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Space Assets and Disaster Management (4)

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SPACE ASSETS AND TECHNOLOGIES FOR BUSHFIRE MANAGEMENT

Abstract

Purpose: The financial, emotional, and ecological impacts of bushfires can be devastating, as seen during the 2019-20 East Australian Bushfires. We aimed to explore how space assets and technologies could be applied to better predict and mitigate the impacts of bushfires. Using the Australian situation as an example, we aimed to develop interdisciplinary recommendations with international applicability.

Methodology: Thirty-three diverse, multidisciplinary participants of the International Space University and University of South Australia Southern Hemisphere Space Studies Program 2021 worked remotely across time zones and hemispheres. Three subgroups focused on prediction of bushfires, mitigation of bushfire impacts, and communication relating to bushfire response, respectively. In each group, a current state and gap analysis was conducted through literature review, presentations from subject-matter experts, group discussions and workshops. A combined set of recommendations was then derived by consensus. **Results:** Three geophysical components determine fire behaviour — fuel, topography and weather. Earth observation data for each of these are essential for accurate bushfire prediction. Satellites provide huge volumes of data which must be combined with weather and climate prediction models to improve forecast lead times. Adequate communication of this information to authorities and communities is vital. Satellite sensors can detect land cover, weather, fuel load and fuel moisture content. Most fires start by lightning strikes which can be predicted using satellite infrared imagery to determine cloud top temperatures. Light Detection and Ranging (LiDAR) can reveal an area's topography. A major limitation is the storage capacity and computational power required for data-storage and high-resolution modelling; however effective use of prediction models can allow targeted hazard reduction methodologies to mitigate bushfire impacts. Firefighter safety could be improved by use of protective clothing modelled on astronaut space suits, and by reinforcing fire trucks with thermal protective materials as used on spacecraft. An interoperable national communications infrastructure is needed to enable rapid sharing of information and resources with emergency responders and citizens across jurisdictions. Communications infrastructure is often damaged during bushfires, hampering the disaster response; a direct satellite-to-mobile phone emergency communication system would address this. **Conclusions:** Space assets and technologies are valuable resources to improve bushfire outcomes. We recommend monitoring of weather, fuel load and topography using space assets. A centralised data platform should be developed to allow integration of data from multiple sources and enable predictive analysis. Space technology can be used to improve firefighting, protective equipment, and communications infrastructure resilience. A clear, consistent national warning system and communications application are needed to empower community action.