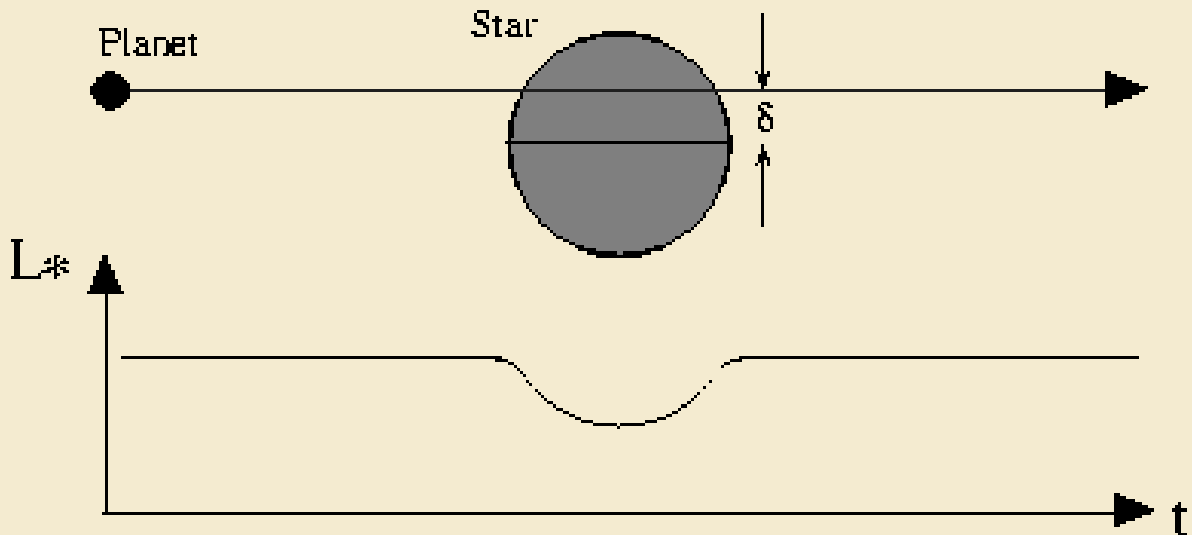# OmegaTranS: are we ready?

R.P. Saglia, MPE

Munich is (still) interested in the project and is (still) willing to keep his GTO contribution, despite having sold ½ of his GTO time to ESO.

- Planets searches using the Transit method
- Our current and future surveys:
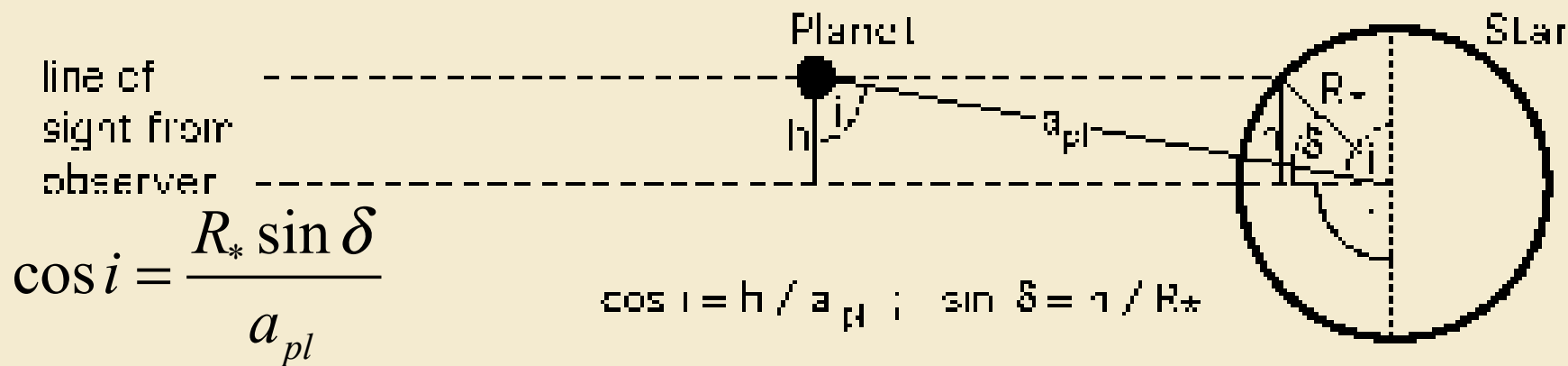 WFI, WTS, PanPlanets, OmegaTrans
- Follow-ups
- RoPacs

Leiden, 31.3.2008

The transit method

$$\frac{\Delta L}{L_*} \approx \left(\frac{R_{pl}}{R_*}\right)^2$$

$$T_{tr} = \frac{T_{pl}}{\pi}\left(\frac{R_* \cos\delta + R_{pl}}{a_{pl}}\right)$$

$$p = \frac{R_*}{a_{pl}} = \cos i_{\min}$$

$$\cos i = \frac{R_* \sin\delta}{a_{pl}}$$

$$\cos i = h / a_{pl} \quad ; \quad \sin\delta = \eta / R_*$$

Science case

- Inclination know → possible to measure mass and density of the planet, test formation models
- Spectroscopy during the transit allows to probe the planet's atmosphere in absorption
- Low probability of detection → need to monitor in the optical large number of stars with high (<~ 0.005 mag) photometric precision
- „Easy" to find Jupiter-like planets around sun-like stars orbiting near the stars
- Brigth (-ish) stars to allow for spectroscopic follow-up → possible to observe during bright time
- From space detection of earth-like planets possible

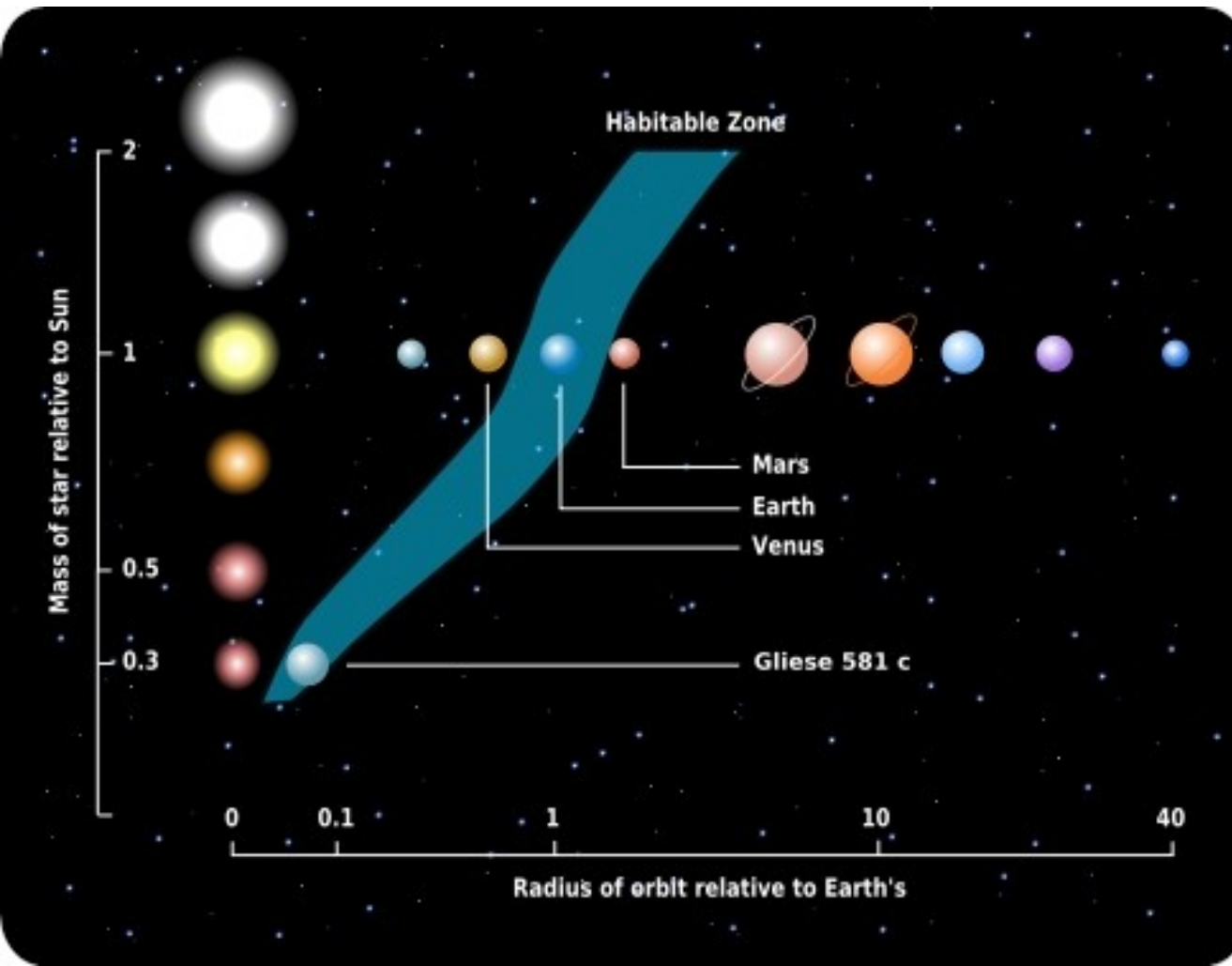# Current transit surveys

The extrasolar planets encyclopeadia:

36 candidate planets discovered by transit searches:
OGLE, TrES, WASP,CoRoT, SWEEPS, HAT, XO.

→ Plenty of Jupiter-like planets around Sun-like stars
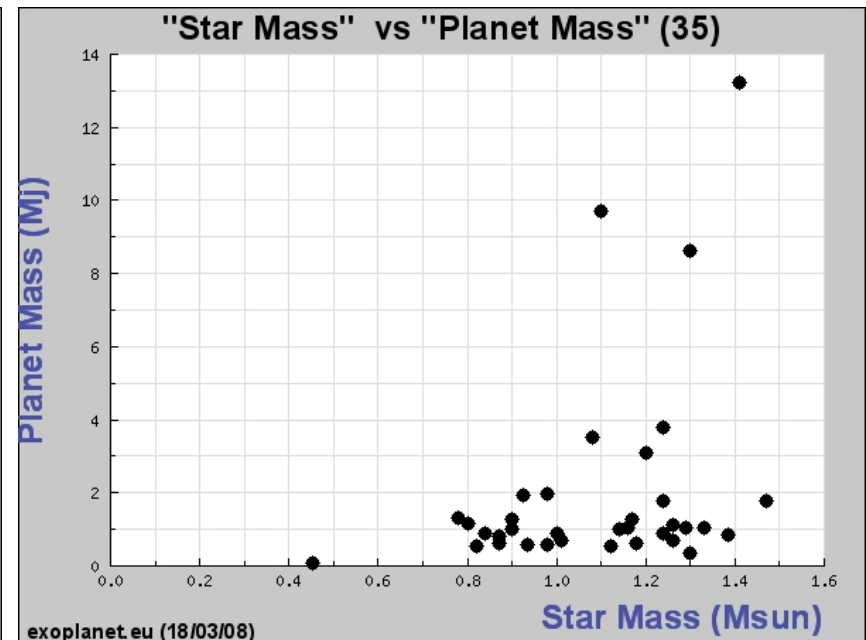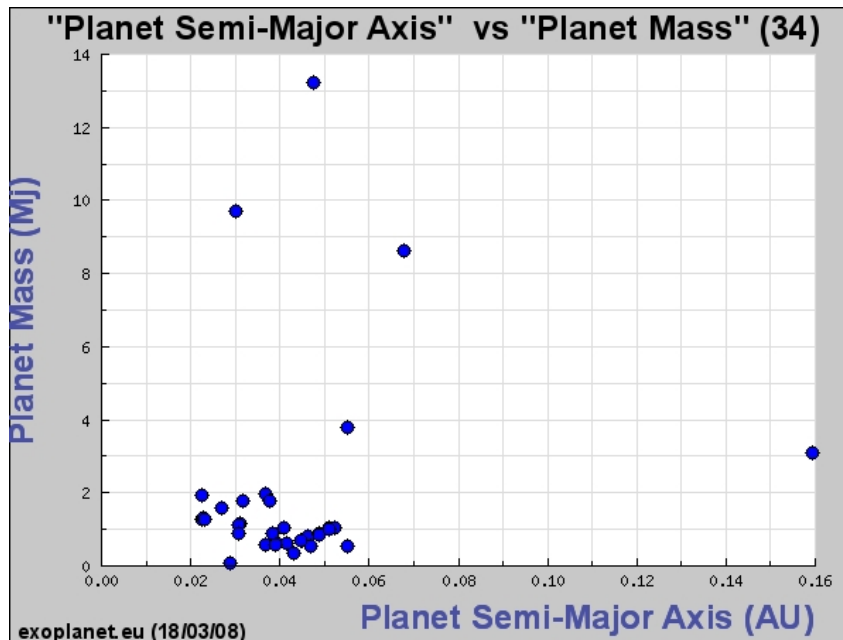
Rocky planets around M stars

- Smaller radii → easier to detect smaller, rocky planets

- Smaller mass → short orbital Times near the Habitable zone

- Cooler stars → Need to observe In the NIR (I-J)

Our present surveys

WFI: see Johannes Talk

WTS: WFCAM Transit Survey, P.I. D. Pinfield & S. Hodgkin
      J band imaging with WFCAM at UKIRT
      in poor seeing/transparency conditions
      Search for rocky planets around M dwarfs
      200 nights allocated over 5 years
      Data being taken

PanPlanets

P.I. Henning+Alonso, Heidelberg

- I band, 120 hours per year, 4 years long, in blocks of 3 hours per night, grouped in two campains
- 1st campain: 3 fields (21 sq. deg.) in the MW plane, sampling every 6 minutes, wth S/N~200 down to I=17, 2000 epochs per field, ~1.5 millions dwarf stars monitored, 80% brighter than 15 mag.
- 2nd campain: open clusters
- Goals: find 50 Hot to Very Hot Jupiters, plus interesting numbers (how many?) Neptunes around M dwarfs

OmegaTrans

Leiden: I. Snellen; Munich: R. Saglia, J. Koppenhöfer;
Naples: E. Covino, J. Alcala'

- Original goal: 3 weaks per year, four fields (i.e. 4 sq. Deg.) monitored every 8.5 minutes in the R band, 450000 stars down to R<17.5 with 1000 epochs every year, expecting 15-20 hot Jupiters in the first year. Fields selected to maximize number of sun-like stars.

- Discussing new focus on M-dwarf stars: I band observations with same exposure (20 sec) give better results than J band UKIRT survey. New optimization of field selection (not too near the MW disk).

Analysis Software

Johannes achievements:

- Monte Carlo simulations of survey efficiencies
- AW Implementation of difference imaging analysis
  Performance's comparison with Naples software
  „Stress-test" on his WFI data set
  „AW dissemination lessons" in Munich and Heidelberg
- Implementation of Sysrem strategy to reduce correlated errors in the light curves
- Implementation of box-fitting algorithm to select candidates
- Two prolonged visits to Hawaii to prepare PanStarrs data stream

... and beat Nick Kaiser!

Follow-ups

Photometry: OmegaCam GTO
Wendelstein (2010: 2m Telescope with optical and NIR cameras)

Johannes last achievement: GROND follow-up of Tres candidate together with I. Snellen

Spectroscopy: HET (7% GTO per year, LRS, HRS)
VLT (through OmegaCam GTO)

RoPacs:
Rocky Planets Around Cool Stars

Approved FP7 - People Marie Curie Actions –
Marie Curie Initial Training Networks (ITN)

P.I.: David Pinfield
Participants: University of Herfordshire, IoA Cambridge, Istituto de Astrofisica de Canarias, MPE, Instituto Nacional de Tecnica Aeroespacial, Main Astronomical Observatory Kiev, Ucraine, Astrium Limited.

Many PostDocs and PhD positions available starting from October 2008