

# Ecosystems earth observation

## Remote sensing expert group for basic and applied ecosystem research

CSIR Natural Resources  
and the Environment

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### Remote sensing of natural resources

The CSIR Ecosystems Earth Observation research group (Eco EO) specialises in remote sensing of natural resources, including:

- provision of comprehensive spatial data (remote sensing and GIS) support, specifically in terms of imaging spectroscopy, structural, and multi-temporal sensing, as well as spatial modelling support to address institutional strategic research initiatives;
- playing a leading role in directing remote sensing research at the CSIR and tailoring current institutional environmental research efforts to cutting-edge initiatives in terms of remote sensing strategic thinking;
- providing remote sensing research leadership and promoting the science at national level;
- continuously striving to deliver high-impact peer-reviewed research outputs; and
- actively contributing to the national human capacity development in terms of remote sensing and general spatial technology expertise.

### Expertise

Eco EO conducts basic-towards-applied and core applied remote sensing research towards improved understanding, management, and monitoring of natural resources. The group addresses the niche that exists between ecosystem scientists or managers and the need for accurate, spatially explicit, and accessible system state information across various scales. This is achieved through close collaboration with experts in the natural resource domains and by developing current and extending future remote sensing scientific capacity.

### Science themes

#### Integrated system modelling

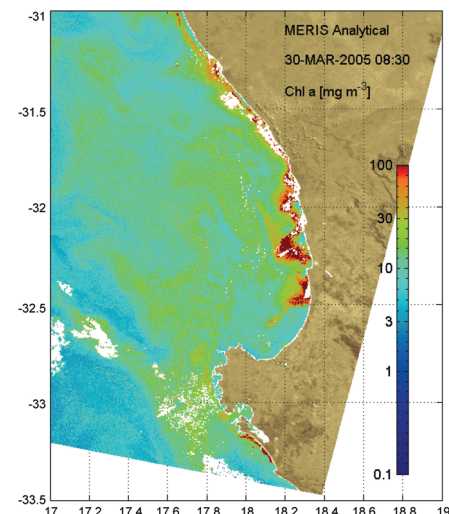
"Integration" can be viewed in two ways in context of this theme: (i) integrated inputs to system modelling and (ii) integration of systems in modelling approaches.

Key to integrated system modelling is the treatment of environments as systems, with definable inputs, processes and outputs. The goals thus become to (i) define the inputs required to derive the specified outputs, (ii) the monitoring strategy during the course of a system cycle, and (iii) adapting inputs (steering) to such a system towards optimal outputs.

#### Oceanographic sensing systems

This theme is in support of the intended establishment of a South African multi-institutional marine remote sensing unit by the end of 2009. This world class facility will have the mandate to serve as a portal and a southern African hub for all marine remote sensing information, products and services, by providing for both research and operational marine remote sensing needs, using a standardised open spatial infrastructure data archiving and metadata system. Its mandate would be contextualised within related international and regional earth observation developments, specifically the Global Earth Observation System of Systems (GEOSS), the South African Earth Observation Strategy (SAEOS), and the South African Environmental Observatory Network (SAEON).

#### Monitoring of harmful algal blooms

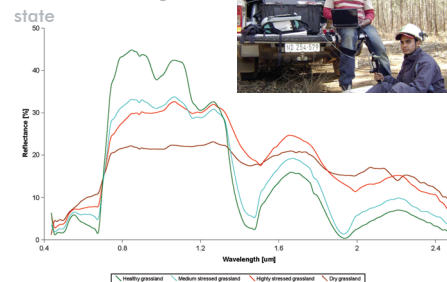


#### Ecosystem state monitoring

This theme encapsulates a broad science scope, ranging from land degradation (e.g. desertification, bush encroachment, productivity loss) to assessment of ecosystems services at large scales. Monitoring of several Southern African ecosystems are of concern and relates to adoption of ongoing remote sensing project work within the CSIR for single ecosystems, (e.g. savanna systems or forests), or developing

operational monitoring systems for ecosystems without current initiatives, (e.g., coastal mangrove forests). The aim is to provide a tool for efficient ecosystem management under current and future land use and climate change scenarios.

#### Imaging spectroscopy assessment of vegetation state



Research within EcoEO is conducted in interdisciplinary fashion amongst remote sensing and ecosystem specialists within the CSIR (including the Natural Resources and the Environment operating unit and the Meraka Institute), various universities (e.g., University of the Witwatersrand, University of Venda, University of KwaZulu-Natal), and other institutions (e.g., National Aeronautics and Space Administration (NASA), German Aerospace Center (DLR), South African National Biodiversity Institute (SANBI), Agricultural Research Council (ARC), Mondi BP, Department of Water Affairs and Forestry (DWAFF) and many others).

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