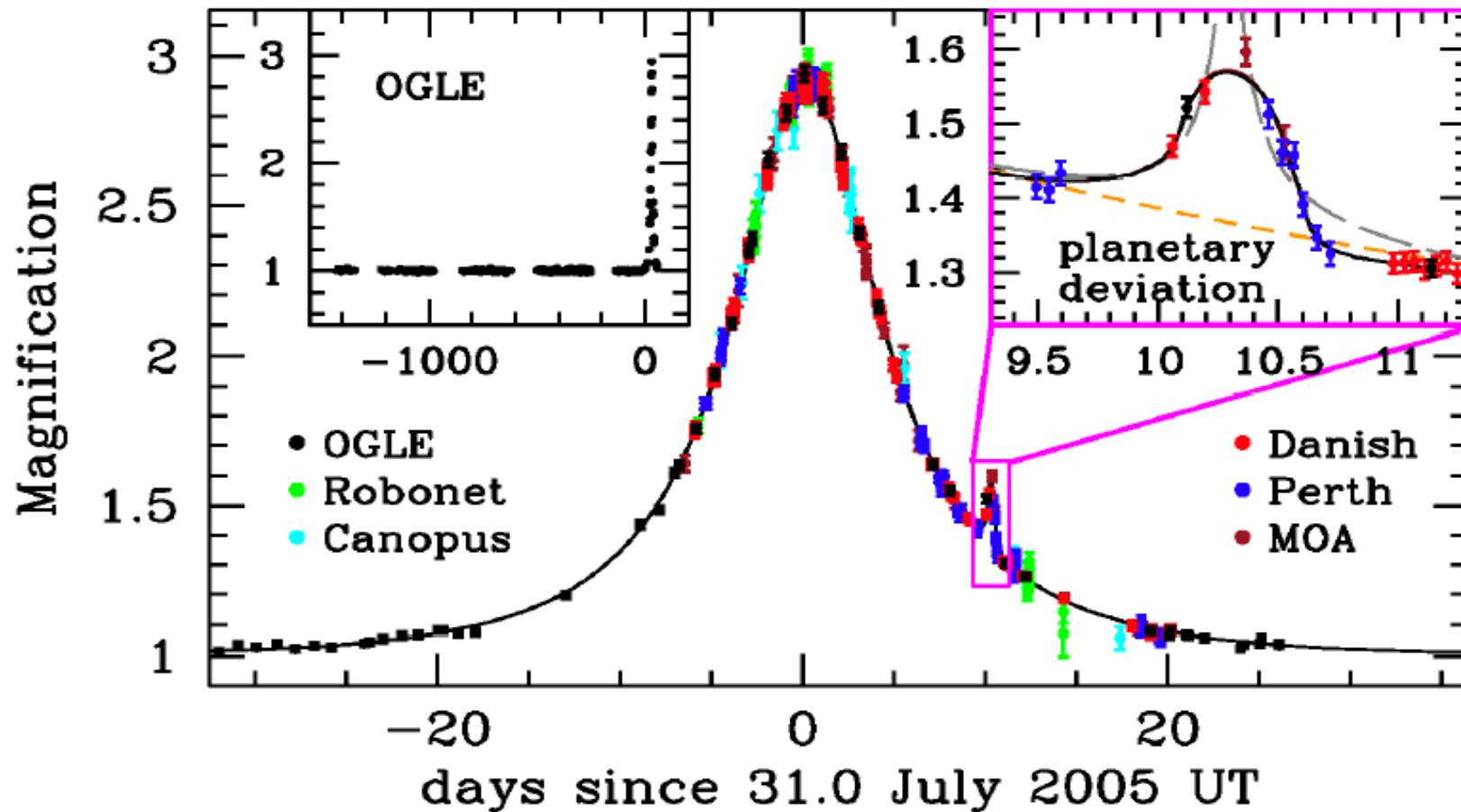
While observations from one site would be useful, there are advantages to be gained by observing from several sites. First,

two telescopes that were totally committed. Third, in view of the fleeting nature of the events, it would seem prudent to build in some redundancy in case of bad weather at a particular site. Thus, the optimal scheme would employ, say, a dozen telescopes. Each of these would be committed to carry out two observations per night. During the near-December season,



# OGLE-2005-BLG-390

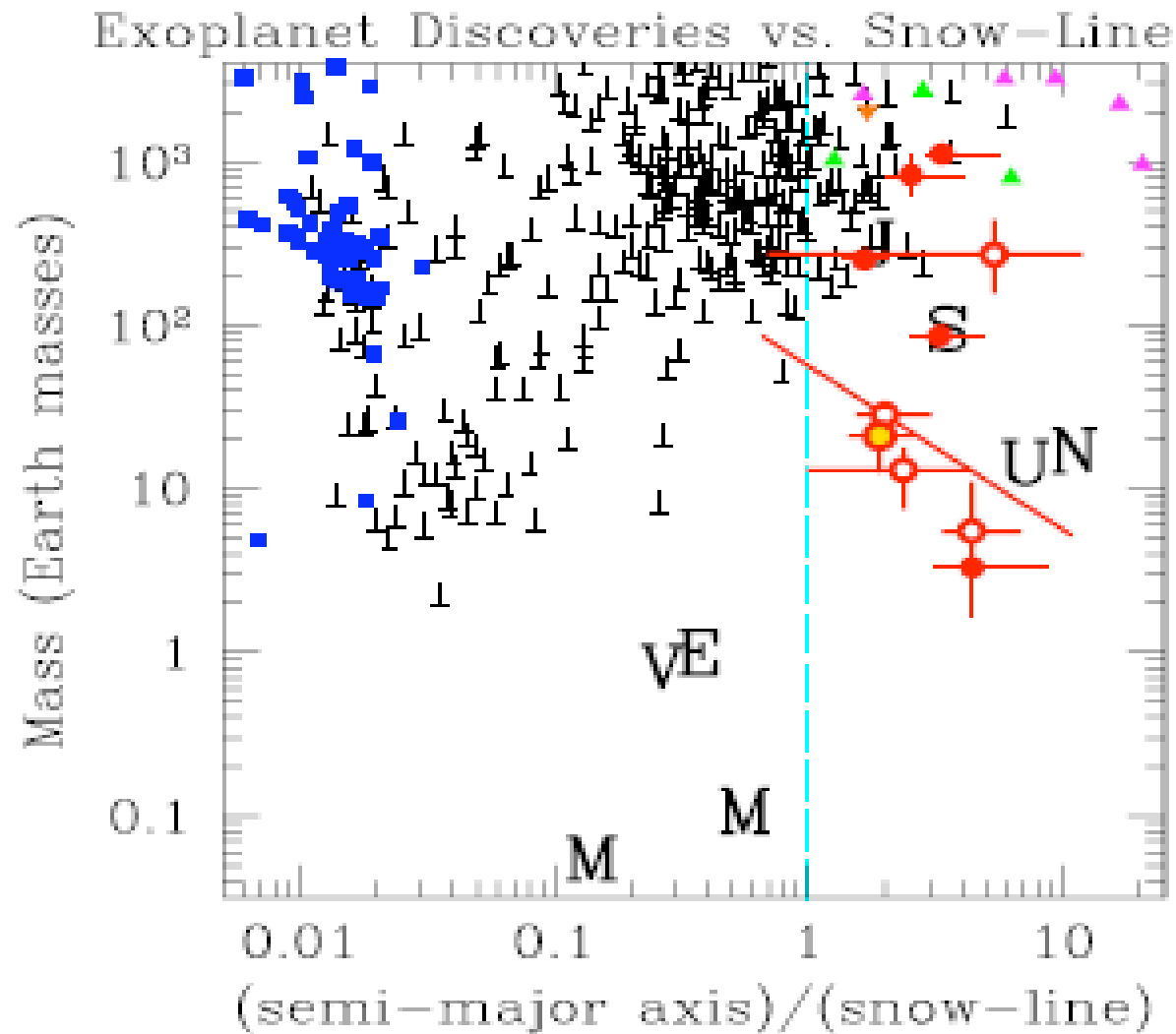
## “Classical-Followup” Planetary Caustic



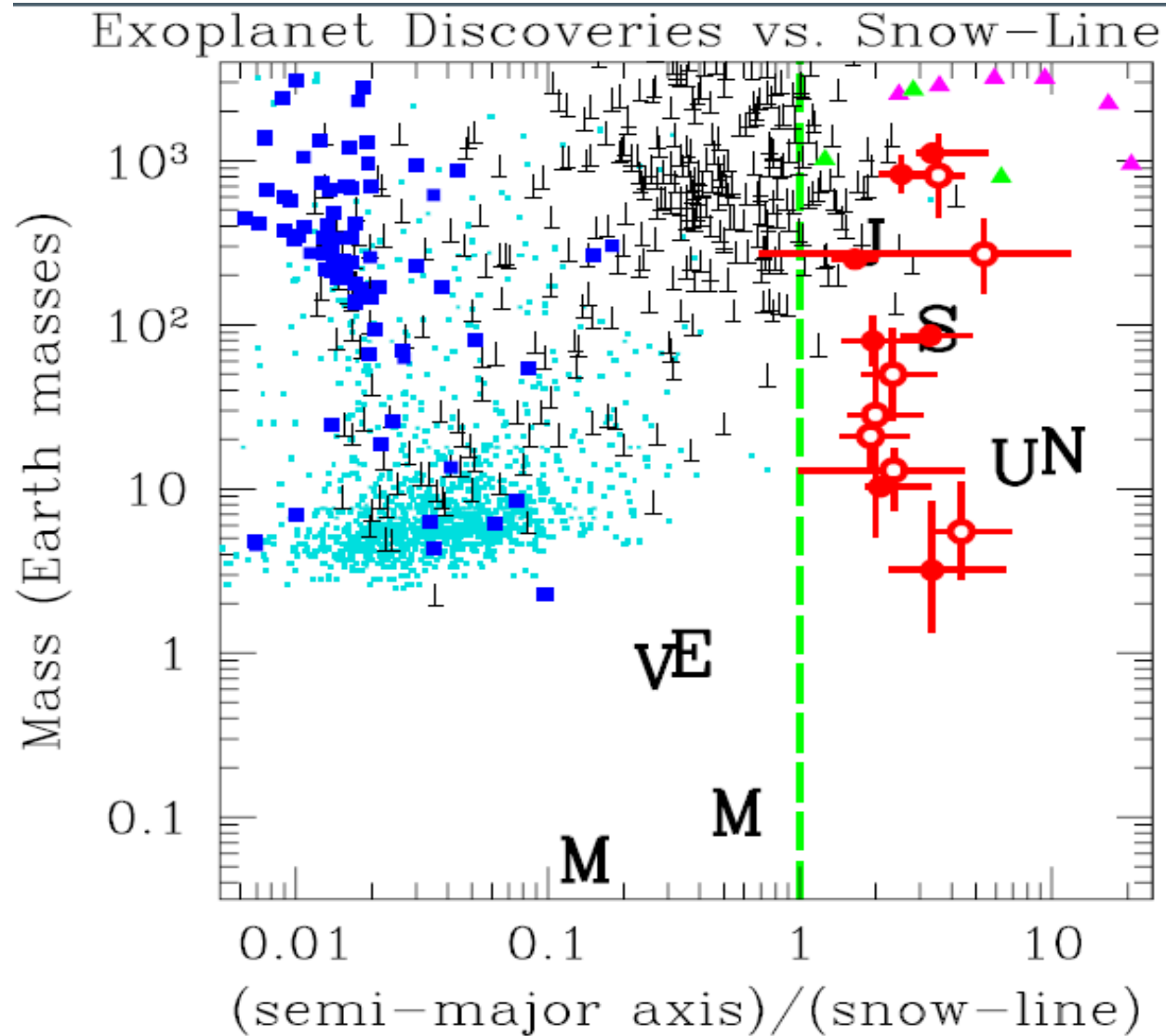
Beaulieu et al. 2006, Nature, 439, 437



# Planets 2010

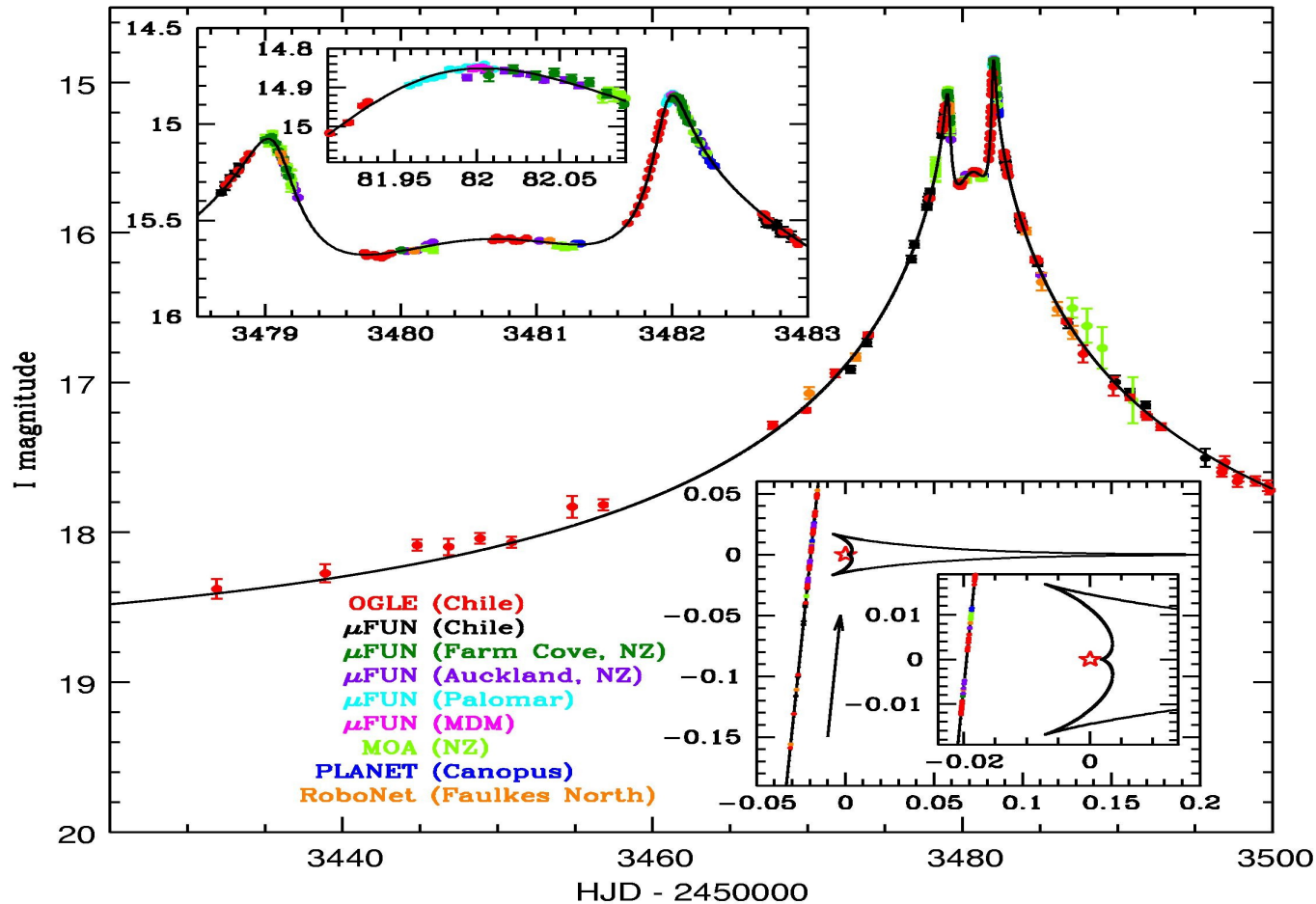


# Planets 2011



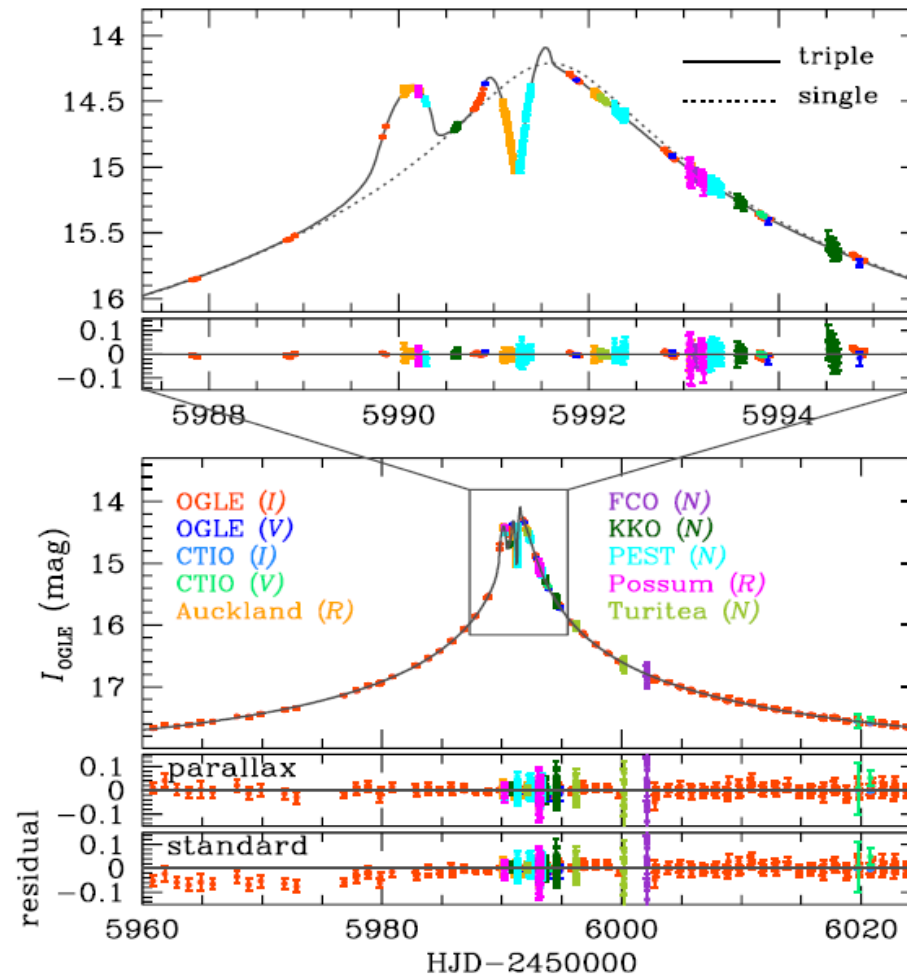
# OGLE-2005-BLG-071

## First “High-Mag” Event



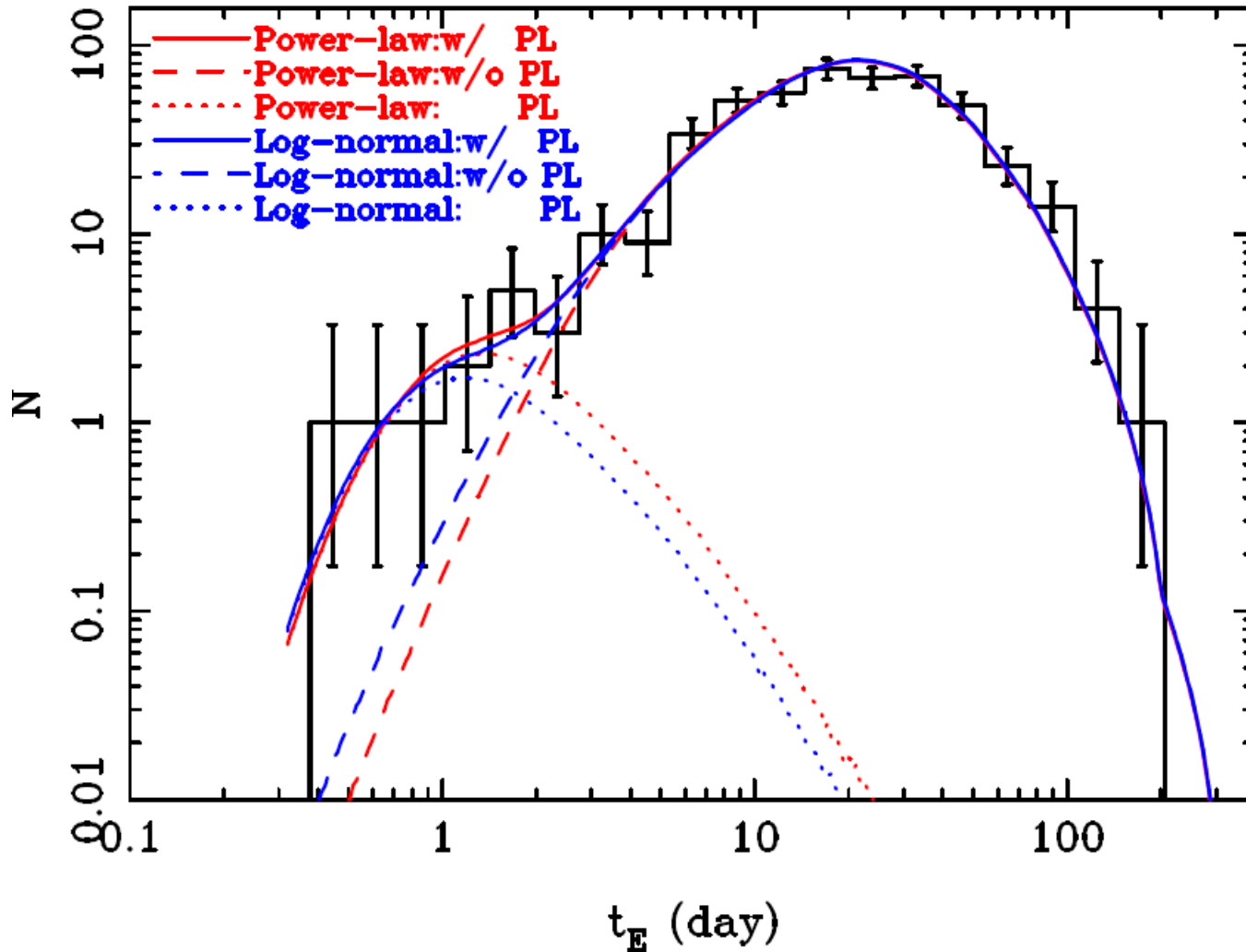
Udalski et al. 2005, ApJ, 628, L109

# OGLE-2012-BLG-0026: 2 planets



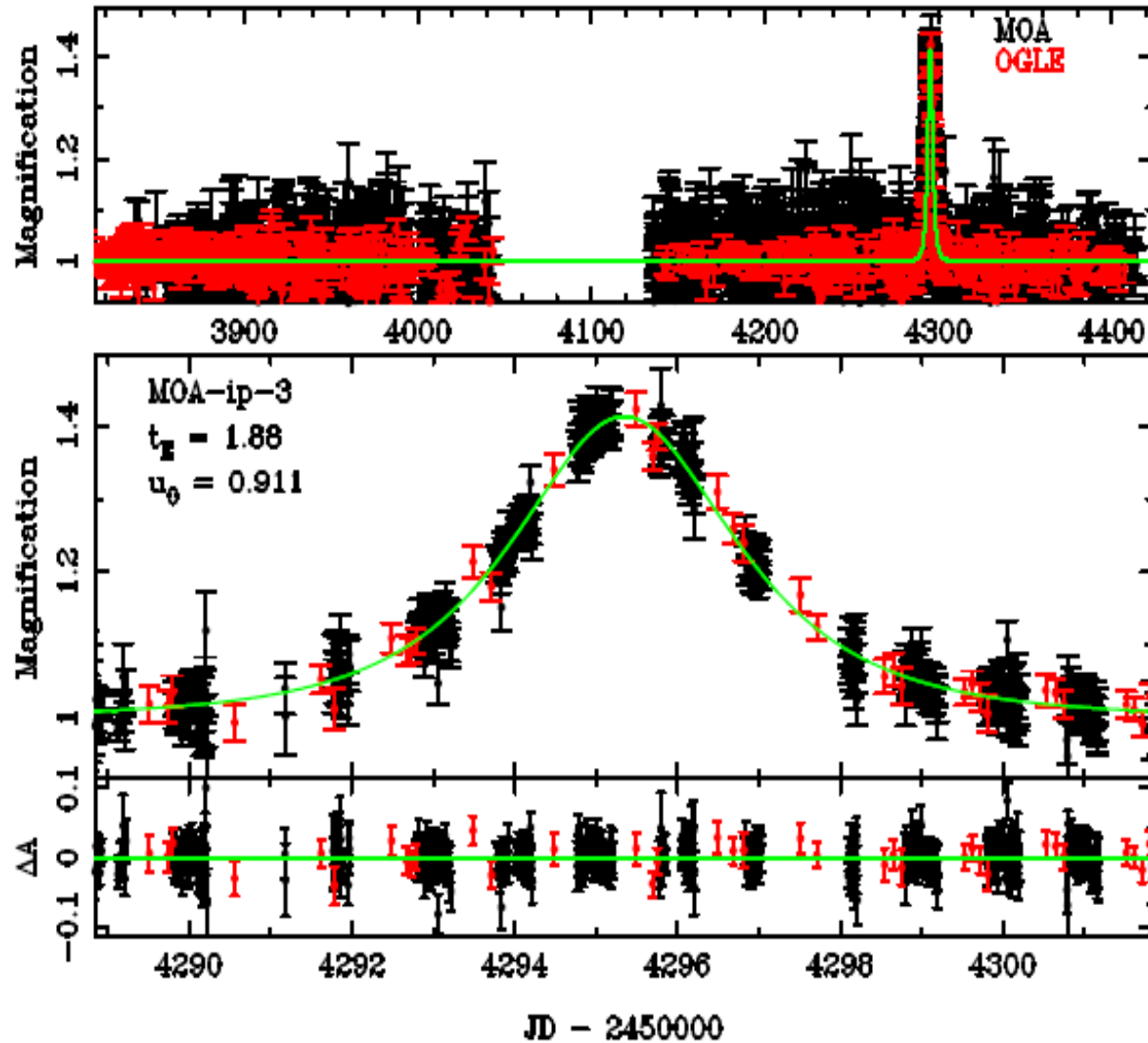


# MOA Point-Lens Events

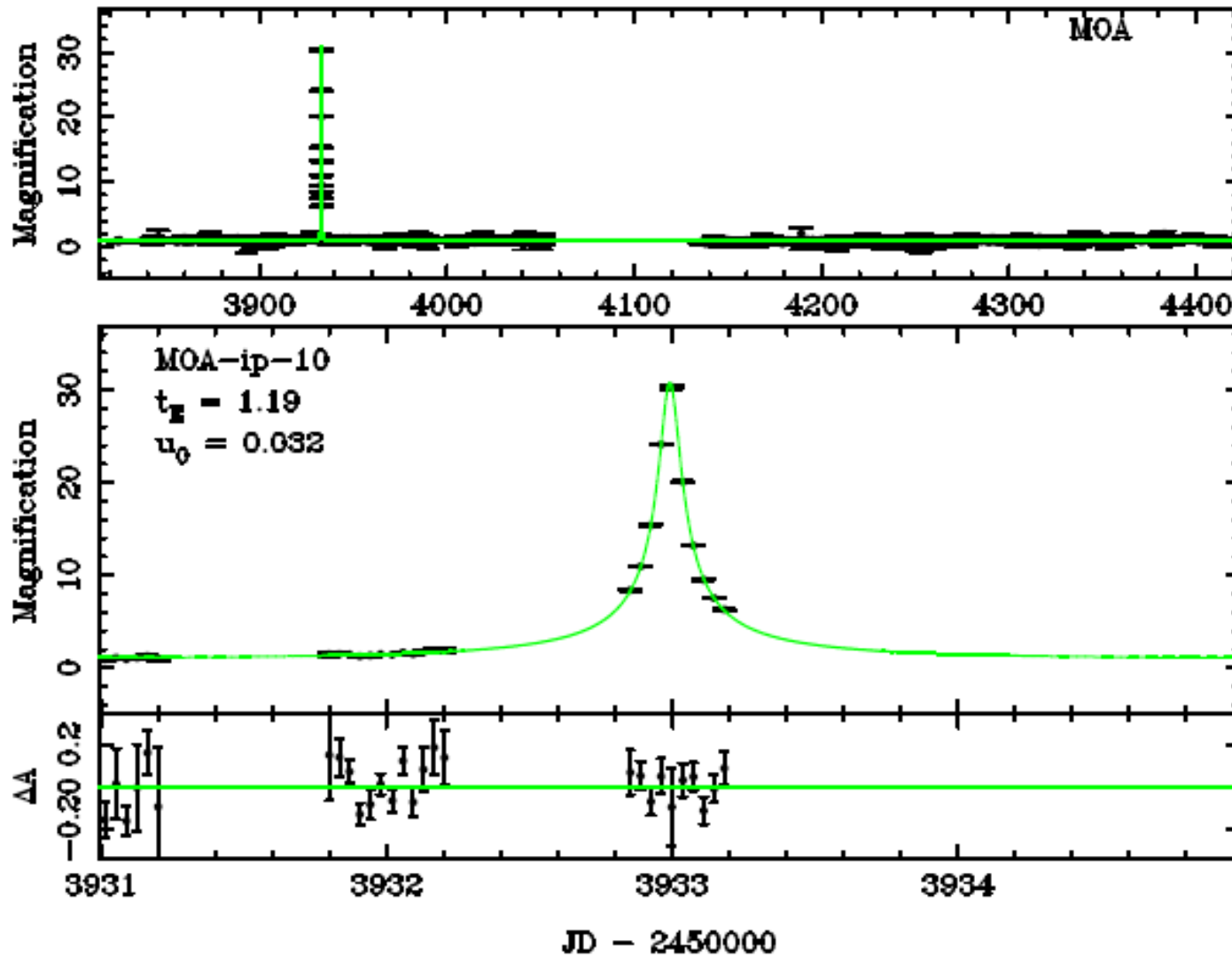


Sumi et al. 2011, Nature, 473, 349

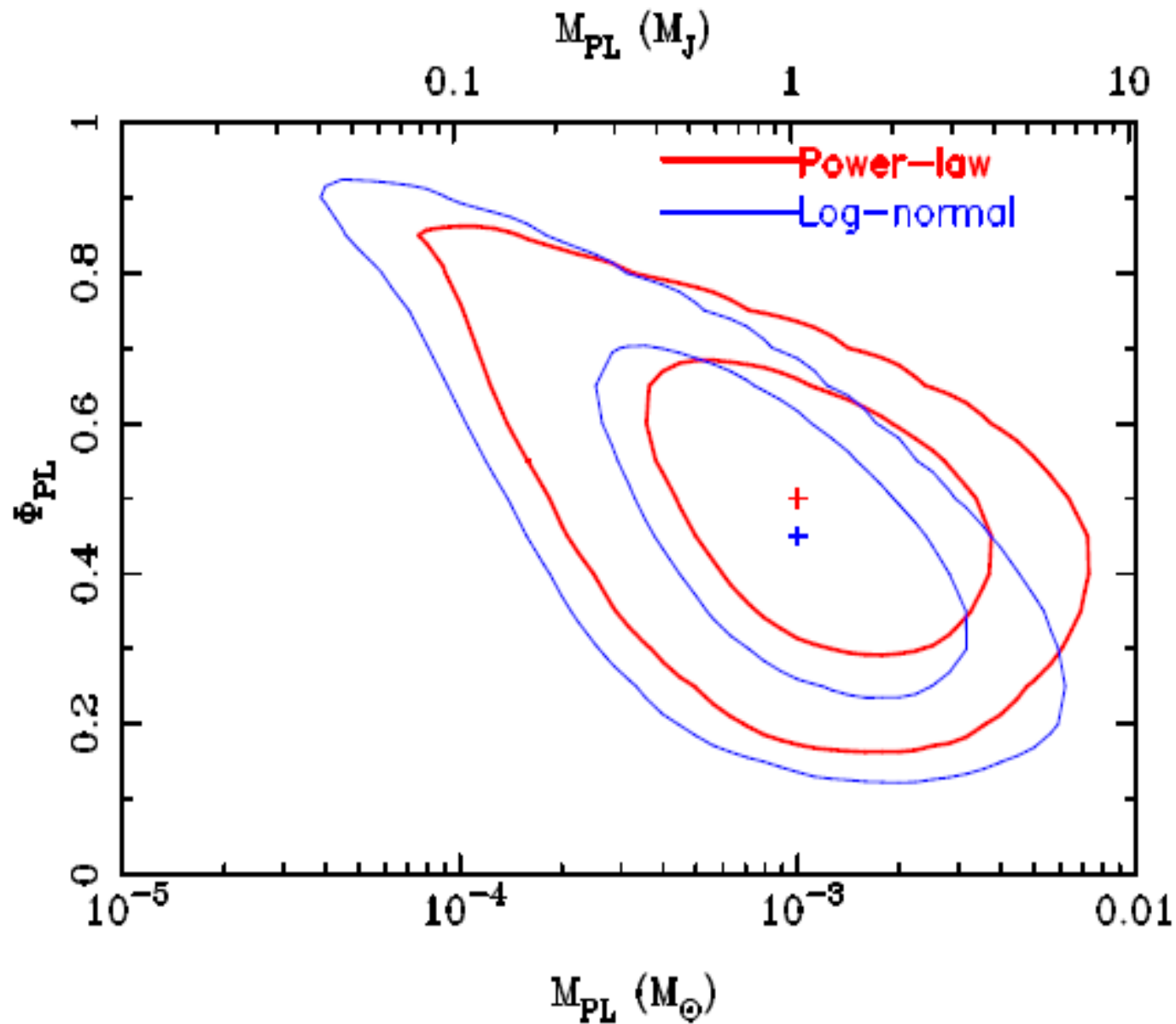
# Sample Event 1



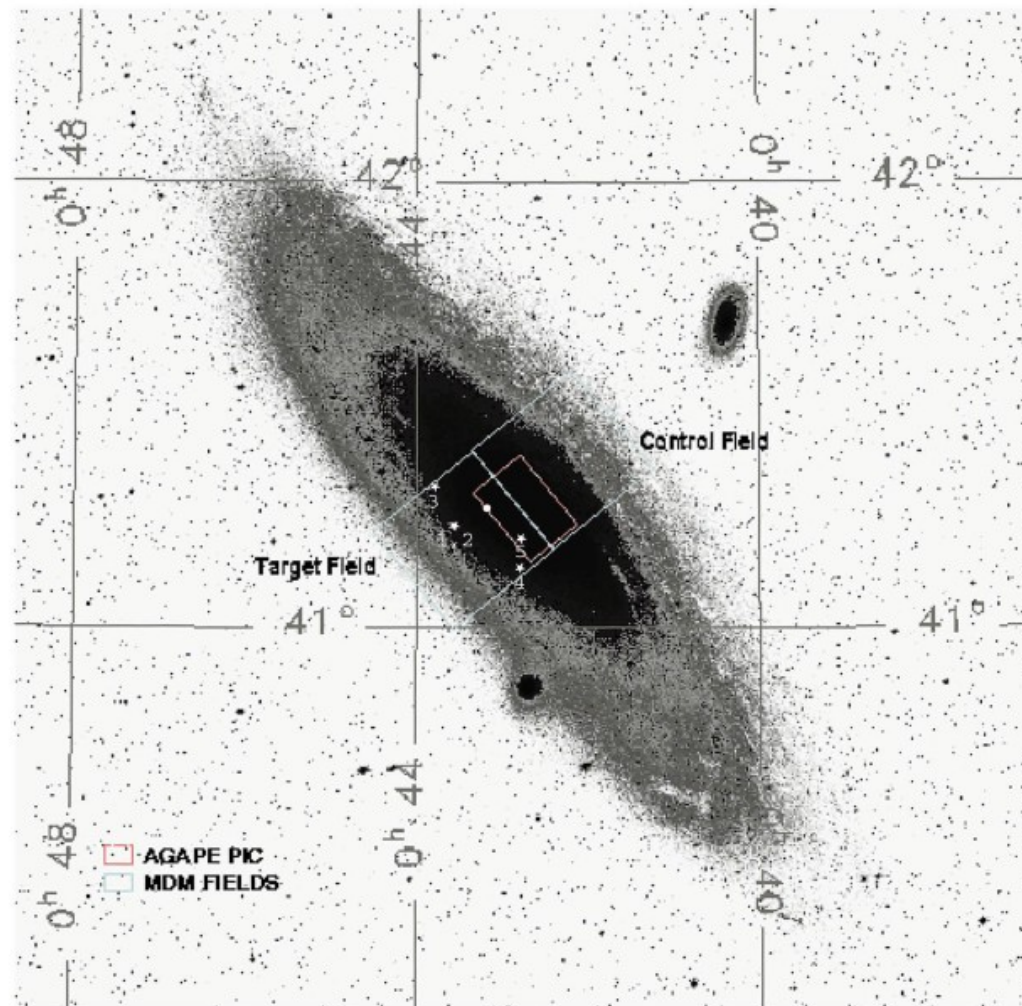
# Sample Event 2



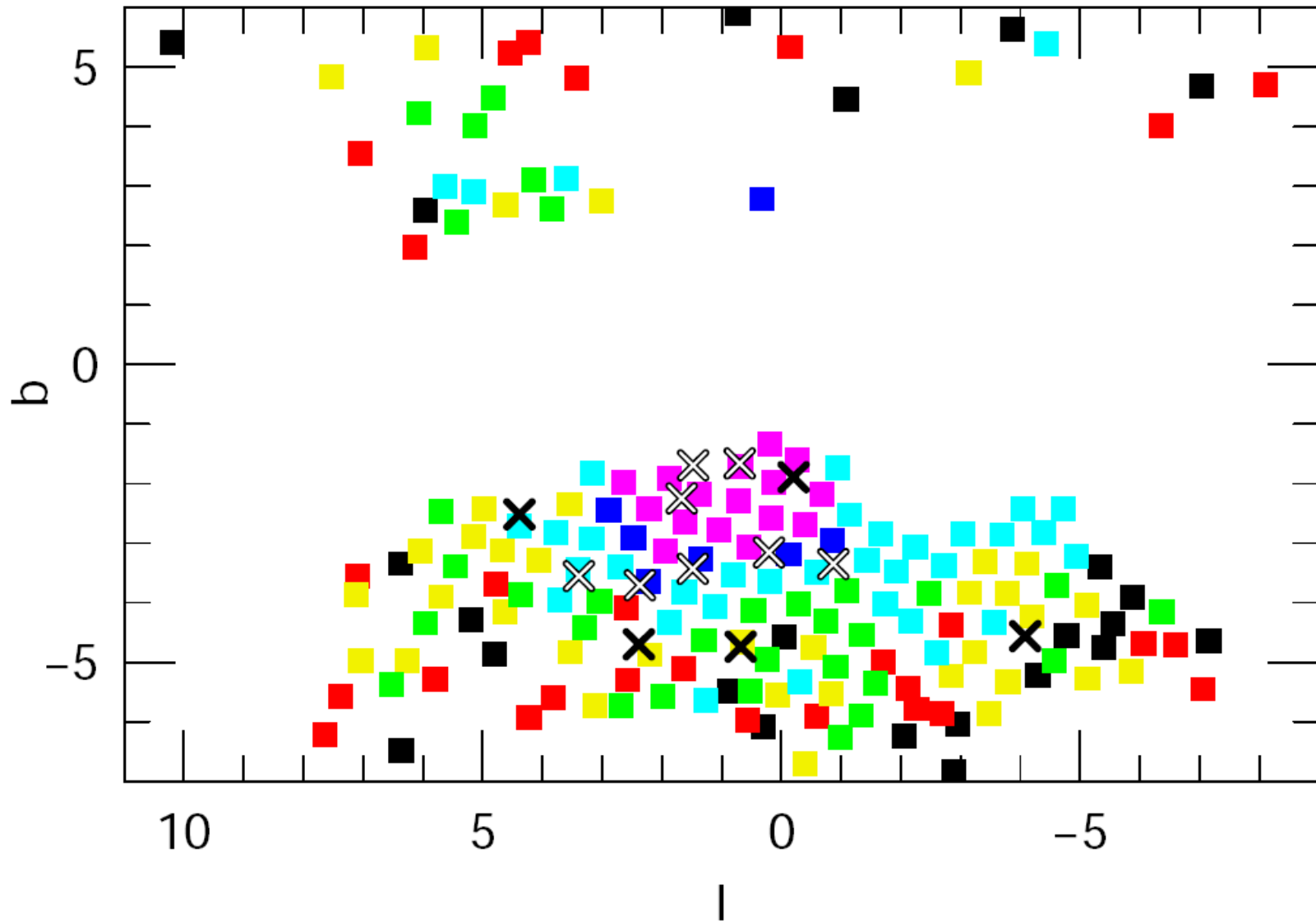
# FFP Best-Fit Characteristics



# M31 microlensing planet searches?

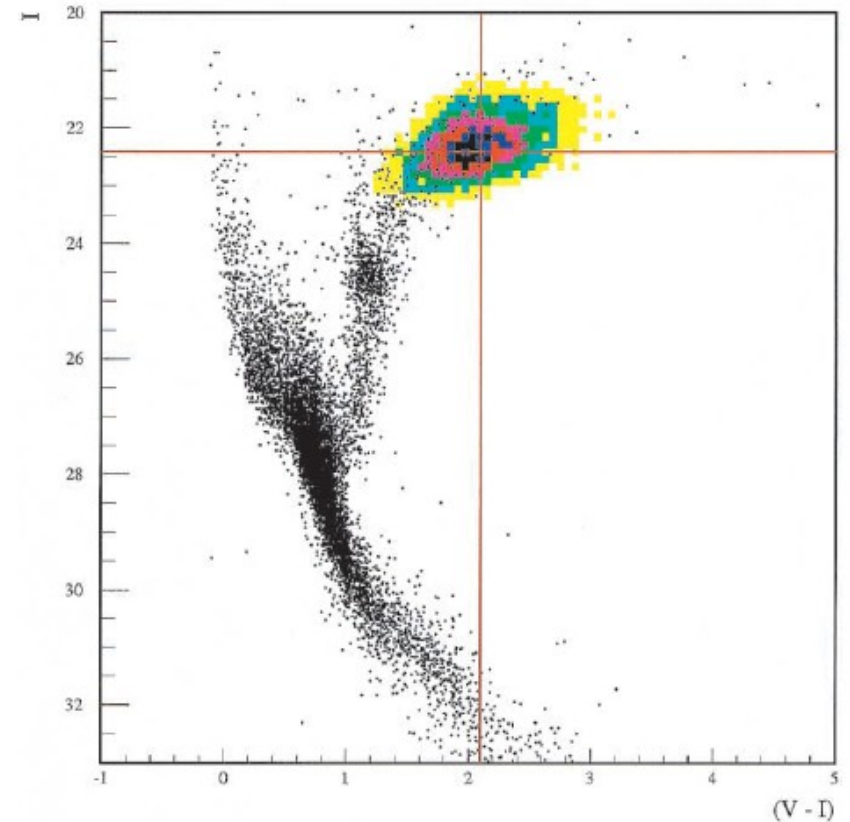
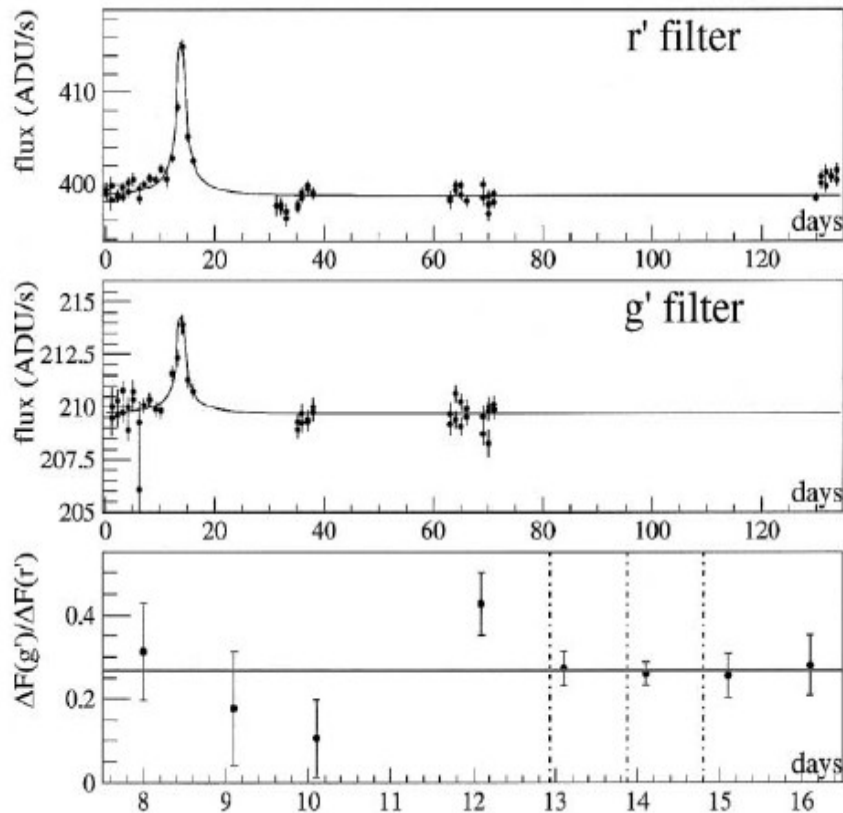


# Distribution of MW Planets on Sky



# Early M31 microlensing event

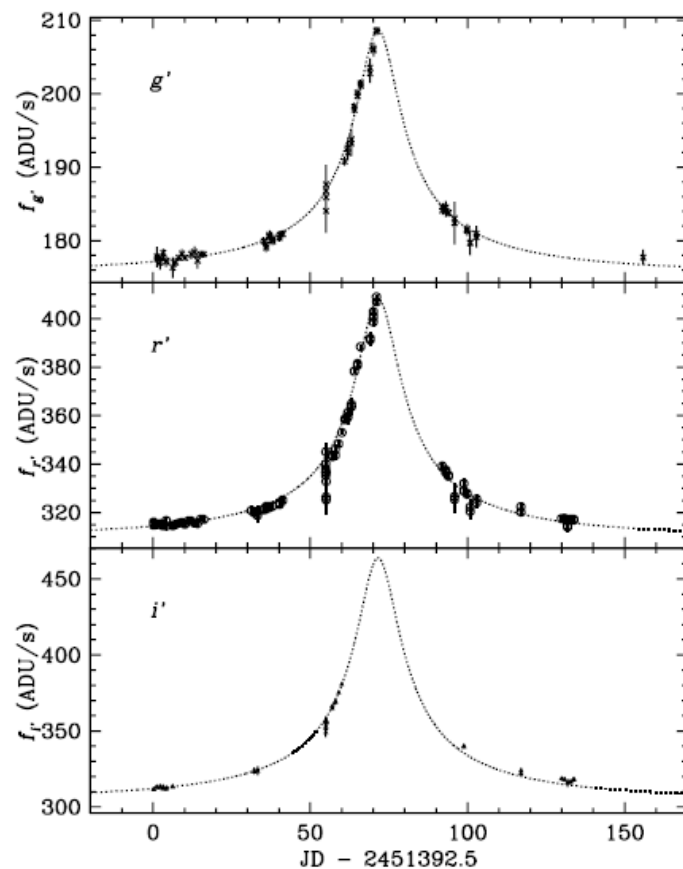
## Bright Giant Source



Auriere et al. 2001, ApJ, 553, L137

# M31 possible planetary microlensing

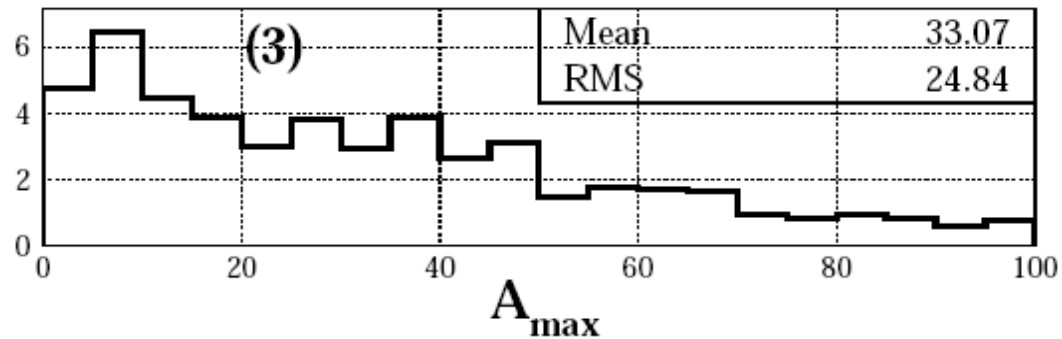
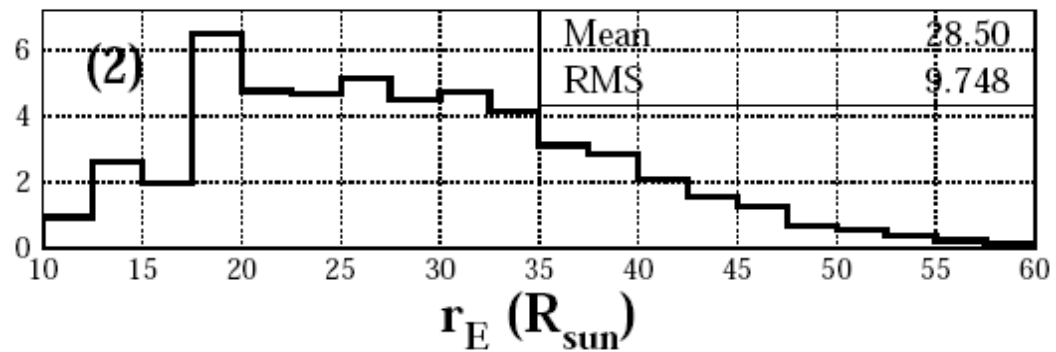
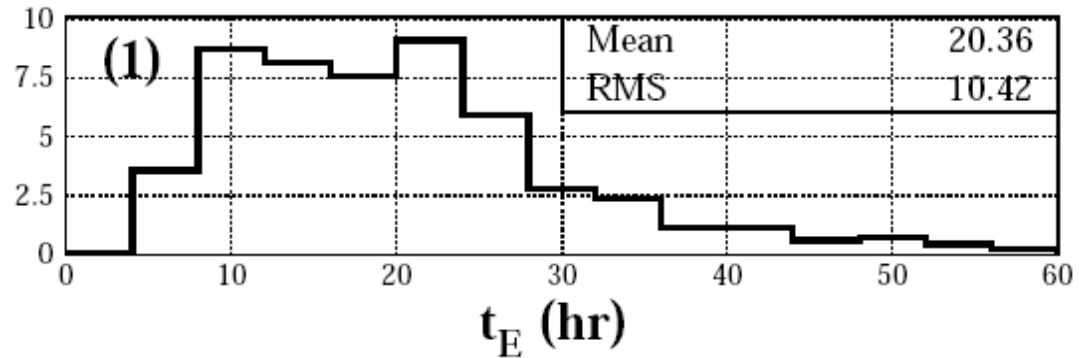
## Also Bright Giant Source



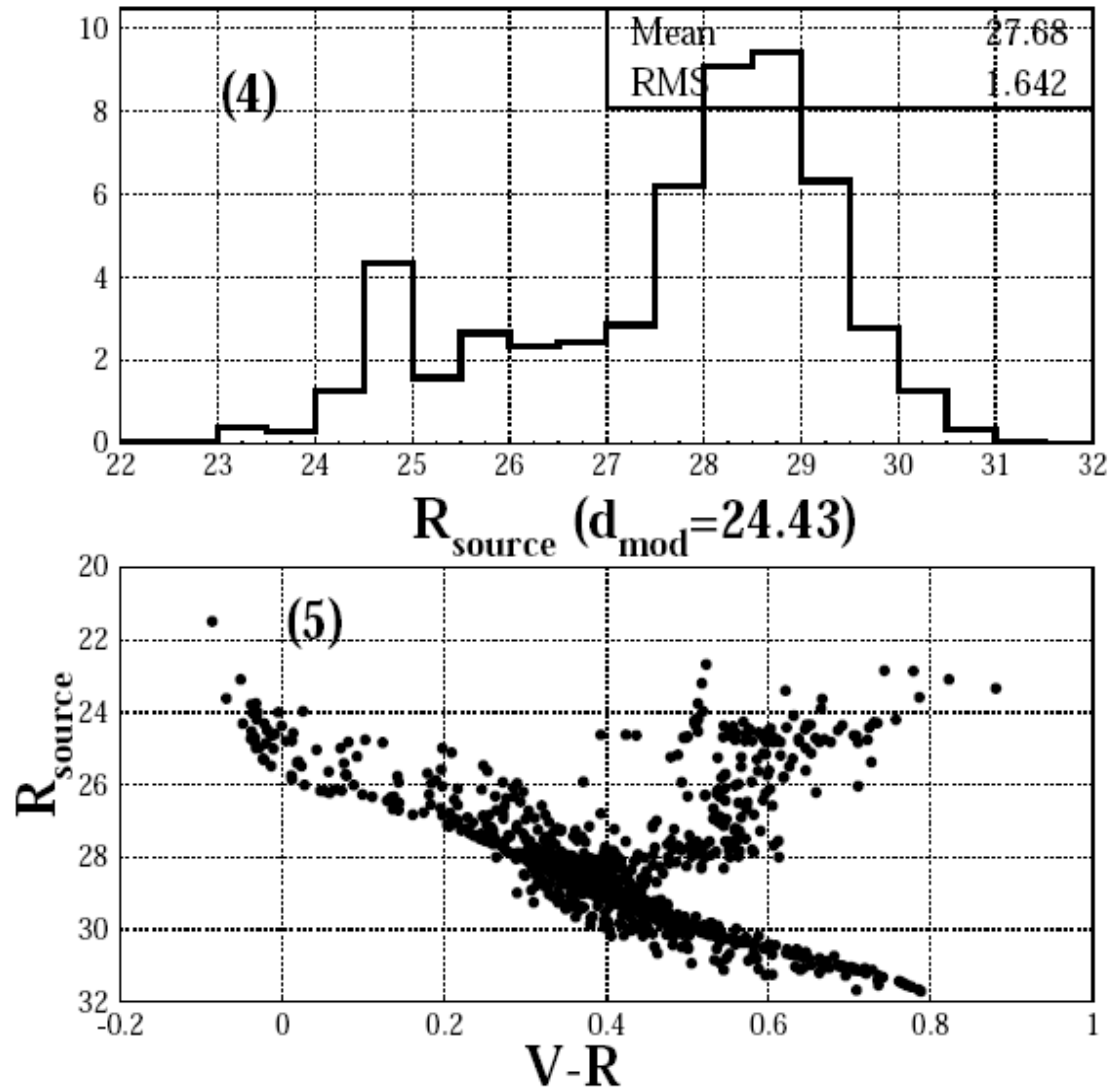
An et al. 2004, ApJ, 601, 845



# M31 FFP Event Characteristics (with LBT)

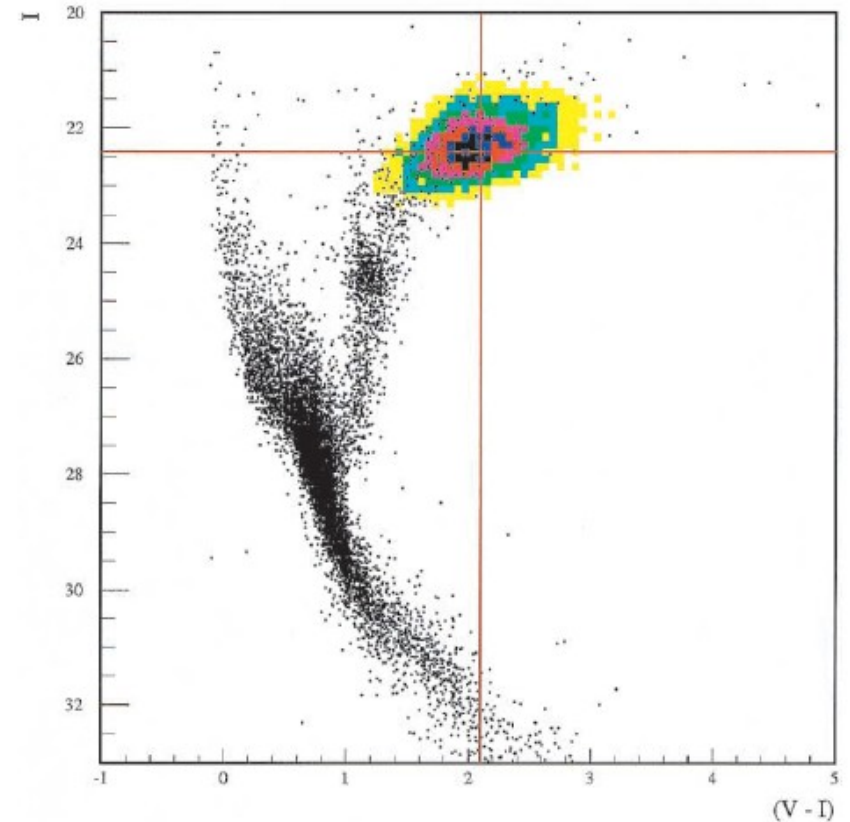
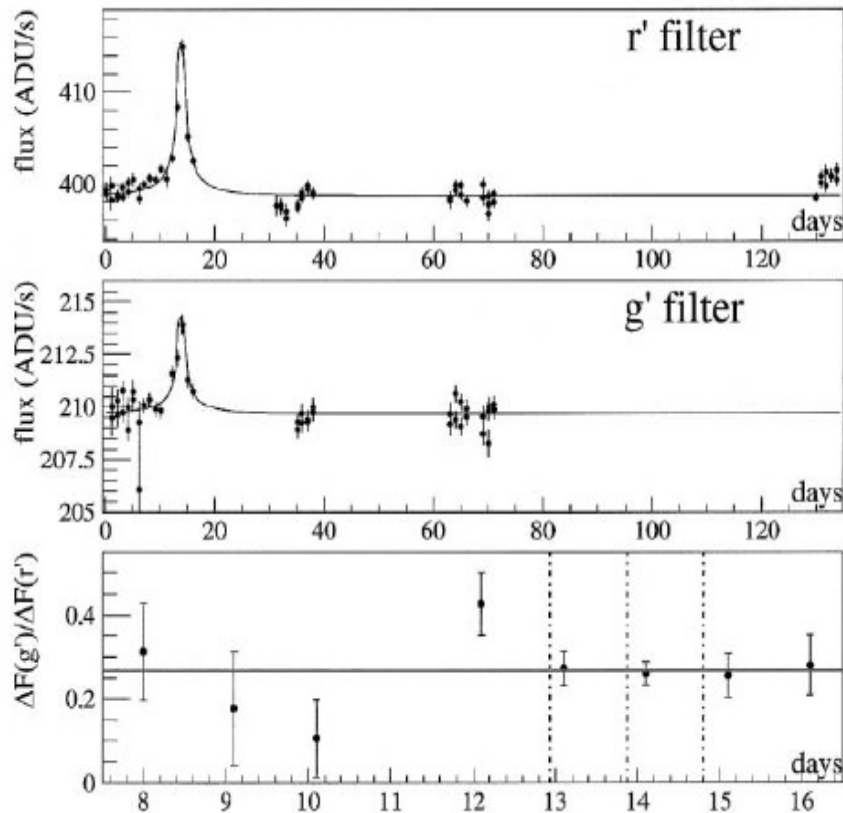


# M31 Planet Event Characteristics



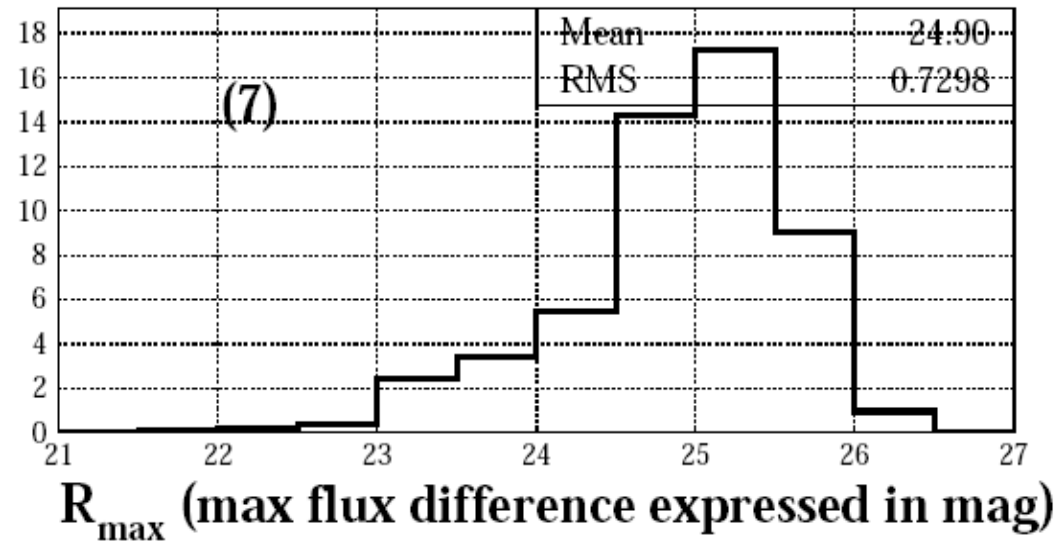
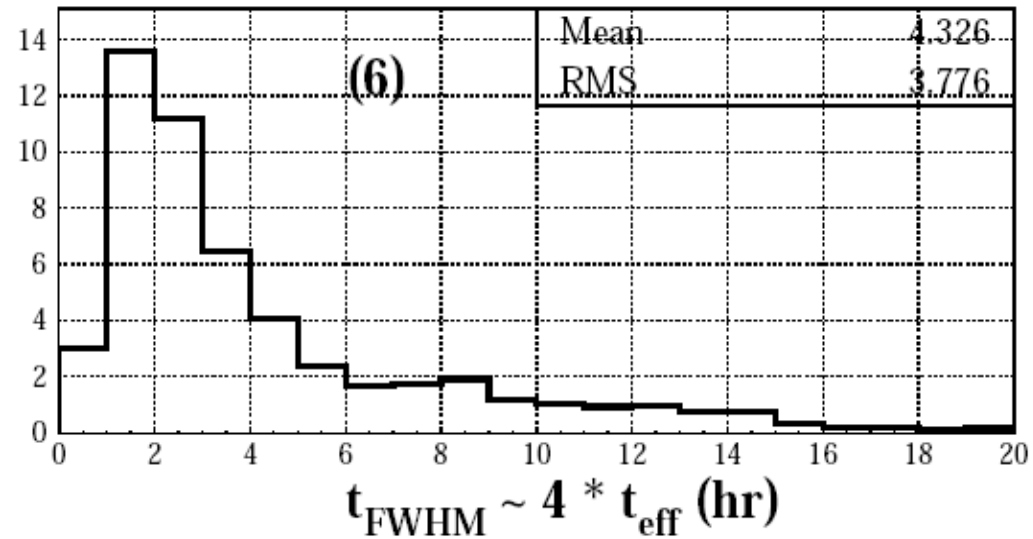
# Early M31 microlensing event

## Bright Giant Source



Auriere et al. 2001, ApJ, 553, L137

# M31 Planet Event Characteristics



# M31 Planet Event Characteristics

