Building on well developed continental and regional optical remote sensing capabilities over last three decades, the team have conducted novel research into radar remote sensing techniques and their applications for agriculture mapping and environmental monitoring.

Digital Surface Model (DSM) from TanDEM-X Imagery

The very high resolution TanDEM-X (TDX) Spotlight data were used to generate DSMs for Perth City. Detailed comparisons of DSMs from TanDEM-X Stripmap and Spotlight mode data and 1 arc-second SRTM, 5m the stereo mapping satellite ZY-3, 0.2m Urban Monitor products from aerial photography can be observed in Figure 1. The Stripmap 5m DSM has shown significant improvement comparing to 1 sec SRTM DSM. The Spotlight 5m DSM has a comparable or better accuracy than the 5m ZY-3 DSM. The Spotlight 2m DSM shows even better accuracy. The relative height accuracy of the 2m Spotlight DSM is about 0.7m.

Rangeland Pasture Biomass Mapping

A pilot study in Spyglass Queensland has demonstrated that combining the available multi-wavelength (X-, C- and L-band) and multi-polarisation radar remote sensing data can provide useful information on pasture biomass distribution for rangelands. More accurate pasture biomass information were derived from C- and X-band cross-pol data. In particular, the combination of C-band, X-band and L-band data enables the landscape to be more accurately stratified into land cover types, which improves the biomass calibrations against field data.

Improved Crop Extent Mapping

For development of crop monitoring system utilising the freely available and broad-coverge Sentinel-1 C-band data, an investigation of Sentinel-1A time series combining Landsat-8 imagery for wheat crop mapping were carried out. A workflow from SAR data pre-processing to crop classification maps was developed and validated. Crop extent maps for the Warracknabeal test site in the western Victoria were produced. Initial polarimetric analysis, using phase information in addition to intensity of SAR data, provides potential for improved crop classification using single date Sentinel-1 data.

Forest / Non-forest Discrimination

Multi-temporal methods developed as part of Australia’s National Carbon Accounting System (NCAS) were used for the integration of Landsat and ALOS PALSAR data. To highlight specific operational aspects of the multi-sensor framework, this approach was demonstrated over Tasmania, one of seven national demonstrator sites defined by the Forest Carbon Tracking task of the Group on Earth Observations (GEO-FCT). L-band data are found to provide most of the forest discrimination in combination with Landsat (Figure 4).

Summary

CSIRO is ready to use Sentinel-1 and other data sources to develop credible methodologies for agriculture, environment, resource and marine applications in Australia and regional countries.

Remote Sensing & Image Integration Team together with CSIRO SAR CoP (Community of Practice) can assist you with any remote sensing solutions.