EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations (IP)

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CONTINENTAL SCALE WOODY VEGETATION MONITORING FOR GREENHOUSE GAS ACCOUNTING

Abstract

Australia uses earth observation data for monitoring land use and land cover changes for reporting greenhouse gas emissions and removals from the land sector. Land sector is an important source of emissions in Australia and globally it contributed 19 per cent of emissions since 1990. Satellite data acquired by the first Landsat satellite launched in 1972 to the most recent Landsat 8 have been used to monitor changes in woody vegetation cover over the entire continent. The monitoring system, developed in early 2000s in collaboration with CSIRO, has been subject to continuous improvements including recent enhancements using Landsat 8 surface reflectance data obtained from Geoscience Australia's Data Cube. Australia has demonstrated use of satellite data for reporting of emissions and removals under the Kyoto Protocol first commitment period (2008-2012). Under the Paris Agreement, Australia has elected additional activities - grazing management, crop management and revegetation, which require additional information. For this purpose, we have expanded the existing system to be able to monitor sparse perennial woody vegetation with a canopy cover less than 20 per cent. A new 3-class classifier has been developed using a combination of spectral and texture measures to estimate an initial class membership probability image for each year of Landsat data collected from 1988 to 2016. A conditional probability network (CPN) analysis is conducted on the entire time series to create a multi-temporal classification which produces yearly change maps showing land conversions between non-woody, sparse woody and forest. All change pixels, representing loss and gain of woody vegetation, are then visually assessed by experienced interpreters, supplemented by high resolution data, to identify human induced land use changes. Confirmed land use change locations are ingested into a custom built, hybrid ecosystem model - Full Carbon Accounting Model (FullCAM) - to estimate emissions from land clearing and removals from forest regrowth. Recent improvements have led to substantial changes in delineating sparse woody and low density forest cover especially around 20 per cent canopy cover, resulting in reclassification of additional lands as forest clearing, which were previously reported as sparse woody vegetation clearing. Final results indicate that most of the additional land clearing is re-clearing of previously cleared, low biomass forests. In 2015, the area of primary forest converted to other land uses was estimated to be 56,000 hectares, down by 90 per cent from an estimated 600,000 hectares in 1990.