which has a sharp (disconformable?) contact with the underlying Petermann Sandstone. Limonite staining after pyrite is common and the sandstone has poor to very good visual porosity.

About 10 km southwest of the initial drillhole, a second stratigraphic drillhole, BR05DD01, intersected 1225 m of Neoproterozoic section. The deepest intersection, the Loves Creek Member of the Bitter Springs Formation, is 700+ m thick and comprises mainly dolostone (silty and occasionally oolitic packstone and wackestone) with occasional black shale, chert and sandstone in the upper section; evaporites become more common with depth. Some vuggy carbonates below 900 m have fair visual porosity, but substantial source rocks are lacking. Unconformably overlying the Bitter Springs Formation is 48 m of massive diamictite belonging to the Areyonga Formation. The upper few metres of this succession is shaly and conglomeratic, and grades into silty mudstone of the Pertatataka Formation, which is 480+ m thick. Black shale of the Aralka Formation is missing in this well. The lower Pertatataka Formation comprises pale-dark grey and chocolate-brown silty mudstone interspersed with thin, upward-fining, occasionally sandy layers, interpreted as turbidites, which are 2–10 m thick but have very poor visual porosity. The top 150 m of the intersected section comprises mainly chocolate-brown silty mudstone and evaporites.

Geochemical analysis of the Pertatataka Formation failed to reveal Total Organic Carbon contents above 1%, as is the case in other parts of the basin, and these may represent depleted source rocks. Further work is required to resolve this and also the nature and source of a small, live oil bleed located in the lower Pertatataka Formation.

It is relevant that the most important Neoproterozoic petroleum system in the basin, the Gillen Member of the Bitter Springs Formation, has not been intersected in the western portion of the basin and the extent and significance of this petroleum system remains unknown.

Northern Territory regolith project:
A successful completion
Mike Craig

This abstract outlines the aims, deliverables, scope, major activities, products, achievements and impacts of the recently completed and highly successful collaborative project on the Regolith-Landscape Framework of the Northern Territory. Staff from the Northern Territory Geological Survey (NTGS) and the Cooperative Research Centre for Mineral Exploration and Landscape Environments (CRC LEME) began a seemingly mammoth collaborative task of documenting and describing the character, distribution and variability of regolith throughout the Northern Territory, on a regional scale not previously undertaken. It has taken twenty-seven months for the team to reach the goals it set in mid 2003.

Aims

The Northern Territory (NT) Regolith Project was designed to establish a regolith-landforms map (1:2.5 million scale), to be supported by a Regolith Materials Atlas, describing how regolith materials vary in appearance, where they can be expected to occur and what their broader identifying characteristics might be. A wide variety of local regolith materials, suitable for addressing the diverse needs of mineral exploration and land management, were to be characterised, and if possible, major landscape domains and their associated weathering history and evolution were to be fitted into the emerging broader geochronological framework of the Australian regolith.

Major project activities and products

1. The generation of a regolith-landforms map of the Northern Territory at 1:2 500 000 scale (Figure 1).

2. The conducting of a trans-NT regolith traverse, to set the scene for a more detailed investigation of the nature and distribution of regolith and associated landforms throughout the NT (Figure 1).
3. The study of major regolith terrains to better characterise the regolith and landform variations throughout the NT (Figure 3).

4. The conducting of a regolith materials and mapping workshop, in Darwin, following on from the NTGS “Gabfest” (18–21 January 2004), to an audience of NTGS staff and invited industry representatives. The workshop focused on regolith materials and mapping techniques, and was presented by Mike Craig, Ravi Anand and David Gray.

5. The distilling of a wide range of regolith information from within the project activities, sufficient to construct an atlas of NT regolith materials (Figures 4 and 5).

6. Using palaeomagnetism in a pilot study, begin to establish a geochronology of oxidation events using surface and mine exposures of the NT regolith and fitting this information into the emerging wider Australian regolith geochronology (Figures 6 and 7).

7. Providing, at project closure to NTGS, a copy of the detailed Geographic Information System (GIS) of regolith-landforms and material attributes constructed.

8. Providing a summary project report.
Project achievements

Formal project work has now ended. The team has achieved the following significant milestones:

1. The NT regolith project has produced a regolith-landforms map (1:2.5 million scale) of the entire Northern Territory (generated from a more comprehensive working GIS detailing the Northern Territory regolith). The hard-copy map is a much needed companion to other Territory-wide maps at 1:2.5 million scale. Note that much more detail can be extracted from the project’s working GIS.

2. The regolith atlas is now complete and is a key milestone in providing critical information in support of the NT regolith-landforms map and the detailed NT regolith GIS. It conveys information to explorers, land use managers and others about the nature and distribution of the NT regolith; how the wide assortment of regolith materials varies in appearance; and broader identifying characteristics, including geochemistry. The atlas will become an indispensable field reference for those needing to know about the Northern Territory regolith.

3. A pilot palaeomagnetics sample program was successfully conducted to help address the issue of a lack of age control in NT regolith materials and landforms. Overall palaeomagnetic ages range from 2 Ma in a weathering profile along the Darwin foreshore to 295 Ma in a road cutting at Tennant Creek. A small cluster of ages occurs around 5–10 Ma, from samples taken from the hinterland of the Darwin coastal plain. A single age of 47 Ma comes from near Glen Helen Gorge west of Alice Springs. Project results generally fall within three major age clusters determined from a very much larger range of samples being amassed by Brad Pillans (pers comm). In view of the results of our pilot program, a much clearer understanding of the timing of NT regolith, weathering and landscape development can be derived from a more focused palaeomagnetic age determination program across the Territory, and would be a welcome addition to the understanding of the NT regolith.

Impacts

The project’s products provide the Northern Territory with the first comprehensive, structured regional account of:

• regolith-landforms, in terms of variability and distribution, from 1:300 k to 1:2.5 million scales
• regolith material characteristics from mesoscale through to microscale
• broader regolith geochemistry
• the beginnings of a systematic oxidation event geochronology.

The detailed regolith-landforms GIS and the pictorial atlas of regolith materials represent a valuable new source of information that will help foster mineral exploration and land management decisions within the Territory by providing a better understanding of its regolith. This work contributes significantly to building a better integrated and more substantial underpinning for geoscientific work in the Territory.

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Acknowledgements
The Cooperative Research Centre for Landscape Environments and Mineral Exploration (CRC LEME) is an unincorporated joint venture between Geoscience Australia, CSIRO (represented by the divisions of Exploration and Mining, and Land and Water), Australian National University, Curtin University of Technology, Adelaide University, NSW Department of Primary Industries, Primary Industries and Resources of South Australia, and Minerals Council of Australia, established and supported under the Australian Government’s Cooperative Research Centres Program.

References

New geochronological data from the Tennant Region
David Maidment, Lex Lambeck, David Huston and Nigel Donnellan

The Tennant Region consists of three provinces that record a sedimentary, igneous and deformational history spanning the interval 1.86–1.71 Ga (Donnellan 2005). The central Warramunga Province (formerly Tennant Creek Block) is bounded to the north by the Ashburton Province and to the south by the Davenport Province. SHRIMP U-Pb zircon geochronological data have been collected from the Warramunga and Davenport provinces as part of a larger project to better constrain the timing of sedimentation, tectonism and mineralisation, and establish correlations with other elements of northern Australia (Claué-Long et al 2005).

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