First Results from the Generation-II OGLE-MOA-Wise survey 2011 season

Yossi Shvartzvald  
Tel-Aviv University  
with Dan Maoz, in collaboration with OGLE, MOA, µFUN

Shvartzvald & Maoz, 2012, MNRAS.419.3631S
Second generation

Controlled experiment: frequency of planetary systems

- Global network, 1-2m class telescopes, degree scale imagers
- Continuous, high-cadence, monitoring of significant fraction of ALL events (not only high-mag)
The generation-II network

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<th>Area [deg²]</th>
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OGLE IV, Chile
MOA-II, NZ
OGLE
Wise Obs., Israel
## The generation-II network

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<td>PTF</td>
<td>40</td>
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![Map of OGLE IV, MOA-II, PTF, and Wise Obs. locations](image)
Simulations

- Monte-Carlo simulations of scaled Solar-like systems:
  \[ R \propto \left( M_{Lens} \right)^S \]
- Real sampling sequences and photometric errors

Shvartzvald & Maoz 2012
Monte-Carlo simulations of scaled Solar-like systems:

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Real sampling sequences and photometric errors

Assumptions:

- Planetary system frequency: \( f = 1 \)
- 340 events/season (observable by all sites)

Shvartzvald & Maoz 2012
Simulations
Anomaly detection criteria

• Same for simulations and real observations

• Detection and not complete characterization

1\textsuperscript{st} step: Point-lens model to inter-calibrate 3 datasets

2\textsuperscript{nd} step: Running $\chi^2$-test:

$$P\left(\chi^2_{\text{local}}\right) > 3\sigma$$
Limiting event peak magnitude: $I \sim 17$
Predictions

Low magnification sensitivity

![Graph showing predictions for different cadence values](graph.png)
Predictions

Shvartzvald & Maoz 2012
Predictions

Example:

- 100 events (all 3 sites)
- $f = \frac{1}{6}$ (Gould et al. 2010)
- Snowline index, s=1

Seasonal predictions:

- 3.3 ± 1.4 planetary detections
- +30% contamination by binaries

Shvartzvald & Maoz 2012
## 2011 season statistics

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<td>Planetary</td>
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Low magnification w/o anomalies

![Graph showing magnification data with different symbols for Wise, OGLE, and MOA]
Other anomalies
Other anomalies

Parallax
Other anomalies
Planetary events

2/6 season planetary events inside the network footprint:
2/6 season planetary events inside the network footprint:

- MOA-293
Planetary events

2/6 season planetary events inside the network footprint:

- MOA-293
- OGLE-0265/MOA-197
Planetary events

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“Survey” data are sufficient
Summary

• 1/3 events inside network footprint

• Number of detections consistent with predictions for $f = 1/6$ for Solar–like systems

(also consistent with $f = 1/2$ for “snowy” Neptunes, Cassan et al. 2012)

• Survey data sufficient to characterize planets
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Next season:

• Real-time analyzed Wise data (DIA)

• Multi-band images – source color near peak for ALL events
Planet identity

- **a - Jupiter**
- **b - Saturn**
- **c - Neptune**

- $\tau_{\text{obs}} = 150$ days
- Cadence = $1/4$ hour

Number of detections

![Graph showing number of detections for Jupiter, Saturn, and Neptune with respect to snowline index.](image-url)