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Exoplanetary Science in Australia: Detection, Characterisation, and Destruction

Dr. Rob Wittenmyer (University of NSW)

Dr. Wittenmyer is a Lecturer in the School of Physics at University of New South Wales in Sydney, Australia. His research focuses on the detection and characterisation of extrasolar planetary systems. Currently He works with Prof Chris Tinney and the UNSW Exoplanet Team, which is the largest exoplanet research group in Australia.

Abstract

I give an update on three major exoplanetary science initiatives being pursued by Australian-based planet-search teams. Further observations from the Anglo-Australian Planet Search (AAPS) have revealed that some systems previously thought to contain a single, moderate-eccentricity planet are better fit by two planets on nearly-circular orbits. We have investigated apparent single-planet systems to see if the available data can be better fit by two lower-eccentricity planets. We identify nine promising candidate systems and perform detailed dynamical tests to confirm the stability of the potential new multiple-planet systems. In addition to the AAPS, I describe the Pan-Pacific Planet Search, a radial-velocity survey of Southern hemisphere evolved, intermediate-mass stars using the 3.9m Anglo-Australian Telescope. We currently achieve velocity precisions of 3-6 m/s, and there are several planet candidates emerging as more data are obtained.

I then describe a plan for Minerva: an installation of four 0.7m telescopes feeding a high-resolution spectrograph, sited at Mt Hopkins in Arizona. Minerva will give exoplanetary scientists the ability to pursue dedicated radial-velocity searches for planets orbiting the nearest bright stars. In addition, a Southern hemisphere Minerva could be used to follow up on objects of interest from Antarctic telescopes such as the Chinese AST-3. I will describe the diverse science cases for this highly cost-effective facility.

Finally, I present results from our recent series of papers in which we have performed extensive suites of dynamical simulations to test the veracity of proposed multiple-planet systems. We show that some systems are strongly constrained by protected low-order resonances, while others are wildly unstable on short timescales. This work highlights the critical need to include dynamical stability analysis as an integral part of the discovery process for candidate multi-planet systems.

All are welcome! Tea, coffee, biscuits will be served at 2:15 P.M.