

**PDC2017  
Tokyo, Japan**

**IAA-PDC-17-06-08**

*Please send your abstract to iaapdc (at) iaamail.org*

*You may visit [www.pdc.iaaweb.org](http://www.pdc.iaaweb.org)*

*(please choose one box to be checked)  
(you may also add a general comment - see end of the page)*

- Key International and Political Developments**
- Advancements and Progress in NEO Discovery**
- NEO Characterization Results**
- Deflection and Disruption Models & Testing**
- Mission & Campaign Designs**
- Impact Consequences**
- Disaster Response**
- Decision to Act**
- Public Education & Communication**

### **Immediate Effects of Asteroid Impacts on the Human Population**

**Clemens M. Rumpf<sup>(1)</sup>, Hugh G. Lewis<sup>(2)</sup>, and Peter M. Atkinson<sup>(3)(4)(5)</sup>**

<sup>(1)</sup> *University of Southampton, Engineering and the Environment, Southampton, UK,  
+44 23 8059 3334, [c.rumpf@soton.ac.uk](mailto:c.rumpf@soton.ac.uk)*

<sup>(2)</sup> *University of Southampton, Engineering and the Environment, Southampton, UK,  
[h.g.lewis@soton.ac.uk](mailto:h.g.lewis@soton.ac.uk)*

<sup>(3)</sup> *Lancaster University, Faculty of Science and Technology, Lancaster, UK,  
[pma@lancaster.ac.uk](mailto:pma@lancaster.ac.uk)*

<sup>(4)</sup> *University of Southampton, Geography and Environment, Southampton, UK*

<sup>(5)</sup> *Queen's University Belfast, School of Geography, Archaeology and  
Palaeoecology, Belfast, UK*

**Keywords:** *asteroid, impact, impact effects, population, impact consequences*

### **ABSTRACT**

Asteroids that collide with the Earth produce impact effects such as wind blast, overpressure shock, thermal radiation, cratering, seismic shaking, ejecta out throw, and tsunami which may harm the human population. Multiple simulation runs of a 50,000 strong asteroid impactor sample, with impact location, angle, and speed distributions that correspond to those of the Near Earth Object population, were performed to measure the relative harmfulness of each of the produced impact effects (impact effect dominance) with respect to the human population across the Earth. The impactor diameter was increased from 0 m to 400 m in subsequent simulation runs and this method allowed to discern how impact effect dominance

varied over impactor size. Impact effects for each asteroid were calculated based on its size, impact speed, impact angle, as well as impact location and the effects were propagated over the local population based on the global population map. The results show that aerothermal effects are most dominant and that the average land impactor is an order of magnitude more harmful than the average water impactor. Ground related effects (cratering, seismic shaking, ejecta) produce relatively low numbers of casualties. The results help to increase understanding of the asteroid impact hazard and they inform disaster managers about which impact effects should be prioritized in order to formulate effective protection for the population. In addition to insights about impact effect dominance, the results provide expected casualty numbers for the average impactor in the size regime up to 400 m in diameter which yield the most frequent impactors.

\*\*\*\*\*