Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00317, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00317
EGU General Assembly 2008

Comparing predictions of soil organic carbon by field vis-NIR spectroscopy and hyperspectral remote sensing

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Remote sensing data might be an important tool for acquiring soil properties information for areas where the soil surface is permanently or temporarily exposed. Providing detailed spectral signature for every pixel, hyperspectral imaging spectrometry can be potentially used to identify the nature and abundance of some soil surface components. Visible-near infrared (vis-NIR) reflectance spectroscopy in the laboratory has been reported to provide accurate prediction of Soil Organic Carbon (SOC) content. Spectroscopy can be used to enhance or replace conventional methods of soil analysis, as it overcomes some of their limitations. Reflectance spectroscopy is rapid, timely, less expensive, non-destructive and sometimes more accurate than conventional analysis. This paper aims to (i) evaluate the potential for measuring SOC using the Hyperion hyperspectral satellite remote sensor (400–2500 nm) and (ii) compare these to predictions of SOC made using field-collected vis-NIR spectra. In both instances partial least-squares regression (PLSR) was used to relate spectral measurements to SOC contents. This study was performed in the Narrabri region of north western NSW, Australia.

This study demonstrates that (a) when the SOC content is lower than 1%, spectroscopic prediction accuracy decreases, (b) SOC content predictions using the field vis-NIR spectra are only slightly better than those from the hyperspectral remote sensing data and (c) the SOC prediction results obtained from Hyperion data show similarities with the field observations. The SOC map obtained using Hyperion hyperspectral

remote sensing data is very encouraging. Hyperspectral remote sensing approach is promising for SOC mapping and could reinforce the development of digital soil mapping methods and is very useful for soil carbon accounting.