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Next Steps in Impact Risk Assessment

Donovan Mathias[(1)], **Lorien Wheeler**[(2)], **Jessie Dotson**[(3)], **Michael Aftosmis**[(4)], **Clemens Rumpf**[(5)]
[(1)]*NASA Ames Research Center, MS 258-5, Moffett Field, CA 94035, (650) 604-0836, Donovan.Mathias@nasa.gov*
[(2)] *RedLine Performance Solutions, NASA Ames Research Center, MS 258-6, Moffett Field, CA 94035, (650) 604-0785, Lorien.Wheeler@nasa.gov*
[(3)]*NASA Ames Research Center, MS 244-1, Moffett Field, CA 94035, (650) 604-2041, Jessie.Dotson@nasa.gov*
[(4)]*NASA Ames Research Center, MS 258-5, Moffett Field, CA 94035, (650) 604-4499, Michael.Aftosmis@nasa.gov*
[(5)]*USRA, NASA Ames Research Center, MS 258-5, Moffett Field, CA 94035, Clemens.Rumpf@nasa.gov*

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ABSTRACT

Impact risk assessment models have advanced greatly in recent years, but the majority of the effort has been focused on ensemble risk estimates—the statistical risk associated with a hypothetical set of impactors reflecting the overall NEO population. These tools have established bounds on damage expectations and have provided increased insight into the dominant hazards for ranges of impactors. As a result, the primary sources of risk uncertainty have been identified. However, as we move beyond the study of ensemble and into effects associated with specific impact scenarios, the primary sources of uncertainty may change. These uncertainties become increasingly important as we perform hypothetical impact exercises, such

as at PDC, and as we respond to the U.S. National Near-Earth Object Preparedness Strategy and Action Plan.

In this talk we will begin by summarizing the current sensitivity to uncertainty in the ensemble assessments. Specifically, we will consider the contributions of the asteroid population models, and their influence on impact frequency, impact location, physical asteroid properties, and impact location. The importance of identifying the transition from purely "local" damage to regional and global effects will be discussed. We will then focus on how the sources of risk uncertainty change as we consider specific impact scenarios. In such cases, we begin with a restricted impact corridor and have at least minimal information about the impactor attributes. Even this basic knowledge can greatly restrict the possible damage outcomes and much of the uncertainty is greatly reduced as further observations provide additional information. However, attempts at impact mitigation introduce additional uncertainty. The shift in uncertainty drivers will be illustrated using hypothetical scenarios from TC4 and PDC exercises.

We will conclude with recommendations on the next steps required to improve our ability to provide the most informed damage estimates for a given scenario based on a range of possible knowledge states.

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