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| **Type the title of your abstract** **Mapping of Forest Structural Patterns by GEDI, Sentinel-1 and 2** |
| **Introduction/Aim:** Forest ecosystems are complex, varying both spatially and vertically. Understanding Forest Structural Patterns (FSP) is crucial for estimating forest biodiversity and habitat suitability, as well as managing plantation and secondary forests. While satellite remote sensing techniques can map basic forest environment aspects such as vegetation coverage and canopy heights from space, comprehensive FSP mapping remains a challenge. Recent advances use foliage height diversity as a measure to quantify complex vertical characteristics of forests, but FSPs are often overlooked.To address this, we developed a new technique for clustering FSPs.**Methods:** Global Ecosystem Dynamics Investigation (GEDI) L2A product was used. We treated the foliage vertical profile, calculated from relative height measurements, as unidirectional data and applied it to dynamic time warping (DTW) that is a widely used method for aligning sequences. We used the calculated DTW distances to measure the similarity of the foliage vertical profiles. These DTW distances allowed us to classify the profiles using a k-Medoids unsupervised classification.We grouped all FVPs from GEDI observation points into three clusters: *Tall crown-rich pattern, midstory-rich pattern*, and *understory-rich pattern*. These clusters were then spatially estimated using a Random Forest classifier from Sentinel-1 (VV and VH) and -2 (Band 1-12 and enhanced vegetation index: EVI) variables. We demonstrated this technique in Nikko-city, Japan, where a comprehensive tree species dataset is publicly available.**Results:** We mapped the FSP at the spatial resolution of 10 m in the study area. The pattern does not correspond to that of species distribution, indicating that the FSP may represent the different aspect of forest ecosystem. The results revealed interesting characteristics hidden in the vegetation cover or canopy heights, providing a new insight of monitoring forest ecosystem.**Conclusion:** The forest structural patterns map has a potential to be a planetary variable to represent an aspect of forest ecosystem. As our approach only uses satellite-based observation data (lidar, SAR, and optical) and doesn't require costly manual measurements, it can be extended for large-scale mapping in future works. |

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