

Recent Progress in Asteroid and Comet Science

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ABSTRACT

* Quantification of impact-induced hazards.

We report on a soon-to-be-published study that refines the NEO impact hazard. The hazard is divided into three components, regional damage from land impacts, tsunami damage from water impacts, and global hazard from massive climatic disruption. Recent progress in NEO sciences allows us to make much better constraints on some of these hazards than was previously possible. In particular, the first concrete quantitative estimate of the impact-generated tsunami hazard will be presented. The risk will be cast in terms of the total long-term hazard, as well as the residual fraction of the hazard that presently remains unretired by the Spaceguard Survey.

* Nongravitational accelerations on comets. (And asteroids, too!)

Recently, several advances have taken place in evaluating and modeling nongravitational accelerations on small bodies in the solar system. Radar ranging to the near-Earth asteroid 6489 Golevka in May 2003 has shown for the first time the action of a nongravitational acceleration on an asteroid. A very subtle radiation-based acceleration, known as the Yarkovsky effect, deflected the asteroid about ten kilometers over the twelve years since it's discovery.

I also report on the implementation of a new "Rotating Jet Model" for comet nongravitational accelerations. This model, which assumes body-fixed jets thrusting in proportion to their insolation, is significantly more sophisticated than the classical nongravitational models. It's principal limitation is that a knowledge of the orientation of the comet's spin axis and the latitudes of the body-fixed jets is required. The Rotating Jet Model has shown very good results in fitting and predicting the positions of a number of comets, including 2P/Encke, 19P/Borrelly and 81P/Wild 2.

* J002E3: The putative return of the Apollo 12 S-IVB.

In September 2002 amateur astronomer Bill Yeung discovered an apparently asteroidal object that was actually weakly bound to the Earth; it was a second moon. The object, known as J002E3, was extraordinary for a variety of reasons, including a significant early possibility that it would impact the moon. It was eventually deduced that J002E3 is in all likelihood the long lost third stage, known as an S-IVB, from the Apollo 12 mission in late 1971. I will recount the history of the detective story and describe what the future may hold for J002E3.