Forest fire detection in the low biomass dry forest with JICA-JAXA Forest Early Warning System in the Tropics (JJ-FAST).

*Manabu Watanabe[1], Christian Naohide koyama[1], Masato Hayashi[2], Izumi Nagatani[2], Takeo Tadono[2], Masanobu Shimada[1,2]

1. School of Science and Engineering, Tokyo denki university, 2. JAXA/EORC

JICA-JAXA Forest Early Warning System in the Tropics (JJ-FAST, [1]) is first and only one SAR-based deforestation detection system monitoring tropical forest globally. The JJ-FAST started from November 2016, and has a merit to operate not only in dry season, but also in rainy season. The current system uses change of gamma_0 for deforestation detection. Watanabe et al. [2] pointed out the JJ-FAST detected not only the deforestation sites, but also detected severely damaged forest fire sites occurred in a dense forest. In this paper, detectability of forest fire in the low biomass dry forest with JJ-FAST system were examined.

JJ-FAST detected 168 deforestation sites between Nov. 11 and Dec. 23, 2018 in South Africa. MODIS burned area product [3] obtained between Oct. 10 and Dec. 31, 2018 were overlapped and confirmed that the almost all the polygons detected by the JJ-FAST deforestation detection algorithm were overlapped with the burned area detected by MODIS. The forest fire area were also identified by Sentinel-2 data. BBC news [4] reported severe wildfire occurred in George, South Africa on Oct. 30, and the area was also coincident with the one detected by the JJ-FAST algorithm. The JJ-FAST algorithm also detected 82 deforestation sites in Mozambique between Aug. 13 and Nov. 5, 2018. These sites were also overlapped with the MODIS burned area. From these facts, we concluded that the current JJ-FAST deforestation detection algorithm could detected severely damaged forest fire area in the low biomass dry forest. It is known that forest fire in dense forest is detected by increase of radar backscattering in HH polarization [2]. This is explained that forest fire makes forest canopy dry and induces more double bounce scattering, implying the increase of backscattering in HH polarization. In the case of low biomass dry forest, forest fire makes forest canopy dry and induces lower volume scattering in a tree canopy layer, implying the decrease of backscattering in HV. The decrease of volume scattering also occurred in the dense forest. But higher density of burned trees left on the ground still induces brighter radar reflection in HV and make it difficult to detects the forest fire sites in HV polarization.

[1] JJ-FAST, http://www.eorc.jaxa.jp/jjfast/jj_index.html, accessed on February 17, 2019

[2] Manabu Watanabe, et al., A possibility of forest fire site detection by JJ-FAST system

[3] https://modis.gsfc.nasa.gov/data/dataprod/mod45.php, accessed on Feb. 17, 2019

[4] https://www.bbc.com/news/world-africa-46029553, accessed on Feb. 17, 2019

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