The MEarth Project:
(an ongoing survey for “Earth”-like planets transiting “M” dwarf stars)

If a planet transits its host star, we can observe the planet’s mass, radius, and atmosphere. Making such measurements for a small, cool planet like the Earth is easier if the planet transits a small, cool star. The MEarth Project aims to find planets in the habitable zones of nearby, very small stars (“mid-to-late M dwarfs”), to provide the best targets for atmospheric study with large telescopes like the James Webb Space Telescope.

MEarth-North

eight 40 cm telescopes
at Mt. Hopkins, Arizona
monitoring the brightness of small (0.1-0.3 solar radii), nearby (<100 lightyears) M dwarf stars, since 2008

GJ1214b is the first planet we found with MEarth. It transits an M dwarf that is both small (1/5 the size of the Sun) and nearby (among the 1000 closest stars), making it an ideal target for atmospheric study. Deep observations (including 76 orbits with Hubble and 20 days with Spitzer) revealed the presence of high-altitude clouds in the atmosphere of GJ1214b. With a temperature of 500K, GJ1214b’s is among the coolest exoplanet atmospheres yet studied. A planet in the habitable zone of an M dwarf like GJ1214 would have an orbital period of 10 days, which is short enough to be detectable from the ground.

MEarth-South

eight 40 cm telescopes
at Cerro Tololo, Chile
monitoring the brightness of small, nearby M dwarfs since 2014

The MEarth Project is targeting planets small enough and cool enough to be habitable. Along the way, we will find slightly larger and warmer planets. We cannot measure masses for most of the Kepler planets, so the mass-radius diagram is still sparsely populated below 10M_

If MEarth finds a potentially habitable planet, JWST will be able to observe that planet’s atmosphere. This simulation scales the performance achieved with Hubble/WFC3 on GJ1214b (Kreidberg et al. 2014) to what we expect for JWST for transmission spectroscopy of a planet in the habitable zone of a star just like GJ1214 (in both size and distance).

cfa.harvard.edu/MEarth

Download MEarth light curves (DR2), learn about our new parallaxes + spectra, watch time-lapse movies, and more!