

Long term shelters to avoid humanity extinction

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Abstract

It is well known that giant long period comets originating from the Oort's cloud could be the most threatening celestial bodies. The probability of occurrence has been estimated at 2.2×10^{-12} for the next hundred years. This is weak but not negligible given the stakes, with the potential extinction of humanity [1]. An important question is the survival capacity of humans. The warning time could indeed be very short and the kinetic energy could be sufficient for global and durable effects on Earth, killing all life forms on the surface. Even if survivors existed in isolated underground shelters located very far from the impact zone, they would certainly die after several months, years or perhaps decades, depending on the duration of the uninhabitability period on the surface of the Earth and the autonomy of the shelter. In order to better understand the survival capacity, it is necessary to better understand the parameters that determine the degradation of life conditions inside the shelters, the expected lifetime and what can be done to increase it. It is shown that the most important parameters are: 1) The amount of initial resources; 2) The energy production capacity; 3) The water and food production capacity; 4) The industrial production and maintenance capacity to maintain life support and habitability; 5) Human factors management. A classification of long terms shelters is proposed according to their adaptation to very long survival (maximum lifetime), taking human factors into consideration. LT1 corresponds to shelters with lots of resources but a weak autonomy, and therefore a well-established lifetime. LT2 corresponds to long term shelters with strong autonomous capacities but obvious flaws or poor management (too many people, important skills missing, or inappropriate organization). The lifetime is therefore much shorter than expected. LT3 corresponds to ideal shelters that could last decades, eventually saving humanity from extinction. The limits of the shelters are discussed, as well as uncertainties. The risk is indeed high that some problems are underestimated and a slow but unstoppable degradation of life conditions would lead to the death of the survivals, whatever the preparation and motivation of the survivals and the category of the shelter.

[1] Jean-Marc Salotti, Humanity Extinction by Asteroid Impact, Futures, March 2022.
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