

# THE USE OF AIRSAR DATA FOR ASSESSING THE POTENTIAL OF FUTURE SPACEBORNE SAR FOR REGIONAL ESTIMATION OF WOODLAND BIOMASS IN AUSTRALIA

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## KEY WORDS:

## ABSTRACT

With the expected launch of polarimetric spaceborne Synthetic Aperture Radar (SAR) sensors over the next few years, namely ENVISAT ASAR (C band) and PALSAR (L band), there is an opportunity for regional estimation of forest and woodland biomass in Australia. However, due largely to political pressures, there is an increasing need to provide reliable estimates of Australia's greenhouse gas emissions resulting from changes in vegetation biomass within a relatively short timeframe. For this reason, the use of existing Landsat-based methods for biomass estimation is likely to continue, despite the known limitations of optical sensors for this purpose and the demonstration internationally of the benefits of SAR. This approach is, however, justified given the uncertainty in the potential use of future SAR sensors.

To address this uncertainty, research was undertaken to investigate how current airborne SAR sensors may be used to assess the potential of future SAR sensors for biomass estimation. This was undertaken by comparing relationships established with above ground/component biomass and NASA JPL AIRSAR data with those established with existing spaceborne SAR data at similar wavelengths and polarisations.

The study was conducted in an area near Talwood, southern Queensland. Ground estimates of above ground and component biomass were generated by applying a range of allometric equations to tree size measurements collected, in 1998 and 1999, from 44 fixed and variable area plots. Relationships were then established between total/component biomass and Japanese Earth Resources Satellite (JERS1) SAR L band HH, Space Shuttle Imaging Radar (SIR-C) SAR C band VV and L band VV, and NASA JPL AIRSAR C band VV, L band VV and fully polarimetric P band data, all acquired over the period 1994 to 1996.

The study indicated saturation of C, L and P band data at all polarisations occurred at an above ground biomass of approximately 20-30 Mg ha<sup>-1</sup>, 60 Mg ha<sup>-1</sup> and 80-100 Mg ha<sup>-1</sup> respectively. Different SAR wavelengths were also shown to interact with different components of the biomass. Furthermore, the saturation levels and relationships observed were relatively consistent between sensors. The study concluded that the AIRSAR can be used to determine the likely potential of future spaceborne SAR sensors for biomass estimation. Furthermore, the added benefits of using SAR for biomass estimation, and hence for better quantifying greenhouse gas emissions from land use change and forestry, are argued.