[PL01] The Possibility of Detecting Planets in the Andromeda Galaxy

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Angstrom project is using a global network of 2m class telescope to conduct a high-cadence pixel lensing survey of the bulge of theAndromeda galaxy(M31). Here we investigate the feasibility of using such a survey to detect planets in M31. We estimate the efficiency of detecting signals produced by planets with various masses and separations from the host star. We find that for a ~5MJ planet that is located within the lensing zone(~1-3 AU), detection is possible above 3σ with detection efficiency ~6%. This corresponds to the yearly detection rate of ~3f_LZ planets, where f_LZ is the probability that a planet exists in the lensing zone. It is expected that most events with detectable planets are associated with giant source stars, and thus source size will have a significant effect on the planet detection efficiency. We also find that the planetary perturbations will be in nearly all cases caused by central caustics, and thus observational strategies focusing on these central perturbations would maximize planet detections. A dramatic improvement in the efficiency of ~30%-50% is expected if follow-up observations on an 8m telescope are made possible by a real time alert system.

[PL02] Tumbling of NEOs via Tidal Encounter with Earth

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Near Earth Objects (NEOs) ought to experience tidal torque whenever they encounter Earth. It has been suggested that the tidal torque is a possible cause for NEOs to get tumble. In this study we evaluate tumbling efficiency of the tidal interaction by making Monte Carlo simulations. For a given set of pericenter distance, encountering velocity, initial spin period and axis ratios of ellipsoidal asteroid, we numerically integrate the Euler equation for randomly chosen sets of initial phase angles, and follow spin angular velocity and inertia tensor as functions of time. At the end of each encounter the dynamic moment of inertia, I_D, is determined from the resulting angular velocity and the tensor. Out of the parameter space constructed by the phase angles, those fraction of the space volume that may render I_D less than a certain critical value is taken to be a measure of the tumbling efficiency. In terms of this efficiency we have demonstrated that asteroids of oblate spheroid are more likely to tumble than of any other shape. It is also shown that the tidal interaction can not excite prolate asteroids to tumble. The I_D based on the impulsive approximation (Scheeres *et al.* 2004) is shown to overestimate the tumbling efficiency.