

**Regolith and Landscape Evolution in Arid Australia:
New digital approaches and methods for continental scale
investigations.**

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ABSTRACT

This study has developed a digital data-collection model and software for regolith-landform mapping from local to continental scales. The system has been applied to collect a wide variety of new regolith data across Australia. The model determines the content required in custom software extensions written during this study to add new capabilities to existing commercial GIS software. These extensions allow the commercial GIS software to collect new and suitable data for quickly making regolith-landform maps and atlases of regolith materials for large areas of Australia and for collecting data suitable for establishing the age of a variety of regolith materials. Research identifies Personal Digital Assistants (PDAs) as the best hardware on which to deploy, test and operate this extended commercial software.

The design prerequisites were speed and ease of use, low cost, high storage capacity, highly GIS compatible data structures, pull-down menu attribute selections, standardised attribute look-up tables, system reliability, and field ruggedness. This system provides the best and fastest method for mapping at scales from local to continental.

The data collection system has been designed to allow frequent modification to maintain or improve its performance. Redirecting data to external storage cards reduces the volume of data stored in the PDA's limited internal storage capacity and improves performance. Where possible, keeping data formats compatible with changes in commercial GIS software produces further improvements. During development, each modification to the data-collection system required field-testing. Field-testing took place in three large field regions in Western Australia, South Australia and the Northern Territory. Recent work in Queensland provided extra opportunities for additional field-testing. Field mapping of large areas of the Eastern Goldfields in Western Australia, smaller areas of the Gawler Craton South Australia, the entire Northern Territory and reconnaissance mapping of Queensland were an integral part of large area field-testing of the digital data-collection system designed in this research.

The total area of the Australian continent is 7.7 million km². The regolith research in this study draws from an area of approximately 2.3 million km², or approximately 30% of the Australian continent. Maps showing the distribution of a

wide range of regolith materials are now available in each study area across Australia because of this research. The maps relied on information contained in regolith-landform mapping case histories assembled during this research. Pilot programs that determined the ages of some regolith materials provided new information about the ages of regolith in WA and NT.

A major upgrade in 2006 of the commercial software used in this research resulted in extensive, major revisions of the digital data model's initial structure and its mode of interaction with the commercial GIS software. Changes in the data model meant changing the custom software extensions developed in this research. As a result, the upgraded regolith digital data system overextended the PDA's computing capacity such that computing speed suffered unacceptably. Upgrading the PDA resolved the problem and produced better overall performance. The new PDA has better memory management, a faster processor speed and higher screen resolution than its predecessor. These non-trivial revisions and upgrades helped to produce a better, faster digital data collection system.

The regolith digital data collection system is now fully developed but it will continue to require changes if commercial software and PDAs are revised. Such changes will be unavoidable. The new digital techniques and approach to mapping and characterising regolith arising from this research provide large volumes of high quality data better and faster than before. Data collected with this system complies with Geoscience Australia's national database standards and those of commercial GIS software. New continental scale regolith maps and atlases will offer mineral explorers opportunities to gain new insights into the complexity and diversity of Australia's regolith.

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