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POTENTIALLY HAZARDOUS LONG-PERIOD COMETS: WARNING TIMES

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ABSTRACT

In this study, we discuss the threat posed by long-period comets (LPCs) over recorded history as potentially hazardous objects (PHOs) to Earth and suggest mitigation strategies. These object were not addressed in the National Research Council's report [Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies (2010)]. Although rare but large (up to tens of kilometers in size) and fast moving, their detection cannot be predicted due to their long orbital periods. As an example, Comet C/1983 H1 (IRAS-Araki-Alcock) was discovered on 27 April 1983 and passed Earth at a distance of 0.0312 AU on 11 May 1983, only 2 weeks later. (A PHO is defined as approaching Earth's orbit within 0.05 AU.) Other comets include D/1770 L1 Lexell (at 0.015 AU) and 55P/1366 U1 Temple-Tuttle (at 0.0229 AU). The results of our preliminary study over the past decade (2000-2010) show average warning times for LPCs remain fairly constant at about 6 months, even with recent survey improvements. There is a slight trend to longer warning times during this decade. Worst-case scenarios include discovery after perigee passage for all but 2 years (negative "warning times"). The best year (2008) for warning times was less than 3 weeks (18 days). Our mitigation strategies for LPCs with short warning times will concentrate on aggressive countermeasures to include space- or ground-based platforms using conventional/nuclear explosives or kinetic impacts with international participation.