Worldwide Monitoring of Natural Hazards through the Constellation System of Satellite Remote Sensing

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The advanced satellite remote sensing technology has engendered a transformative approach to monitoring natural hazards on a global scale. A comprehensive review and an integrated framework for a constellation system of satellite remote sensing, designed to provide real-time data acquisition, processing, and analysis for the ubiquitous monitoring of natural hazards provides an overview of hazards to understand the global phenomena and planetary health. This study outlines the infrastructural elements of the constellation, encompassing a synergistic network of multispectral, hyperspectral, and radar satellites, supported by terrestrial sensor network, cutting-edge computational algorithms, and the advancements in Artificial Intelligence (AI) for enhanced data assimilation, feature detection, and event prediction regarding natural hazards. The constellation system boasts an expansive spatial, temporal, and spectral coverage, enabling it to detect, categorize, and monitor a vast array of hazards, from meteorological phenomena such as hurricanes and tornadoes to geophysical events like earthquakes and volcanic eruptions, as well as climate-related emergencies, including urban heat island and wildfires. This study present case studies of its deployment in diverse geographical locales, demonstrating its robustness in providing critical insights during the pivotal initial phases of disaster risk reduction, response and relief to illustrate the system's efficacy. This study suggests that the interdisciplinary effort required to realize the constellation system which notably enhances the precision of hazard forecasting, risk mitigation strategies, and the coordination of emergency responses.