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TUNGUSKA AND THE JUNE 2019 BETA TAURID OBSERVATIONAL OPPORTUNITY

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ABSTRACT

Hydrocode models of the 1908 Tunguska airburst have provided reasonable explanations for most of the phenomena associated with that event, from the shape of the treefall pattern to the bright nights over western Europe (Boslough & Crawford, 1997; 2008). Similar models are used to estimate the damage component of probabilistic risk assessment and cost/benefit analysis for planetary defense. Nevertheless, there is still an enormous range in model-based estimates of the size of the Tunguska impactor and explosive yield, from as low as 3 to as high as 30 megatons. This range of possible sizes, combined with NEO population estimates, leaves us with one unsatisfying conclusion: the Tunguska event was an extreme outlier. The probability of an impact of that magnitude having happened only 110 years ago is extremely low. The frequency of the smallest and largest possible Tunguska-like events should be on the order of once every thousand and ten thousand years, respectively.

One way out of this dilemma is to question a built-in assumption in our probability estimates that small NEOs are effectively distributed randomly. Whereas the most sensational claims of “coherent catastrophism” lack merit, it is reasonable to

speculate that the Taurid complex has significant concentrations of Tunguska-sized fragments that are too small to be observed unless in the vicinity of the Earth. Large fireballs--some associated with meter-class impactors--were observed during the Nov, 2015 Taurid swarm return (Spurny et al., 2017). Additionally, several small asteroids--such as 2015 TX24--have orbits that are nearly identical to the 2015 Taurid fireball swarm (Olech et al., 2016; 2017). When the Earth intersects with this stream, the probability of impact is elevated. If the Tunguska object was a member of a Beta Taurid stream (Kresák, 1978) then the last week in June 2019 will be the next occasion with a high probability for Tunguska-like collisions or near-misses (Asher & Izumi, 1998). Because the Beta Taurids approach from the sunward side, we propose a survey designed to observe such objects after they have passed into the night sky which would have little lunar interference because the moon is new on July 3, 2019. Moreover, the possibility of enhanced daylight fireballs and significant airbursts should be anticipated during that time due the expected return of the resonant Taurid swarm (Asher et al., 1993) in June, 2019, which will be the closest Earth passes to the outbound leg (daytime) portion of the resonant stream since 1975.

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