

Astrometry, The Next Step

Andreas Quirrenbach; University of California, San Diego

Planets can be detected indirectly by measuring the motion of the parent star around the system's center of mass. Spectroscopic searches look for the radial component of this motion, while the two tangential components can be detected with astrometric methods. Astrometry is complementary to the radial velocity method since it allows detection of planets around stars without sharp absorption lines, because it allows determination of the planet's mass independent of the orbital inclination, and because it is more sensitive to planets in relatively large orbits. The precision of ground-based astrometry is limited by atmospheric fluctuations. For small angles between the target and a reference star the limit is proportional to this angle, and scales with the telescope's diameter (or interferometer's baseline length) to the $2/3$ power. At a good site, a precision of about 10 microarcseconds over an arc of 10 arcseconds can be achieved with a 100m to 200m baseline. The Palomar Testbed, Keck, and VLT Interferometers will exploit this regime. NASA's Space Interferometry Mission (SIM) scheduled for launch in 2005 will push the astrometric precision to one microarcsecond.

I will discuss the prospects for planet search programs that can be carried out with ground-based and space-borne interferometry. Within a few years, it should be possible to carry out a thorough survey of nearby stars for giant planets. SIM may find the first Earth-like planets in the Solar neighborhood, and open new vistas that can be explored with the advanced interferometric missions currently under study by ESA and NASA.