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Hazard Estimate Of 2019 PDC Impact Scenario

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ABSTRACT

A hypothetical scenario of asteroid impact (<https://cneo.jpl.nasa.gov/pd/cs/pdc19/>) is used as the basis for discussion and analyses during the PDC 2019 table-top exercise. The asteroid is "discovered" on March 26, 2019, assigned the designation "2019 PDC", and predicted to impact Earth most likely on April 29, 2027. The asteroid is classified as a potentially hazardous asteroid (PHA) with a diameter initially estimated 100-300 meters in terms of absolute magnitude. Given on first day of the conference, the risk corridor of impact wraps more than halfway around the globe, spanning from the Hawaii on the western end, across the U.S. and Atlantic Ocean, and all the way to central and southern Africa on the eastern end.

In this paper, We have developed the AICA (Asteroid Impact Consequence Analysis) code to estimate impact hazard such as overpressure caused by blast wave, heat radiation by fireballs, earthquakes and so on. Models and methods such

as NASA's fragment-cloud model (FCM), Weibull's strength law, break-up criteria based on dynamic pressure, SEDAC's world population data, and nuclear test data of U.S, are employed in the code. Because the asteroid is too far, we know very little about its geometric, physical and mechanical properties, such as shape, density, materials and strength. So in our analysis, two types of materials (S and M) are assumed with sizes from 100 to 300 meters, and several values of material strength. The initial condition of entry is obtained from the table of impact points along the central axis of risk corridor (2019pdc_mts.txt) at the preceding website. The estimate results show that M type asteroids have enough strength and are not fragmented, while S type asteroids usually disintegrate and the altitudes of disintegration mainly depend on entry condition. The damage ranges at ground along risk corridor are also presented in this paper.
