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X Planetary Defense – Recent Progress & Plans

- NEO Discovery**
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NEAR REAL TIME BOLIDE IMPACT ASSESSMENT

Edward Tagliaferri⁽¹⁾, Garry Schnelzer⁽²⁾, Lindley Johnson⁽³⁾

(1) The Aerospace Corporation, El Segundo, CA, 90245-4609

(2) Space Dynamics Laboratory, North Logan, UT, 84341-1947

(3) NASA Headquarters, Washington DC., 20546-00

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The earth is bombarded daily by about a hundred tons of cometary and asteroidal debris as it orbits the sun. Most of the debris particles are very small, and burn up entirely in the atmosphere. However, the entry of meteoroids of sizes of a meter diameter and up often results in the object penetrating deep into the atmosphere. Because of the very high entry velocities, the objects have an enormous amount of kinetic energy, a significant amount of which is converted into light and shock as the objects experience violent disintegration. These events are often referred to as bolides. The amount of energy released can approach that released by nuclear bombs, and in fact, bolides could be misinterpreted as a nuclear detonation (NUDET). NASA is currently funding an effort to analyze and publish information about bolide events which are detected by US Government sensors worldwide. The analysis is largely manual, and requires 1 to 3 days from the time of the event for the report to be published. The reports are sent to the NASA NEO office at NASA HQ in Washington, DC, which in turn sends them to JPL in Pasadena, California, for publication on a public website (<http://neo.jpl.nasa.gov/fireballs/>). Included in the reports are the time of the event, location, altitude at which the object detonates, the velocity of the object at the time of the detonation, the total optical radiated energy, and the pre-entry velocity, if that can be estimated. An approximate conversion between the measured optical radiant energy and the total impact energy can be made using an empirical relationship provided by Peter Brown and colleagues in 2002. (P.G. Brown et al., The flux of small near-Earth objects colliding with the Earth. *Nature*, vol. 420, 21 Nov. 2002, pp. 294-296). Given the total impact energy and the velocity, the mass of the object can then be estimated. By assuming a density, the size of the object can be estimated as well. In this paper we propose automating the processing of the event data, and the development of a communications architecture allowing the release of a report within minutes of an event. This near-real time notification would allow governments to immediately react to sizable bolide events, and if warranted, alert emergency personnel. It would also allow governments to differentiate between natural and nuclear events.
