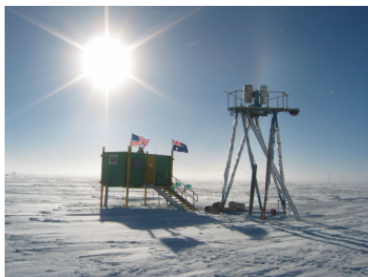


Vulcan South - Extrasolar Planet Transit Search

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What is it?

- A search for transits of extrasolar planets
- Uses a wide-field (7 x 7 deg) CCD photometer with a 8" aperture lens
- Continuously monitors a star field to search for the periodic signature of a transiting close-in giant planet

Why transits?

- Orbital inclination & planet *size*; *density* with radial velocity follow-up
- Transits around bright stars can allow detection of the planet's atmosphere through *transmission*, or *reflected light*

Giant Planet Transit properties

- Probability of transit = R_*/R_{orb} **~10%** for close-in planets
- Brightness change = A_*/A **~1/100** for Jupiter - Sun system
- Duration **~2.5 hours** for close-in planets ($P = 3$ days)
- Probability of detecting a transit in a survey is:

$$P_{\text{detect}} = P_{\text{planet}} P_{\text{transit}} P_{\text{dwarf}} P_{\text{obs}} \sim (0.0075)(0.1) P_{\text{dwarf}} (0.66)$$

=> a survey must monitor **~2000 F-M dwarfs** in order to discover one transiting planet

Advantages of the South Pole

- Long night offers better multi-transit phase coverage
 - Quickly detect short-period planets
 - Better chance to find longer period planets (<20 days)
- Stars move at constant airmass, eliminating flux changes of ~10-20% due to extinction at temperate sites
- Low sky background & scintillation noise



Expected Data Volume

- ~2.5 GB of compressed image data per day
- Data quality and engineering logs emailed north daily

Logistics Needs

- Summer electronics & light machining work
- Winterover support for setup, initial instrument checkout, routine maintenance, and troubleshooting

Expected Results

- 10 transiting planets over 2 seasons
- precise nearly-continuous photometry on >60,000 stars
- detect transits of smaller planets (Saturn-sized)
- demonstrate that the Antarctic plateau is the best place for a more sensitive extrasolar planet search telescope