令和4年度　環境科学院　修士論文内容の要旨

Vegetation recovery assessment using UAVs in forest areas after the 2018 Hokkaido Eastern Iburi Earthquake
(2018年北海道胆振東部地震後の森林域におけるUAVを用いた植生回復評価)

Hokkaido University, Graduate School of Environmental Science
Division of Environment Science Development, Course of Human and Ecological Systems
Wang Xiaoxiao

An intense earthquake with a magnitude of 6.7 struck the eastern Iburi region of Hokkaido, northern Japan on 6 September in 2018, and the forest in this area including Atusma Town has been widely affected by this earthquake and associated coseismic landslides. It is essential to monitor the vegetation recovery process in the forest areas for prevention of further disasters and rehabilitation of the forest. This study assesses the vegetation recovery process in forest areas after the 2018 Hokkaido Eastern Iburi Earthquake using satellite and aerial remote sensing approaches and field-based investigations. This research targets approximately 1.3km2 area of the forest area in Apporo, Atsuma Town in Hokkaido. The author used high-resolution multispectral imagery captured by satellites (Sentinel-2) and unmanned aerial vehicles (UAVs: DJI P4 Multispectral and DJI Mini) to classify land cover and to monitor the recovery status of the forests therein after the earthquake. For the land cover classification, along with the visual identification, the random forest algorithm was applied for the wide area, and seven classes were mapped in this area: five tree species, grass, and land. Field investigation was also performed to check the dominant species in the forest area. UAV-based multispectral imagery collected during spring, summer, and autumn, three seasons from 2021 to 2022, and Sentinel-2 imagery selected from 2017 to 2021 were used to analyze the Normalized Difference Vegetation Index (NDVI) and Normalized Difference Red Edge Index (NDRE) values of each vegetation class for vegetation recovery assessment. Satellite images were mainly used to observe annual changes over years before and after the earthquake, while UAV images were used to analyze seasonal changes for 2 years in the post-earthquake period. As a result, this forest area was appeared to be dominated by five species: Sinanoki (Tilia L.), Honoki (Magnolia L.), Mizunara (Q. mongolica Fisch.), Konara (Quercus L.), Harigiri (Kalopanax Miq.), with an overall accuracy of more than 80% for the tree species classification. The NDVI values calculated by Sentinel-2 images showed vegetation was largely affected and deactivated by the earthquake and coseismic landslides in 2018, recovered significantly in 2019, and returned to the pre-earthquake levels of NDVI values in 2020. The NDVI and NDRE indices of each species were calculated by multispectral UAV imagery from 2021 to 2022 showed that, compared with NDVI, NDRE is less sensitive to changes in vegetation. The changes in NDVI and NDRE also showed that tree species have different recovery rates. The reasons for different recovery rates were considered to be different preferable habitats for different species, mainly affected by topographic and hydrological factors.This study will provide helpful information for forest rehabilitation to optimize the vegetation restoration strategies after the earthquake.