



Australia – HyspIRI Partnerships

Alex Held, CSIRO

ARIES Scope (mid-1990's)

www.csiro.au



What is ARIES ?

**A Resources
Information
Company**



**Australian Resources
Information and Environmental
Satellite**

**Data Processing and
Information Extraction**



Environmental Monitoring



Agriculture



Mineral Resources

New Australian Space Research Program (\$40+m)

www.csiro.au

Commercial-in-Confidence

- Started July 2009
- Includes a Space Policy Unit
- Funding Stream A: Space Education Development Grants
- Funding Stream B: Space Science and Innovation Project Grants

Among many others in Australia, CSIRO is proposing 3 'hyperspectral' projects:

- 1. Continental-scale hyperspectral terrestrial, coastal mapping and monitoring program**
- 2. Development of a prototype thermal infrared (TIR) spectroscopy sensor**
- 3. Continental Cal/Val Program**



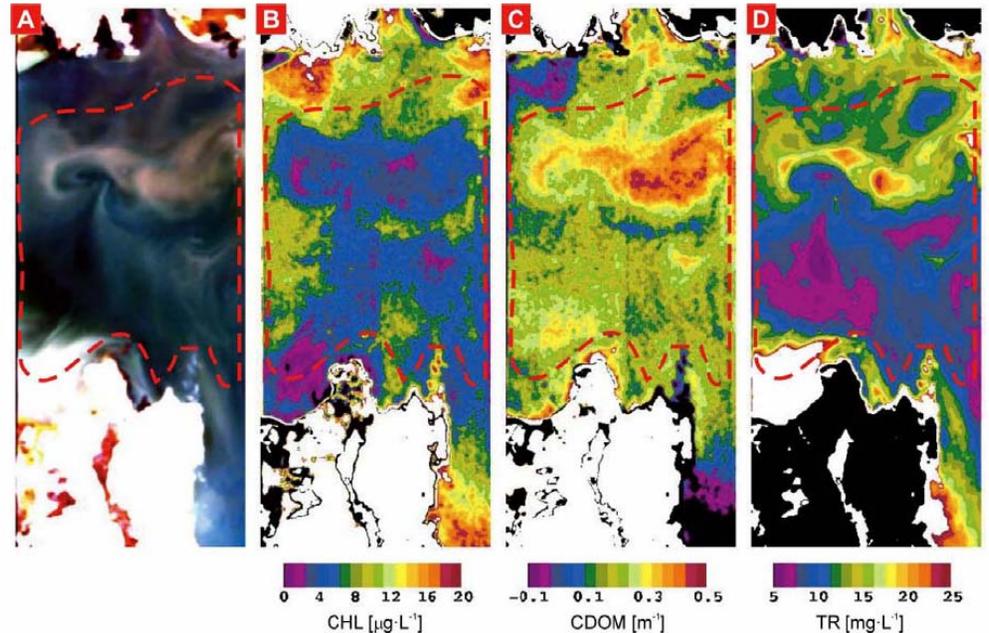
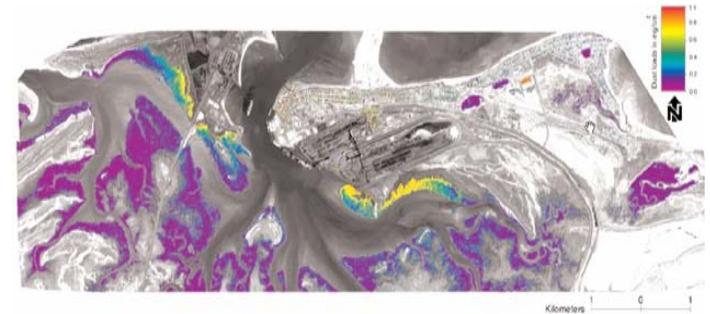
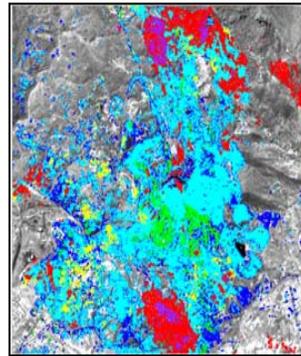
Australia and NASA HypsIRI

Our interests

CSIRO and Australian research community have an interest in future use of wall-to-wall, systematic data acquisitions of spaceborne imaging spectroscopy (hyperspectral) data for a wide range of national priority mapping and monitoring applications, which include:

- Geological Mapping and Exploration
- Coastal water quality monitoring
- Agricultural crop and condition monitoring
- Forest degradation monitoring
- Minesite and pollution monitoring
- Fuel type and fuel load mapping

New national programs such as projects under the ASRP, plus the “Terrestrial Ecosystem Research Network - TERN” (like the US NEON) and the “Integrated Marine Observing System – IMOS” provide excellent platforms for collaborations on improving ways to characterise land-surface dynamics and coastal & marine environments over Australian terrestrial and marine areas.



HyspIRI Collaborations/Partnerships

What can we offer:

- Extensive experience in Applications Development, as demonstrated during EO-1 Science Validation Team participation, and ongoing use of Hyperion data.

- Radiometric calibration/validation.

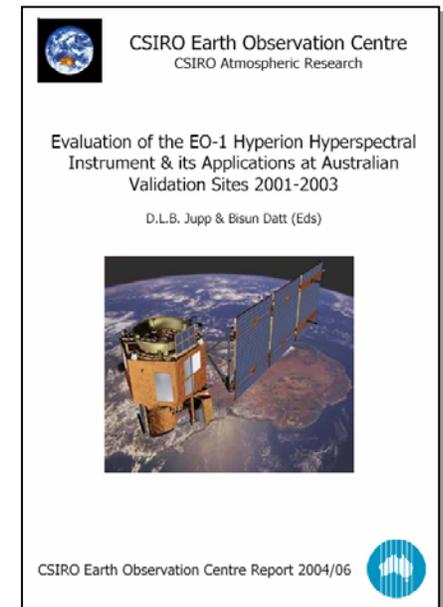
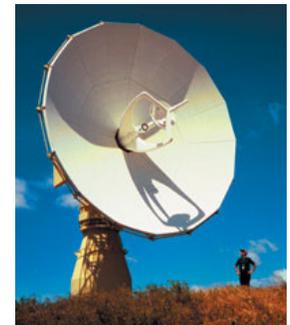
Lake Frome, Lake Fefroy, Lucinda Jetty, Lake Argyle

Heron Island, Ningaloo Reef, Colembally, Tumbarumba, Etc.



- Access to airborne data from Hymap and other imaging spectrometer data sensors

- Future direct-readout capabilities, and processing via X-, Ka-band stations (Hobart & Darwin)



HyspIRI – Australian Antarctic Division



Australian Government
Department of the Environment,
Water, Heritage and the Arts
Australian Antarctic Division

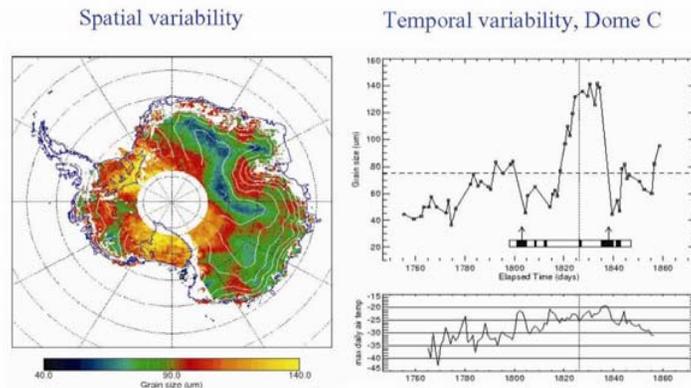
AAD interest:

- AAD has a strong ongoing interest in the large-scale mapping of surface properties (e.g. roughness characteristics & snow grain size) over the Antarctic Ice Sheet, & detection of changes in these properties.
- Application of HyspIRI data to small area surveys around field measurement sites on the East Antarctic Ice Sheet, to complement & calibrate/validate whole ice sheet studies using moderate-resolution satellite sensors e.g. AATSR.

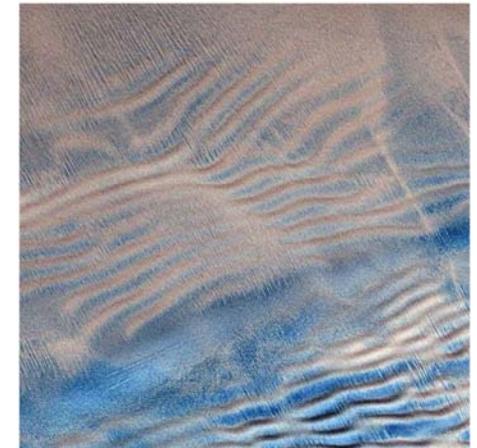
What AAD can offer:

- Measurements from in situ campaigns in East Antarctica for the cal/val of hyperspectral data acquired over the ice sheet.
- Considerable expertise in the analysis of long time series observations of surface properties over the ice sheet.

Snow grain size of Antarctic snow cover
[from ATSR-2 instrument (ERS-2 satellite) radiance measurements]



Ice sheet “mega-dunes” & wind lineations mapped using Landsat ETM/TM data as indicators of surface processes that modify the snow cover & hence impact on snow properties & trace materials incorporated into the snow / ice cover & subsequently measured in ice cores.



Courtesy Neal Young (AAD)

Courtesy Neal Young (AAD)



Australia hosts a large variety of sites and surface types for use in Vicarious Radiometric Calibration and for Level 2, 3 Product Validation

The central map of Australia is color-coded to represent different surface types and is annotated with the following locations:

- Darwin
- Jabiru
- Lake Argyle
- Cape Tribulation
- Lucinda Jetty
- Heron Island
- Moreton Bay
- Ningaloo Reff
- Birdsville
- Moomba
- Tinga Tingana
- Lake Frome
- Coleambally
- Canberra

The surrounding collage includes:

- Aerial view of a large blue lake (Lake Argyle).
- A red and white propeller plane.
- Aerial view of a dense green forest.
- A satellite view of a coastal area with a blue reef.
- A ground-based radiometric calibration site with a sensor on a tripod.
- A ground-based radiometric calibration site with a sensor on a vehicle in a field.
- A ground-based radiometric calibration site with a sensor on a flat surface.
- A 3D bathymetric map of a coastal area.
- A pier structure extending into a body of water.
- A mosaic of satellite imagery.
- Two people standing in a wetland area.
- A satellite view of a coastal area with a blue reef.



Operational
(Weather and Comms.)



Operational
(GPS Navigation)



Operational
(Weather, Oceans
Land-mapping)



**Semi-Operational
And Experimental**
(Weather, Oceans
Land-mapping, Environment
Atmosphere)

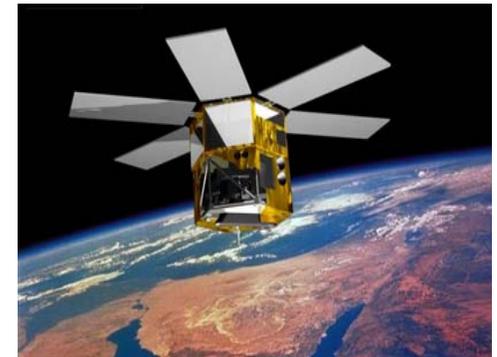


**Operational, Opportunistic
and Experimental**
(Coastal, Resources, Topo
Land-mapping, Precision Ag
Etc.)

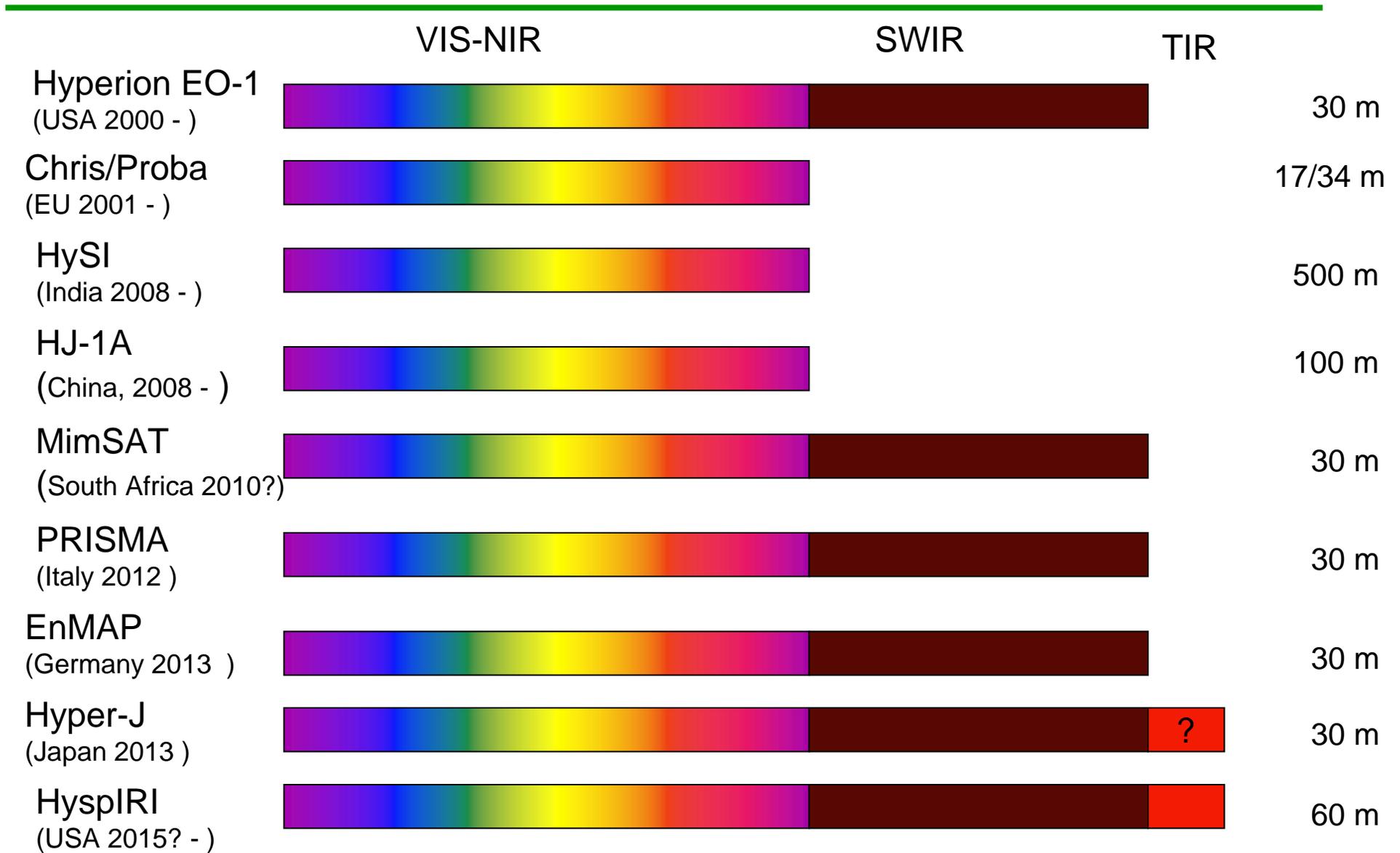


International Satellite Imaging Spectroscopy – ISIS Technical Committee

Co-Chairs: Alex Held, CSIRO - Australia
Karl Staenz - University of Lethbridge - Canada



Current and Planned Civilian Satellite Missions





Background

- The ISIS TC provides a forum for technical and programmatic discussion and consultation among national space agencies, research institutions and other spaceborne IS data providers.
- Main goals of the ISIS are to share information on current and future spaceborne imaging spectroscopy (“hyperspectral”) missions, and to seek opportunities for new international partnerships to the benefit of the global user community.
- An initial “ISIS Working Group” was established in November 2007, realising the large number of countries planning imaging spectroscopy (‘hyperspectral’) satellite missions with little mutual understanding and coordination.
- Meetings of the WG have been held in Hawaii (2007), Boston (IGARSS 2008) and Tel Aviv (EARSeL 2009).



Inaugural Meeting of ISIS WG

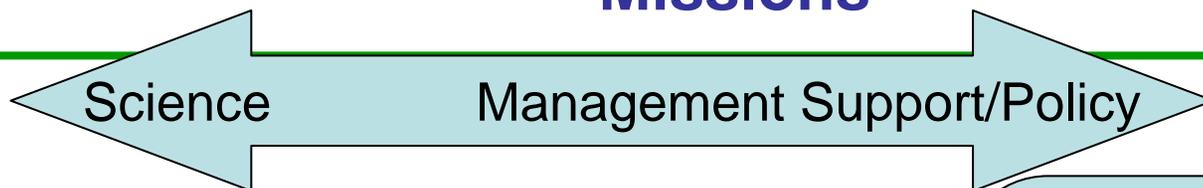
Hilo, Hawaii, November 2007



Bryan Bailey (USGS), Greg Asner (Carnegie), Bruce Quick (USGS), Andreas Muller (DLR), Joe Boardman (AIG), Karl Staenz (ATIC), Hermann Kaufmann (GFZ), Benoit Rivard (Univ Alberta), Steve Ungar (NASA), Jan van Aardt (CSIR), Hiroji Tsu (ERSDAC), DeWayne Cecil (NASA/USGS), Rob Green (JPL), Alex Held (CSIRO), Duke Takahashi (WSI), Stephen Ward (Symbios Communications), Nagamitsu Ohgi (JAROS),



Key Drivers/Arguments for Funding of National Imaging Spectroscopy Missions



Science Questions
Eg. HypIRI

- VQ1 - Pattern and Spatial Distribution of Ecosystems
- VQ2 - Ecosystem Function, Physiology and Seasonal Activity
- VQ3 - Biogeochemical Cycles
- VQ4 - Ecosystem Response to Disturbance
- VQ5 - Ecosystems and Human Well-being
- VQ6 - Surface and Shallow-Water Bottom Composition
- TQ1 - Volcanoes and Earthquakes
- TQ2 - Wildfires
- TQ3 - Water Use and Availability
- TQ4 - Human Health and Urbanization
- TQ5 - Earth Surface Composition and Change
- CQ1 - Coastal, Ocean, and Inland-Aquatic Environments
- CQ2 - Wildfires
- CQ3 - Volcanoes
- CQ4 - Ecosystem Function and Diversity
- CQ5 - Land Surface Composition and Change
- CQ6 - Human Health and Urbanization

**Standard
Level 2, 3
Global
Products**

**Commercial
????**

GEO 'Societal Benefit Areas':
Energy
Health
Agriculture
Water
Disasters
Etc.

National Priorities
Food Security
Water Security
National Security
Etc.

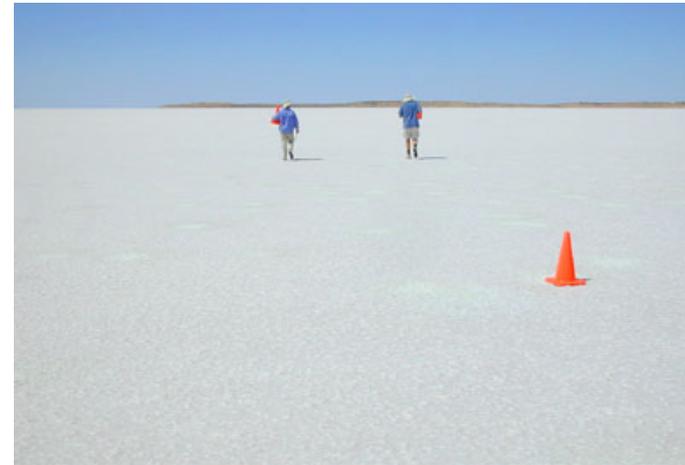
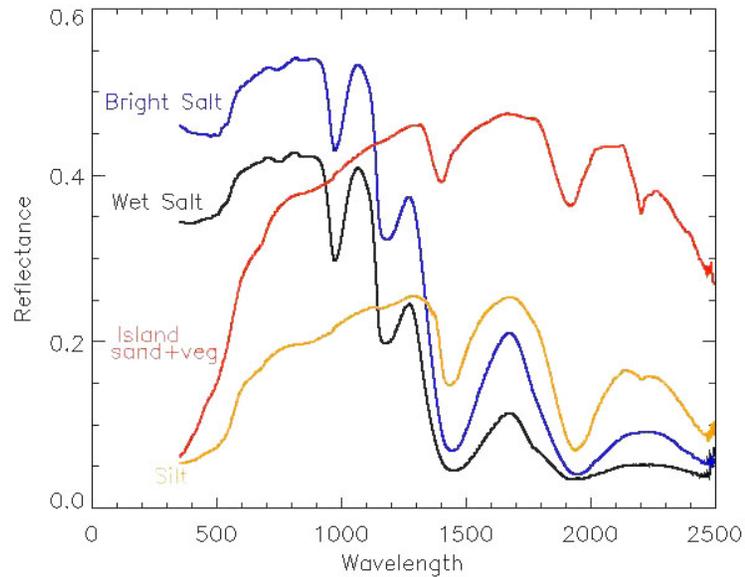
Policy-relevant Issues
Climate Convention
Desertification Convention
Etc.



Main Topics for GRSS ISIS TC

- Primarily about multiple satellite mission planning, and data interoperability aspects [Not about hyperspectral science and applications development -this is well covered elsewhere].
- Specific coordination of:
 - interoperability among missions,
 - ‘best practice’ mission implementation,
 - mass data management challenges,
 - establishment of global reference cal/val sites and regular field campaigns and
 - ‘Global’ hyperspectral products.

Establishment of Key Post-launch Spectroscopy Instrument Calibration & Validation Sites





Next Meeting

ISIS Meeting planned for IGARSS 2010
July 26-30, Honolulu, Hawaii, USA

[http://www.grss-
ieee.org/Resources/TechCommittees](http://www.grss-ieee.org/Resources/TechCommittees)

Would probably include a workshop on 'Global Products'

Also plan to attend ISRSE 2011 in Sydney