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HIGHLY RESPONSIVE SPACE AND GROUND SYSTEMS: NEW OPPORTUNITIES FOR DISASTERS MANAGEMENT

Abstract

This paper analyses the feasibility of innovative spacebased systems supporting the prevention and management of disasters, focusing on early warning, alert and emergency response. The new space systems (current ones or planned in a near future), based on small and large constellations, high performance communication links and powerful ground segments, enable high resolution, low latency and real time applications. They can be key components of integrated applications for risks and disasters management and could drastically improve the performance of emergency response services and their use in the most critical part of the crisis cycle. After a presentation of the state of the art in emergency response and early warning, the second part of the paper reviews the new trends in space systems, technologies and innovative applications: The evolution of Earth observation, communication and navigation satellites with small and large constellations, with high revisit or low latency solutions. The availability of operational missions with new sensors (e.g. ionosphere monitoring, meteorology, machine to machine, etc.) The development of new services based on massive data analytics (big data) and artificial intelligence (e.g. machine learning). Third part presents the recent research work on the potential use of GNSSTEC and airglow cameras: they could improve the tsunami warning systems by introducing ionospheric observations as new way to estimate the tsunami risk. Based on these trends and results, we discuss new opportunities triggered by these developments focusing on early warning and alert and emergency response. Our perspective is the feasibility of new integrated applications, combining Earth Observation, meteorology, navigation and communications, applied to disaster management, from tasking and data acquisition to transmission of informations to warning centers and decision makers. The importance of the ground systems and the integration with non space data and solutions is emphasized. A tentative road map is also proposed. One of the first objectives would be to implement a regional preoperational prototype in order to confirm the promising scientific results. Capacity gaps and needs for future developments are also identified. The last part of the paper addresses the impact on governance, in a context of international

or regional cooperation and increasing role of commercial actors, whereas disaster management is usually under the responsibility of institutional actors: possible evolutions of existing schemes at international (e.g. Copernicus or International Charter Space and Major Disasters) or regional level are discussed.