MONITORING OF TROPICAL TREE CROPS BY JERS-1 AND ERS-1 SAR DATA

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While many reports have been published on radar backscatter characteristics of coniferous and deciduous tree types, little work appears to have been done on investigating the backscatter properties of palm trees. In this study, JERS-1 LHH band and ERS-1 CVV band SAR data have been acquired over parts of Kedah and Penang states in West Malaysia in order to investigate the radar backscatter properties of two common tree crops in the tropical region with significantly different structures. RTraditionalS deciduous tree s are here represented by rubber trees, while palm trees are represented by oil palms.

Results show that the radar backscatter for the deciduous rubber trees - for both JERS-1 and ERS-1 - appear to behave in accordance with what has been reported earlier for coniferous and deciduous trees, that is, scattering on trunks, branches and twigs at L-band and scattering in the canopy at C-band. The JERS-1 backscatter shows limited correlation with the rubber growth up to a level where the signal saturates. This corresponds to an intermediate growth stage where the trees have reached a height of about half that of fully grown rubber trees (~20 m). The bio-physical parameter that correlates best with the L-band response is the average stand height. Not surprisingly, ERS-1 C-band data display poor correlation with the growth of rubber trees and depending on the conditions of the soil and under cover vegetation, even cleared areas are often difficult to distinguish from mature plantations.

Oil palms, with their characteristic straight, rough trunks and large umbrella shaped crowns, on the other hand affect the radar signal differently at both L- and C-band. At L-band, scattering in large crown is the dominating backscatter mechanism, with little or no penetration through the thick canopy. This results in poor correlation with trunk height or above ground biomass. Crown related factors such as Leaf Area Index and frond length correspond best to the radar response, with the developed. In contrast to the poor correlation with rubber growth, C-band backscatter displays strong correlation with the growth of the palm trees. The C-band response is almost identical to that for L-band, i.e. scattering on the large crown and saturation for a closed canopy.

Distinction between the two tree species (for stands above the saturation level) is feasible at both frequencies, although C-band data displays slightly better results due to a larger difference in the saturation levels between the two species.