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EXPLORING GOVERNANCE FRAMEWORKS FOR AN EARTHQUAKE EARLY-WARNING FUTURE SPACE-BASED SYSTEM

Abstract

Earthquakes are one of the sudden natural phenomena that, together with floods, hurricanes, and volcanic eruptions, can cause the most devastating destruction, loss of life and property, as shown throughout human history.Technological advances allow to anticipate the majority of these phenomena through observation of several precursor events. This is not true for earthquakes: no scientific theory nor technology has so far succeeded in presenting a feasible way to foresee a seismic event, other than with a probabilistic risk-approach based on historical and geo-physical considerations. Therefore, today's initiatives related to mitigation or avoidance of casualties and property damage only focus on severe building regulations. Previous space missions have observed variations in the ionosphere (specifically in parameters related to the electromagnetic field and charged particles) which occur in conjunction with major seismic events on Earth. It is hypothesized that this could be related to the emission of extremely-low frequency electromagnetic waves from the earth's crust occurring during the event. As of today, data is not accurate enough, nor do the observations constitute a significant statistical sample, to analytically model a possible correlation between earthquakes and ionosphere phenomena. Satellite systems are being developed, such as the Chinese-Italian CSES mission, with the aim of further investigating this possible correlation, and in addition, examining whether space-detected signals can lead to an early-warning of a seismic event. It is important to stress that the feasibility of this approach is still to be proven. However, the science, technology and governance behind early warning systems have spread unevenly across communities, regions and countries and significant gaps with timely warning information still exist. Therefore, there is a need to set up a governance framework modelled on the existing early-warning tsunami systems in the Pacific Ring of Fire countries as well as drawing parallelisms with Space Weather governance models. Finally, the paper aims at providing recommendations for a global initiatives on space for earthquakes that includes global governance mechanisms based on the initiatives elaborated under the aegis of the UN, national governments and space agencies. The attention will be posed also on the contribution that the private sectors and the NGOs can offer to reduce the risks and to prepare adequate responses. All these elements, plus dedicated funding for RD, technology demonstration and for setting up of an operational system, will be required to manage and make use of the life-saving information obtained through a hypothetical space-based earthquakes early-warning system.