



CSIRO LAND and WATER



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# Environmental Remote Sensing Research Group

Sentinel Bush Fire Mapping - Netscape 6

http://www.sentinel.csiro.au/mapping/viewer.htm

### SENTINEL Hotspots

Layers

- Hotspots By Date
- Last SatellitePass Data
- Hotspots last 12 Hours
- Hotspots 12 to 24 Hours
- Hotspots 24 to 48 Hours
- Hotspots 48 to 72 Hours
- Rail
- Water Courses
- Builtup Areas
- LatLon Grid
- MODIS Imagery
- Landsat Mosaic
- Base-Map
- Hill Shade

Rec#	Date/Time(UTC)	Latitude	Longitude	Satellite
1	2003-01-13 12:39:27	-36.488	147.811	terra
2	2003-01-13 12:39:27	-36.400	147.894	terra
3	2003-01-13 12:39:27	-36.402	147.887	terra
4	2003-01-13 12:39:27	-36.404	147.924	terra

IP: 192.168.1.100 / Images: 50 / Spans: 2003-01-13 17:23:50 (UTC) or 3:23:50 (Eastern Standard Time)

CDATA# - Longitude: 147.88, Latitude: -36.48 - ScaleFactor: 0.00775262903892226

## Research Group Profile and Activities

### Senior Scientists:

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**CSIRO** is Australia's **C**ommonwealth **S**cientific and **I**ndustrial **R**esearch **O**rganisation.

As one of the world's largest and most diverse scientific global research organisations our work touches every aspect of Australian life: from the molecules that build life to the molecules in space.

Working from sites across the nation and around the globe, our 6500 staff are focused on providing new ways to improve your quality of life, as well as the economic and social performance of a number of industry sectors through research and development.

These sectors are:

- Agribusiness
- Energy and Transport
- Environment and Natural Resources
- Information, Communication and Services
- Manufacturing
- Mineral Resources

Our home CSIRO Division is Land and Water. It's goal is to develop economically and socially responsible land and water management strategies, based on rigorous biophysical research. To achieve viable outcomes, we recognise that our science needs to be strongly integrated with social and economic factors.

In the pursuit of sustainable solutions based on systems understanding, we work in groundwater, rivers and floodplains, lakes and storages, estuaries and coastal lagoons, and on their surrounding landscapes. Our science spans spatial scales from paddock to catchment, and process scales from molecular to continental.

Water—its equitable allocation, quality and re-use—is at the core of our business. Water quantity and quality is dependant on how our waterways and their surrounding landscapes are used. Consequently, our science focus includes the influence of soils, different land uses (both urban and agricultural) and land management practices on cycling and transport of water, nutrient, carbon, salt and other pollutants.

CSIRO Land and Water focuses on four integrated thematic areas that reflect national and international research priorities. We also provide information on other major issues for land and water management in Australia.



The Environmental Remote Sensing Research Group at CSIRO Land and Water has been involved in the use of remotely sensed data for environmental applications and natural resource mapping for close to 25 years. We specialise on use of bio-geo-physical approaches to basic and sophisticated image analysis, and forward & inverse methods.

Our scientific approach is to use rigorous application of radiative transfer physics through water and atmosphere, combined with experience in vegetation stress monitoring, to develop new mapping algorithms that are scalable from imaging spectrometers systems to broad-band satellite sensor systems. For this reason we also have a strong emphasis and investment into quality ground verification and instrument development

### **Broad application areas:**

- Near Real-time emergency mapping and data delivery
- Regional mapping of tropical ecosystems through optical & radar data integration
- High resolution mapping of sensitive coastal ecosystems such as mangroves, seagrass and other submerged habitats
- Broad-scale mapping of optical water quality parameters
- Submerged object detection & bathymetry
- Monitoring of vegetation ‘health’ and stress in agricultural and natural ecosystems
- Environmental assessment and monitoring in mining operations and oil refineries
- New Sensor Calibration Validation

### **Specific Areas of Expertise are:**

- Use of fundamentals of *Imaging Spectroscopy* (hyperspectral remote sensing) to develop scalable algorithms for vegetation condition mapping, land use assessment, water quality assessment, seagrass and macro-algae mapping and coastal zone (mangrove) mapping.
- Analysis of multi-band, multi-polarisation Synthetic Aperture Radar image data and fusion with optical imagery for detailed assessment of vegetation composition, structure and biomass.
- Ocean Colour satellite sensor applications adapted to coastal and large inland waters
- Ground-based field verification and use of hand-held spectroradiometers, and related climatic, water quality, plant or forestry measurement methodologies
- Instrumentation development for ground-truthing and related remote sensing projects
- Specialised software development (ENVI-IDL) for image analysis
- GIS integration and mapping for natural resources assessment and near real-time emergency monitoring.
- Operationalisation & commercialisation of prototype sensors and methodologies

### **Background**

Since its inception almost 25 years ago, this group has had the mission to research the use of remotely sensed data for environmental monitoring, or as input to hydro-ecological models mostly in Australia. Early achievements were the first satellite-mapping project of the Great Barrier Reef of Australia, using Landsat MSS and TM

data in the early 1980s by Dr. David Jupp, and the development of image processing software called MicroBRIAN. Other projects used the NOAA-AVHRR, to map soil moisture in the 1 million square kilometre Murray Darling Basin of Australia, and airborne scanners such as the Daedalus-TM, to characterise the bi-directional reflectance and hotspot effects in forested systems, as a means to estimate forest height and structural characteristics.

Since the early 90's, the group has also undertaken a number of international projects and developed a number of applications and software tools for airborne hyperspectral mapping, with sensors such as *casi* (Compact Airborne Spectrographic Imager – Itres Calgary). Most projects of this nature have been in the form of 'proof-of-concept' studies or direct consultancies for measurements of water quality (chlorophyll, turbidity, blue-green algae), submerged benthic materials and major algae types. Some of these were the largest airborne hyperspectral sensor-based projects carried out at their time, worldwide.

The group has thus now acquired ample experience and international exposure in the fields of rapid ground deployment, field radiometry and logistics, airborne operations management, airborne survey with hyperspectral sensors, and advanced image analysis techniques. New software tools such as computer-assisted tree crown counting and spectral identification algorithms and atmospheric correction, have been implemented, which can be used in conjunction with high-resolution imagery (1 m pixels or less), to generate relevant statistics for forest management, biodiversity or ecological studies. Some of this experience, 'know-how' and specifically developed software has been 'packaged' and licensed for commercial use by Australian companies. We also carry out direct consulting services for environmental baseline mapping or new applications development for a range of local and overseas mining and oil-companies.

### **Current Projects**

The group runs a number of remote sensing projects in both the [Cooperative Research Centres for Tropical Rainforest Ecology and Management, CRC for Viticulture](#) and the [Cooperative Centre For Coastal Zone, Estuary and Waterway Management](#). These involve projects on the use of optical and radar sensors for monitoring rainforests, changes in mangrove ecosystems, grape health, water quality and benthic communities, including coral reefs.

*Regional State of the Wet Tropics [Satellite-based] Monitoring Information System.* Rainforest CRC – Cairns. Demonstration project & training to develop an operational information system on satellite-based Wet Tropics Heritage Area monitoring of various indicators.

*Adelaide Coastal Waters Study:* Demonstration project to highlight the use of airborne hyperspectral data to map seagrass diversity/condition and other benthic substrates off the coast of Adelaide.

*Rapid Emergency Mapping System:* Development of a prototype system, based on the daily-overpass MODIS sensor, for use in continental-scale bushfire and other emergencies mapping.

*Sugarcane R&D Corporation:* Development of a sugarcane yield forecasting system, which combines 20-years of satellite data, a crop growth models and climate forecasting techniques.

*Grape & Wine R&D Corporation:* Remote sensing-based methodologies for early detection of Phylloxera infestation in grapes.

Methodologies are currently being developed to combine various sources of remotely sensed data (e.g. airborne gamma radiometrics, reflective and radar) with digital elevation models, geology and climatic data. The objective is to provide new insight into catchment processes, and to aid in future regional assessment and management of land and water interactions. Long-term environmental change is being mapped through the use of time-series of satellite data.

*International Activities:*

The group has undertaken and is currently involved in numerous projects in Indonesia, Malaysia, New Zealand and in the US. Some of the consulting work has been under contract from with large companies such as PT Freeport Mining, Chevron International Petroleum, Ball Aerospace and Pacific Gas & Electric – California.

At the science level, the group is well regarded and is a frequent participant in international conferences and workshops. Australia is only one of three countries outside the US, taking part in verification and applications development for the NASA's Hyperion sensor on the EO-1 satellite. Dr. Held is a co-investigator in the CSIRO team leading this activity. Dr. Dekker is the Australian PI for international the European Space Agency's MERIS cal/val activities in this country and on a NEMO evaluation project with the Office of Naval research.

**Staff**

*Research scientists:* Dr. Alex Held, Dr. Arnold Dekker, Dr. Catherine Ticehurst, Dr. Vittorio Brando, Dr. Kadja Oubelkheir, Dr. Luigi Renzullo.

*Technical staff:* Ms. Janet Anstee, Mr. Guy Byrne, Mr Paul Daniel & Mr. Alan Marks

The group also hosts a number of post-graduate students and visiting academics from local and overseas universities, which are engaged in collaborative research.