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EDITORIAL

A chairman's swansong

Yes ..... in more ways than one!

This newsletter sees the end of my 3-year stint as GRSG Chairman, and the end of over 7 years presence on the GRSG Committee in some capacity or other. It's all Geoff Lawrence's fault - he asked me to sign up in the first place! Seriously though, this is a good moment to ponder on the state of geological remote sensing (or should we say 'Earth Observation'?) - brought into further focus by ongoing events within the mineral exploration industry, most recently in a certain company called Rio Tinto.

Throughout the 1990's we have chewed fingernails, waiting for that newly operational 'killer' data set to complement or succeed Landsat TM. Oh woe - no Landsat 6, a blighted JERS-1, no Earlybird, a dead Lewis, launch delays for everything else. Sure, TM is good stuff and has been our mainstay for so many years, but there is only so much management impact you can achieve with scales of 1:50,000 or smaller, and with vague 'clay' or 'iron oxide' maps - plenty of good things to follow up but plenty of false anomalies too. 1998 was meant to be a good year for new data (ASTER, IKONOS), but I guess it'll be 1999 now.

In the meantime, some of us have had the opportunity to dig into airborne technology, perhaps with mixed experiences, but nevertheless learning at the same time what sort of instrumentation improvements appeared necessary to match the character of the problem. Field-based instrumentation such as Pima has allowed us to develop fast understanding of the mineralogical setting of ore deposits – knowledge that previous technology did not allow us to acquire. Once we know what it is we seek to map (i.e. a clearer definition of the problem), then better judgement may be applied to selection of the 'remote' instrument.

Now we have HYMAP, SFSI and PROBE to consider as a new generation of hardware - which is the 'killer' data set, or is it more of a question of the right sort of problem, in the right exploration context, proving to management that it is all

worthwhile? Can aircraft data settle into their own operational niche (these days - probably yes), or are we all more comfortable with an eventual satellite capability?

Things I suspect have been a bit easier in the oil industry, where TM, SPOT and radar have been perfect for the sort of structural syntheses required for targeting. The spectral side hasn't required the same degree of emphasis. Also, the geological scale is so different with ore deposits, such that 30m pixels are so often struggling, except in semi-regional projects. Air photos? Sure, but project geologists in many cases use them directly out in the field - I don't know of any mining companies who retain an in-house 'traditional' photo-geologist. Furthermore, industry pundits rarely give remote sensing any credit at all for contributing to discovery - even the project geologist on a successful project will forget that he based much of his field campaign on remotely collected imagery, which suggested he ought to go and look on the other side of the hill.

Other obstacles can be the difficulty of developing technical consensus in a strongly decentralised company - there are too many people to convince and 'sell' it to, not just the boss. Maybe they listen, maybe they don't. Maybe they want you to train somebody up locally so they can do it themselves, but - come the next round of local budget and it's the people you've trained up who go first. So, does that imply that regional exploration centres should rely on outsourcing, or an in-house centralised, technical group (oh dear....there aren't many of those left these days!).

The ongoing shrinkage or disposal of in-house technical departments can mean a number of things. It can mean (a)" nice stuff, but we reckon we can do with out it", or (b) "nice stuff, but we reckon we can buy it cheaper, as needed, as an outsourced service", or (c) "well – beyond evaluating advanced projects already at drill target stage, we are not in an appropriate 'grassroots' exploration context to need much of that stuff". Scenario (a) means that we, as exploration technologists, have failed. Scenario (b) means that we've succeeded, at least to a degree, but that the market paradigm for remote sensing and exploration technology in general has shifted. Scenario (c) means we've done nothing necessarily right or wrong, but that high-level shifts in corporate exploration policy (e.g. to explore or to acquire) mean that the end-user or 'customer' is perhaps no longer there, at least for the moment. Working in-house meant that one could still function as an explorationist, but with remote sensing skills. On the outside, it is more a case of being a remote sensing specialist with an Earth Science or exploration background. I have always been aware of this professional dichotomy and never really sure, within a mining company, which side to emphasise.

Nevertheless, 1999 should be a wonderful year in terms of technical opportunity. We now have operational, airborne, hyperspectral data from HYMAP and other airborne systems. Landsat-7, ASTER, Orbview-3, IKONOS-1 and Earlybird are due for launch, and the ARIES project should progress. I find this tremendously exciting as I think of the globally expanding Remote Sensing and GIS markets, and the challenge to take one's exploration experience into other application and market areas.

Also, as this will be the last Newsletter for 1998, may I take this opportunity to wish you all a prosperous 1999.

Alistair Lamb

GROUP & MEMBERS' NEWS

Committee News……another cabinet reshuffle

After many years of service, Alistair Lamb and John Moore stood down from the GRSG committee at the 1998 AGM. Taking Alistairs's place as Chairman will be Stuart Marsh, who has been Secretary for the past four years. Stuart will be handing his Secretary duties over to Anthony Denniss. The posts of Membership Secretary and Treasurer are being combined and Ross Smail will be first incumbent. Finally, now that your Editor has finished her PhD a new student rep is required. Rob Wright of the Open University will be taking on this role. As ever, volunteers for the committee are always welcome!

The new committee wish to thank Alistair and John for their outstanding contribution, which has left them as the two longest-serving committee members. They will be a hard act to follow, but we'll give it our best shot. The task is made easier by the excellent condition that they leave the GRSG in. (Your round, guys!)

Cheers,

Stuart.

Moving on.....

It's all change in the Remote Sensing Section of the British Geological Survey (BGS) this month. Anthony Denniss who has worked for BGS for nearly 3 years as a spectral geologist, has now joined the National Remote Sensing Centre Ltd. Anthony will be initially based at NRSC's Barwell office in Leicestershire where he will take on the role of 'Senior Applications Specialist'. Anthony's new duties will include technical bid preparation, project management and product development related mainly to aircraft derived data. Anthony will also be working closely with the NRSC's Oil and Gas group based in Farnborough to ensure that he doesn't forget his spectral geology skills. New contact details for Anthony can be found on the inside cover of this issue.

....Moving in....

Meanwhile BGS have just recruited two new staff in the Remote Sensing Section. First to arrive will be Gisela Ager, who has been working for Hunting Technical Services in Poland after completing an MSc at Cambridge. She will be working primarily on digital photogrammetry projects in the first instance. In the New Year she will be joined by Colm Jordan. After working for the Geological Survey of Ireland, Colm is currently completing his PhD. He will be working on a variety of remote sensing and GIS projects.

....Moving up!

The new-look remote sensing team will also have a new leader. After many years in the post, Dave Greenbaum has left the section to become BGS's Regional Geologist for Asia and the Pacific. GRSG's very own Secretary, Stuart Marsh, will be taking Dave's place as Head of Remote Sensing, having completed his secondment as Secretary of the BGS Board. We wish them all well!

GRSG Student Award

The GRSG committee have decided that the nature of the GRSG Student Prize should be changed slightly. The prize awarded will in future be a travel bursary, intended to fund or part-fund a trip to an international conference (such as ERIM) or for fieldwork. Please contact either Stuart Marsh or Anthony Denniss.

Stop Press. GRSG Membership goes up!

Yes, shocking news, I know but the GRSG annual subscription has at last had to be increased. This is the first time an increase has been made in 3 years so hopefully you're not feeling too hard done-by! From January 1999, individual membership will be increased to £10.00, student subscription remains at £6.00, as does corporate membership at £100.00.

Sad news for GRSG Members

As you will have read from Alistair's parting words, Rio Tinto around the World have reduced exploration staff, Kerry Sullivan, Mike Hornabrook, long with RTZ/CRA in Melbourne are gone along with several others and Alistair, Gavin Hunt Frank Arnot in Newbury are out. It's not isolated, other GRSG members Greg Lipton, Lyle Burgess and others have lost their mineral industry jobs in the last few months.

The oil industry shake out hasn't stopped either with new rounds of redundancies announced in Occidental and Shell. When does it end?

It isn't all bad news though, fortunately. There are jobs being created in the contractor side of things - NPA recently took on two new MSc Remote Sensing graduates and more are apparently in view.

Robert Johnson, who works for Geoff Lawrence in Houston, is getting underway OK. So there is business and work, it is just that big corporate geology, at least if it concerns exploration, is taking big hits.

FREE Window on the World CD

Don't' miss your FREE Window on the World CD inside this issue. Produced in collaboratively by the British National Space Centre, the Remote Sensing Society and The Sunday Times, the CD contains a wealth of information about remote sensing, satellite sensors, images, quizes in a Web-like environment. The CD also contains PC, Mac & Acorn compatible web-browsers (in case you don't have one!) for easy browsing.

SENSOR NEWS

SOHO IS NEARLY BACK IN BUSINESS

Date:Oct.14 1998

High-quality new pictures of the Sun, taken earlier this week from the Solar and Heliospheric Observatory (SOHO), have raised hopes that the mission may soon be returned to scientific operations. Engineers have successfully reactivated nine of the 12 instruments on the European Space Agency (ESA)/NASA SOHO mission, which has been out of commission for nearly four months after contact was lost on June 24.

As of today, nine of the 12 instruments on board SOHO have been turned on. Four of them are already fully functional; the other five are still undergoing careful recommissioning activities. So far no signs of damage due to thermal stress during the deep freeze have been detected.

On July 23, SOHO was located using radar techniques with the 305-meter Arecibo, Puerto Rico, radio telescope of the U.S. National Astronomy and Ionosphere Centre as a transmitter and a 70-meter dish of the NASA Deep Space Network as a receiver. SOHO first responded to radio-transmissions on August 3, and telemetry from SOHO was received August 8, telling controllers the condition of the spacecraft and its instruments. The spacecraft's frozen hydrazine fuel was gradually thawed, and on September 16, SOHO's thrusters were fired to stop its spin and to place it in the correct orientation towards the Sun.

SOHO operates at a special vantage point 1.5 million kilometres (about one million miles) out in space, on the sunward side of the Earth. The spacecraft was built in Europe and it carries both European and American instruments, with international science teams. SOHO was launched on an Atlas IIAS rocket and is operated from NASA's Goddard Space Flight Centre in Greenbelt, Maryland.

Images from the Michelson Doppler Imager and the Extreme Ultraviolet Imaging Telescope on SOHO are posted on the Internet at:

http://sohowww.nascom.nasa.gov

LANDSAT-7 LAUNCH SCHEDULED FOR APRIL 15, 1999

NASA has selected a new launch date of April 15, 1999, for the Landsat-7 Earth science satellite. The launch, originally scheduled for December 1998, will take place from Vandenberg Air Force Base, CA.

The Enhanced Thematic Mapper Plus (ETM Plus) on Landsat-7 will continue a database of high-resolution Earth imagery begun in 1982 by the Landsat-4 thematic mapper. The spacecraft contains several technological improvements over previous Landsat satellites and their instruments. These improvements include better instrument calibration and a solid-state data recorder capable of storing 100 individual ETM Plus Earth images. This capability will enable Landsat-7 to update a complete global view of the Earth's land surfaces seasonally, or approximately four times per year. The Landsat series has provided the longest record of the Earth's continental surfaces as seen from space.

"The launch delay of Landsat-7 was caused by a need for changes in the design of the electrical power-supply hardware for the spacecraft's instrument," said Phil Sabelhaus, Landsat-7 project manager at NASA's Goddard Space Flight Centre, Greenbelt, MD. During instrument-level thermal vacuum tests beginning in December 1997, a power supply on the ETM Plus instrument failed twice. These technical challenges have been resolved and Landsat-7 is on track for launch.

NASA is developing in parallel to the Landsat-7 mission the next generation Landsat instrument and spacecraft technologies through the New Millennium technology demonstration program. This follow-on technology development effort will enable future measurements to be made by a sensor that is one-fourth the mass of the ETM Plus. A new sensor enabled by this development will use only 20 percent of the electrical power currently needed, while reducing the overall mission cost by 60 percent. The next generation Landsat flight demonstration is expected to launch in late 1999.

NASA intends to operate Landsat 7 and the flight demonstration spacecraft in the same orbit, but separated from each other by approximately one minute in distance. Such a flying formation will allow for observing the same area of Earth by both satellites, providing validation of the new imaging technologies being demonstrated. The advanced Landsat technology mission is intended to mitigate

technological risk, improve future Landsat performance by a factor of four, and reduce overall mission development time by half.

JERS-1 GOES DOWN

On 11 October the JERS-1 satellite ceased to function and was terminated. Although it never functioned as designed, it did collect useful EO data for over six years, on a design life of two!

GRSG CORPORATE MEMBERS

New Corporate Members in 1998 are:

NPA Group

Crockham Park, Edenbridge, Kent, TN8 6SR

Tel: 01732 865023 Fax:017322 866521

www.npagroup.co.uk

ERIM International, Inc.

P.O. Box 134008,

Ann Arbor, Michigan 48113-4008, USA

Tel: +1 734 994 1200 Fax: +1 734 994 5123 www.erim-int.com

Analytical Spectral Devices (ASD) Inc.

5335 Sterling Drive,

Boulder, Colorado USA

Tel: +1 303 444 6522 Fax: +1 303 444 6825

Email: info@asdi.com Web: http://www.asdi.com

ERDAS (UK) Limited

Telford House, Fulbourn,

Cambridge, CB1 5HB, U.K.

Tel: 01223 880802 Fax: 01223 880160

www.erdas.com

Natural Environment Research Council

Directorate of Science and Technology, Polaris House,

North Star Avenue, Swindon SN2 1EU

Tel: +44 (0)1793 411500

www.nerc.ac.uk

Corporate Member Reminder

NPA, ERIM, ERDAS & NERC are reminded that they have not yet taken advantage of their right to place a full page advert in the Newsletter and should contact the Editor when they wish to do so.

The following were Corporate Members in 1997:

Floating Point Systems UK Ltd.
Ash Court, 23 Rose Street, Wokingham, Berkshire, RG40 1XS
Tel: +44 (0) 118 977 6333 Fax: +44 (0) 118 977 643
http://www.floating .co.uk http://www.rsinc.com

PCI Geomatics Group Ltd.
5 Shenley Pavilions, Chalkdell Drive, Milton Keynes,
Buckinghamshire MK5 6LB
Tel: (44) 1908 523300 Fax: (44) 1908 521511
http://www.pci.on.ca/

Rio Tinto Mining & Exploration
4 The Broadway, Newbury, Berkshire, RG14 1BA U.K.
Tel: +44 (0)1635 48511 Fax: +44 (0)1635 35542 or 35947

PRODUCT NEWS

ASD introduces new spectroradiometer

The FieldSpec® HandHeld, is a highly portable, spectroradiometer with applications in fields ranging from remote sensing, precision agriculture and forestry to industrial light measurement, oceanography and mining.

The HandHeld spectroradiometer is priced at only $9,995 and weighs 2.7 pounds. It measures 3.3 x 6 x 8.2 inches, runs on standard camcorder batteries, and can be operated by the right or left hand.

With a wavelength range of 300 nm to 1100 nm, the instrument offers spectral resolution of 3.5 nm and a 1.6 nm sampling interval. The spectroradiometer captures 10 spectra/second, allowing real-time display of spectral data, with integration time as low as 17 ms.

The spectroradiometer measures radiance, irradiance, CIE color, color temperature, luminance, illuminance, reflectance and transmittance. An RS-232 serial interface allows for easy data collection. The FieldSpec® HandHeld employs the same quality 512-element silicon photodiode array and ASD RS2 processing software as the FieldSpec® FR portable field spectroradiometer.

Automatic mosaic and balance of air photographs

Earth Resource Mapping announced the release of new wizards to automatically mosaic, balance and colour correct aerial photographs. The wizards produce seamless colour-balanced mosaics of any number of images. Unlike conventional methods, which take about an hour to colour-balance each image, the new wizard technology generates seamless mosaics in real time. Black edges, hot spots, radiometric rolloff, and chromatic aberrations are automatically detected and corrected. Overlap and feather edges are automatically defined to ensure seamless mosaics.

The free wizards will function under ER Mapper 5.5, and can be downloaded from the ER Mapper web site (http://www.ermapper.com) though this is actually a pre-release of ER Mapper 6.0 functionality.

PLANETARY NEWS

New Mars images show lava flow plates and active dunes

The latest images from NASA's Mars Global Surveyor spacecraft show giant plates of solidified volcanic lava, and evidence for active dunes near the planet's north pole with sands that have hopped or rolled across the surface in recent months.

The close-up views of Mars' Elysium Basin reveal the first evidence of huge plates of solidified lava, rather than lakebed sediments, that appear to have been broken up and transported across the Martian surface millions of years ago as they floated on top of molten lava. This implies that the area in the planet's northern lowlands was once the site of giant ponds of lava flows hundreds of kilometers across, according to Dr. Alfred S. McEwen of the University of Arizona, Tucson, a member of the Global Surveyor science team.

McEwen and his co-authors believe that lava erupted near this area and the upper surface became crusted, then cooled and cracked. Some cracks widened and portions of the surface crust became rafts of solid rock that moved in the direction that the molten lava was flowing underneath. Other Viking and Global Surveyor images have shown similar plate-like lava textures in nearby Marte Vallis, implying that some of the lava from Elysium Basin spilled into this valley and flowed thousands of kilometers to the northeast.

The sparse occurrence of impact craters on these plate-like lava surfaces suggests that the eruptions happened relatively recently in Mars' history. These eruptions could be much younger than the youngest of the large Martian volcanoes like Ascraeus Mons and Olympus Mons in the Tharsis region, but they would still have occurred many, many millions of years ago. So the images should not be treated as evidence that Mars is volcanically active today.

Additional close-up views of Martian sand dunes in the north polar region are showing scientists detailed patterns of ongoing movement of sand across the planet for the first time. Drs. Kenneth S. Edgett, staff scientist at Malin Space Science

Systems, San Diego, CA, and Michael Malin, Mars Global Surveyor camera principal investigator, report the presence of many fresh dunes that have been active as recently as July or August.

Martian dunes typically contain granular fragments of rocks and minerals ranging from 0.002 to 0.08 inches (0.06 to 2 millimeters) in size, which puts them in the geologic classification of "sand." The sand appears to have been transported by wind in one of two ways: either by hopping over the ground, a geological process called "saltation," or by rolling along the ground, a process known as "traction."

Some of the dunes appear to be coated with thin, bright frost that was left over from the northern winter season that ended in mid-July, according to Edgett and Malin. This frost is covered with dark streaks emanating from small dark spots that dot the bases of many of the dunes. "The simplest explanation is that gusts of wind have blown the dark sand out across the frost-covered dunes, creating a streak of deposited sand over the frost," Malin said. "Some spots seen in the close-ups have multiple streaks, each one indicating that a different wind gust has moved in a different direction."

The images are available on the Internet at the following locations:
http://www.jpl.nasa.gov, http://photojournal.jpl.nasa.gov ,
http://mars.jpl.nasa.gov and http://www.msss.com .

NEW HYPERSPECTRAL DATA

Geosat Proposal for Hyperspectral Group Shoot

The Geosat Committee Inc. organised an industry group to acquire airborne hyperspectral data for user evaluation for a variety of applications in August 1998. There were four test sites for oil and mineral exploration, onshore & offshore oil seep detection, environmental assessment of hydrocarbon contamination & remediation, and impact assessment for agricultural manure run-off (on surface waters, vegetation, coastal and near-shore marine areas).

1. The mineral exploration site is at Virginia, Nevada.

2. Two test sites in Santa Barbara for oil seep & spill detection (Santa Barbara West) and for detection of vegetation stress associated with onshore seeps, and for geologic stratigraphy and structural mapping (Santa Barbara East).

3. A third test site is north of Oakland (Pancheko Creek) where the target is an oil-spill site selected for study of the impact of spill on freshwater and marine wetlands, and for vegetation mapping.

4. The last site is for agricultural applications and covers a large livestock farm at Tomales Bay, north of San Francisco.

The products from this survey include the following data:

Level 0 - 5 m resolution pre-processed VIS-NIR SWIR Probe 1 hyperspectral data (128 channels) on exabyte tape, for all 4 sites

Level A (Products available October 98 to January 1999)

- Radiance cubes for the 4 test sites
- Reflectance cubes for all 4 sites (non-geo-rectified)
- geo-rectified reflectance cubes
- ortho-rectified geometry file for each flight

Level B (Products available March to April 1999)

- Appropriate hyperspectral images

- Interpretation maps for specific targets of interest (hardcopy or digital)
- Spectral signature determination for specific targets of interest
- Written reports for each test site
- Basic graphics for management

Anyone interested should contact:

Rebecca Dodge
Pan American Centre for Earth and Environment Studies,
University of Texas,
El Paso, Texas 79968-0518
Tel: +1 (915) 747 5305
Fax: +1 (915) 747 5073
Email: dodge@geo.utp.edu

WEB LINKS

In our ceaseless attempt to keep you abreast of interesting new and not-so-new web sites, we have compiled this list of useful places to visit and browse; so that you can spend hours learning rather than hours searching.

Space agencies	
BNSC	http://www.open.gov.uk/bnsc/bnschome.htm
Nasa	http://www.nasa.gov/
NOAA	http://140.90.236.89/
NOAA(Global Programs)	http://www.ogp.noaa.gov/
ESA	http://www.esrin.esa.it/
CEO(centre for Earth Obs)	http://ceo-www.jrc.it/
DLR(German Space Agency)	http://www.dlr.de/
ACRES(Australian Rem.Sens.)	http://www.auslig.gov.au/acres/index.htm
CSIRO(Australian EO)	http://www.eoc.csiro.au/
Norwegian Space Centre	http://www.spacecentre.no/
CCRS(Canadian RS)	http://www.ccrs.nrcan.gc.ca/
Brazilian RS	http://www.inpe.br/
India (RS Agency)	http://www.nrsa.gov.in/
NASDA(RS Japan)	http://www.nasda.go.jp/index_e.html
Thailand Remote Sensing	http://www.nrct.go.th/remoteSensing/intro.html
Satellite News	http://www.latrobe.edu.au/www/crcss/news.html
Space Imaging (Europe)	http://www.si-eu.com/
Aster	http://asterweb.jpl.nasa.gov/
Aviris	http://makalu.jpl.nasa.gov/aviris.html
Atsr	http://www.atsr.rl.ac.uk/
JPL imaging radar	http://southport.jpl.nasa.gov/
SAR(Polar regions)	http://southport.jpl.nasa.gov/polar/index.html
Radar Satellite Link	http://southport.jpl.nasa.gov/polar/satellites.html

And the GRSG web page can still be found at the following address:

http://www.brookes.ac.uk/geology/kelly/remote.html

GRSG MEETINGS

13th INTERNATIONAL CONFERENCE

APPLIED GEOLOGIC REMOTE SENSING

Practical solutions for Real World Problems

CALL FOR PAPERS

1-3 March 1999

Vancouver, Canada

GRSG will hold its usual informal lunchtime and speaker session between 12.30 – 14.00 on March 3 (Day1)

Final camera-ready copy: 1 December 1998

Details from: ERIM/ Geologic Conference

P.O.Box 134008, Ann Arbor, MI 48113-4008 USA

Tel: 00 1 734 994 1200 ext3234 Fax: 00 1 734 994 5123

Email: geology@erim-int.com

Also see: http://www.erim-int.com/CONF/GRS.html

OTHER MEETINGS

ISPRS WORKING GROUP 11/6 WORKSHOP ON:

3D GEOSPATIAL DATA PRODUCTION – MEETING APPLICATION REQUIREMENTS

7-9 April 1999, Paris, France

Contact: Dr. David McKeown

Tel: +33 1 412 268 2626 Fax: +33 1 412 681 5576 Email: dmm@cs.cmu.edu

Web: http://www.cs.cmu.edu/~MAPSLab/isprs.html

2ND IAA SYMPOSIUM

SMALL SATELLITES FOR EARTH OBSERVATION

12-16 April 1999, Berlin, Germany

Contact: Bernd Kircher

Tel:+49 30 67055 545 Fax: :+49 30 67055 532 Email: iaa@symp@dlr.de

GEOTECHNICA '99

INTERNATIONAL TRADE FAIR FOR THE GEOSCIENCES AND GEOTECHNOLOGY

18-31 May 1999, Cologne, Germany

For further information contact: KolnMesse

Tel: +49 221 821 0

Fax: +49 221 821 74

EARSeL 19th SYMPOSIUM - REMOTE SENSING IN THE 21ST CENTURY : ECONOMIC AND ENVIRONMENTAL APPLICATIONS

31 May – 2 June 1999

Valladoid, Spain

First Announcement and Call for Papers

For further information, contact: EARSeL Secretariat, M. Godefroy

2 Avenue Rapp, F-75340 PARIS, Cedex 07, France.

Tel: +33 1 455 67360 Fax: +33 1 455 67361 Email: earsel@meteo.fr

IUFRO CONFERENCE

REMOTE SENSING & FOREST MONITORING

1-3 June 1999

Rogow, Poland

For further information, contact: Conference Secretariat, A. Nowicki, W. Karaszkiewicz, Faculty of Forestry, Rakowiecka 26/30, 02-528 Warsaw, Poland.

Fax: +48 22 491375 Http://giswitch.sggw.waw.pl/rogow99

EARSeL / ISPRS Joint Workshop

3-4 June 1999

Valladoid, Spain

Workshop themes include: Remote sensing and vision theories for automatic scene interpretation; Integration of image analysis and GISS; Computer assisted image interpretation and analysis; data fusion.

Contact: Dr. Manos Baltavasias

Email: manos@geod.ethz.ch

4th INTERNATIONAL AIRBORNE REMOTE SENSING CONFERENCE AND EXHIBITION

21-24 June, 1999

Ottowa, Ontario, Canada

For further information, contact: ERIM Airborne Conferences, Box 134001, Ann Arbor, MI 48113-4001, USA

Tel: +1 734 9941200 Fax: +1 734 9945123 Email: wallman@erim-int.org

Web: http://www.erim.org/CONF/conf.html

IGARSS'99

28 June – 2 July 1999

Hamburg, Germany

Contact: Prof. Werner Alpers,

Inst. F. Meereskunde, University of Hamburg, Troplowitzstr. 7, D-22529 Hamburg, Germany

Fax: +49 40 4123 5713 Email: alpers@ifm.uni-hamburg.de

RSS99 25th ANNUAL CONFERENCE AND EXHIBITION OF THE REMOTE SENSING SOCIETY

EARTH OBSERVATION – FROM DATA TO INFORMATION

8-10 September 1999

University of Wales, Cardiff

For further information, contact: P.Pan, Dept of Maritime Studies and International Transport, University of Wales, Cardiff, P.O. Box 907, Cardiff, Wales, CF1 3YP

Tel: +44 1222 874271 Fax: +44 1222 874301 Email: Pan@cardiff.ac.uk

19TH ISPRS CONGRESS – GEOINFORMATION FOR ALL

16-23 July 2000

Amsterdam, Netherlands

Call for Papers

Abstract deadline: September 1999

Manuscript deadline: March 2000 Preliminary programme: April 2000

For further information, contact: Prof. Klaas-Jan Beck or Secretary: Dr Freek D. van Meer, ITC Hengelosestraat 99, P.O.Box 6, 7500 AA Enschede, The Netherlands.

Fax: +31 53 487 4335 Email: isprs@itc.nl

GRSG ANNUAL GENERAL MEETING

GRSG AGM at Oxford Brookes University

GRSG held a one-day Research in Progress meeting at Oxford Brookes University on Wednesday 18 November 1998. There was a disappointing turn out on the day; about 25 people in all. Eight talks were planned, of which one was cancelled at the last minute. The talks began at 10.30 and finished at 4.30 and abstracts are listed below.

Morning session

- Revolutionary accuracy in Land cover mapping
  Phil Murffit, Laserscan
- Digital photogrammetry and computer-assisted terrain visualisation for geological image mapping
  M.A. Bussell, Greenwich University
- Satellite ortho-imagery for geological remote sensing
  A. Ganas, IIS SA, Athens
- Remote sensing of Venus: making full use of the things that we find
  R. Ghail, Imperial College

Afternoon Session

- Mutli-temporal ERS-SAR coherence imagery in the Sahara Desert, Algeria
  H.Lee, Imperial College
- Analysing the current summit Eruption of Mount Etna using infra-red radiance data from ATSR-2
  R. Wright, Open University
- Comparing the decorrelated stretched images of Indian Remote Sensing Satellite (IRS-1A) and Landsat Thematic Mapper for lithological mapping.
  S.Singa, University of Reading

The meeting was followed by the GRSG AGM, which was chaired by Stuart Marsh and attended by about 13 people, including 4 Committee members. Start gave the Chairman's, Secretary's and Treasurer's reports as they were away or had been detained. The prognosis seems to be quite good. GRSG is doing quite well, with a fairly constant membership and bank balance. The most visible upcoming change is likely to be the GRSG Web page which needs updating and the Committee is currently considering several available options.

Then came the news of Alistair's step-down and the ensuing shifting of Committee responsibilities. Nominations for posts mentioned in the Group & Members' News section were made, seconded and voted in by all parties present.

We are all looking forward to our next meeting scheduled for March 1 1999, at ERIM in Vancouver and hope that many of you will attend.

We all had a little wine, some nibbles and then retired to the pub for serious discussions.

Selected abstracts from the research in progress meeting

Revolutionary Accuracy in Land Cover Mapping

Phil Murfitt

Business Development Manager , Laser-Scan Ltd, Cambridge Science Park, Milton Road, Cambridge, CB4 4FY

For many years remote sensing (RS) techniques have been used to pre-process satellite imagery before being analysed by a Geographic Information System (GIS). Over the last few years there has been a steady trickle of systems emerging that span the two disciplines of RS and GIS. These technologies can now be further enhanced with the addition of an active, intelligent database to provide a truly multi-disciplinary approach to the refinement and subsequent spatial analysis of remotely sensed data.

Over the last several year Laser-Scan has been involved in several commercial and research projects for which this multi-disciplinary approach, in particular the use of the active, intelligent database, has yielded significant benefits in terms of both

accuracy of results and productivity, when applied to land cover mapping and monitoring applications.

It is not only Laser-Scan's close involvement with the customer during such projects hat has resulted I the development of several new techniques, but also the company's revolutionary approach to geospatial intelligence which is applied by the data model itself and is independent of the application. Applying intelligence to the data model rather than to the application software significantly reduces the need to customise commercial-off-the-shelf (COTS) packages, whilst providing an enhanced level of control in such areas as data security and integrity, production flow controls, simplified data flowlines and also the automatic invocation of data validation checks. This latter eliminates the projects delays associated with the manual validation checking methods typically employed in conventional first-generation projects.

In addition the emergence of commercially available Very High Resolution (VHR) imagery, typically sub-5-meter resolution, will undoubtedly have a measurable impact on the GIS and RS user communities. The significant increase in data volumes and the contextual information contained in these new sources will require new methodologies and techniques to enable end users to derive maximum benefits from the data. Techniques developed in support of commercial and research projects have gone some way towards addressing these needs.

This paper will expand upon the many new technologies developed and business benefits derived as a direct result of close collaboration between vendor and customer.

Digital photogrammetry and computer-assisted terrain visualisation for geological image interpretation

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Traditionally stereoscopic interpretation of vertical aerial photographs has provided a prime tool for the exploration of inaccessible terrain. The principal shortcoming of this technique is the fixed vertical nature of the viewpoint. The optimum potential of

three-dimensional visualisation of geological structures is often achieved by strategic viewpoints, for example along the trend of overstep at an unconformity, fault-vein intersections and fold axes. Such viewpoints are most uncommon in vertical stereo pairs and when they do occur they are fortuitous. A more trivial problem with the traditional approach is the intractable nature of the large number of paper prints needed for any regional study. A costly and sometimes dangerous solution is use light planes or helicopters, a cheaper and safer alternative is to use the commonly extant aerial photographic archive in conjunction with digital photogrammetry. Improvements in resolution available from space will extend these techniques to regions without photographic archives.

Digital photogrammetry provides a set of procedures for the generation of digital ortho-images and digital elevation models (DEMs). There are two outputs from this process. First a digital elevation model (DEM) is produced: a raster array of height values mosaiced to cover the region of interest. Because the DEM is a model of the surface seen on the aerial photograph, it will include buildings, trees and continuous canopy surfaces. In such cases a certain amount of editing is necessary if a model of ground heights is required. These effects are minimal in poorly vegetated semiarid areas and acceptable DEMs for visualisation purposes are fairly easy to produce. Regions of heavy shadow can also cause local DEM anomalies. The second output is a digital ortho-image which is similarly a mosaic of the region and which, when printed, has all the appearance of a normal aerial photograph. The difference is that all radial relief distortions have been removed, scale is constant in all directions and a map co-ordinate grid can be placed on the image. If the aerial photography is in colour then the ortho-image can be manipulated by methods chosen from an array of routine image processing techniques in order to enhance geological features.

These techniques can be applied to terrestrial and aerial stereo-pairs and the outputs used to assist in terrain visualisation and geological interpretation. The DEM can be displayed using appropriate software to generate a perspective model of the terrain, the ortho-image can then be draped over this model and inspected from any desired angle in order to help clarify details of a geological interpretation. Because the DEM and ortho-image are mosaics produced from a large number of overlapping photographs they can be inspected continuously over a large region by "fly through" methods giving maximum flexibility in three-dimensional visualisation of the dataset.

Multi-Temporal ERS SAR Coherence Imagery in Sahara Desert, Algeria

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Multi-temporal SAR coherence imagery is a useful tool for the detection of random changes of land surface. Three scenes of ERS-1 SAR raw data of east Sahara desert in Algeria acquired on 8th September 1992, 13th October 1992 and 28th September 1993 were processed by a SAR processor to produce Single Look Complex (SLC) images. The three SLCs were then co-registered to sub-pixel accuracy to produce coherence images. The three coherence images generated have shown several interesting phenomena:

1. Episodic erosion of river channels are clearly defined by low coherence features in the 350 day separation coherence image but show none obvious features in the one with 35 day separation.

2. Sand dunes and sand encroachment characterised by complete de-coherence are accurately mapped and there is no evidence of the movement of complex dune formation over a year period.

3. Straight lines corresponding to human activities (e.g. geophysical survey or other engineering work) are revealed as a network pattern of low coherence lines against a high coherence background of the bare desert surface.

4. In the foreshortened east-facing slopes of gullies, spatial de-coherence features due to terrain slopes are discriminated and separated from temporal de-coherence phenomena caused by natural process and environmental change.

Key words : SAR, multi-temporal coherence imagery, random surface change

Satellite ortho-imagery for geological remote sensing

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Image Ortho-rectification becomes increasingly important in EO data processing because of the new applications of geological remote sensing that require accurate image data : Terrain Visualisation (with thematic information overlain), Geomorphometry, Earthquake Geodesy and Exploration. Ortho-rectification is necessary to remove radiometric distortions because of relief, to reduce positional errors in the raw data which are about 300 - 500 metres (TM level 5 or SPOT 1B) and to resample imagery that has been acquired with off-nadir geometry. Ortho-images also comprise better components for fused products and mosaics of large areas of the Earth's surface.

Data needed for the production of Ortho-Imagery are : 1) Ephemeris data to establish platform orbital height and motion at the time of the overpass 2) a geocoded Digital Elevation Model (DEM) to rectify the image where its size should ideally match the EO data pixel size (i.e. 10-20 m for IRS-1C and SPOT, 30 m for TM) and 3) good ground control for exterior orientation provided by GPS control points or from points digitised from large-scale topographic maps. The DEM can be supplied by a) automated stereo-matching of SPOT PAN 1A or IRS 1C stereo-pairs and b) digitisation of large and medium-scale topographic maps to the appropriate raster grid. The latter process is more accurate when contour sampling is total and not selective. The requirements for a successful, spaceborne DEM include : selection of a high B/H ($\geq$ 0.6) stereo-pair, high-sun angle imagery, $\leq$ 30 days acquisition interval and clear atmosphere during acquisitions.

SPOT DEMs produced by IIS at 10 and 20 m grid size using the EASI/PACE v6.2 software have been used to rectify SPOT PAN imagery in the Evia region, central Greece and to produce elevation maps for a Ferro-Nickel mining district. The DEMs attain z-RMS errors of about 15 metres outside the mining district. This error is attributed to the rugged relief of this area (0-1300 m). A one-to-one pixel comparison of the SPOT DEM with a 10 m, reference DEM (rasterised 1:50,000 topographic map) yielded a mean error of -3.5 m and a standard deviation of 21.2m.

The problems often encountered during the production of ortho-imagery are : 1) the availability of only low-sun angle imagery for the time period of interest (when using the spaceborne DEM method) 2) the very-high viewing angles that do not help to locate GCPs, 3) the non-optimum distribution of GCPs across the images or the topographic map and 4) the degraded accuracy of GCPs in some topographic maps (where elevation errors of 10 m and planimetric errors of $\geq$ 15 m are often found). Ortho-images are also a time consuming production activity when compared with non-parametric rectifications since for a 2nd order polynomial transformation the

time required to achieve a XY RMS error ≤ 1 pixel (at the GCPs) is between 3-4 hours. This time can only be reached using Ortho-Procedures when a geocoded DEM is available from external sources.

If the cost of acquiring Ortho-Imagery can be sustained then it is recommended that ortho-images are used instead of polynomials for all geological work in areas of high relief. Recent work at IIS with Landsat 5 TM data for NE Attica (Greece) showed that the internal geometric characteristics of the ortho-images were much better than those on images rectified with polynomials. For example, coastlines and cultural features on the 1:50,000 topographic maps matched better (within a TM pixel) their counterparts on the ortho-images.

Remote Sensing of Venus: making good use of the things that we find.

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The US Magellan mission to Venus completed three mapping cycles in which it acquired synthetic aperture radar imagery at a resolution of about 100 m, and altimetric and radiometric data at a resolution of about 5 km, plus two further cycles in which gravity data were acquired at a resolution of several tens to hundreds of km. These data have been processed and reprocessed and are available in digital format for scientific analysis.

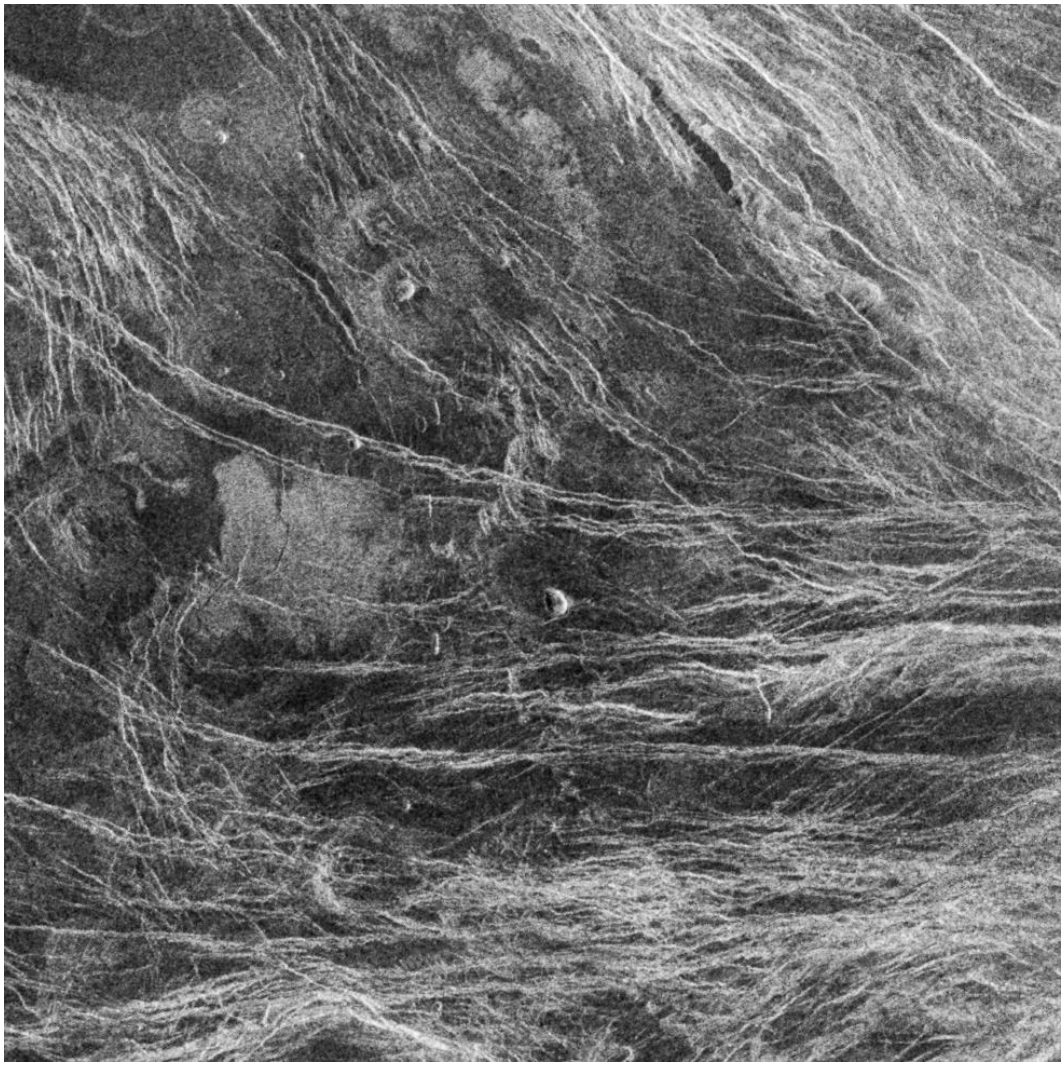
Much of the geological mapping of Venus has utilised just the primary cycle-1, left-looking, synthetic aperture radar imagery, combined with the altimetry data. Whilst this has proved adequate for the purpose, much more geological information can be extracted from the data and used to aid mapping.

Cycle-1, left-looking, and cycle-2, right-looking, SAR imagery can be combined to produce false-colour shaded-relief images that greatly enhance geological interpretation, by separating the effect of relief from the effects of roughness and emissivity. The effect of emissivity can largely be corrected by using the lower resolution radiometric data in which the intrinsic emissivity of the surface was measured.

Emissivity, reflectivity and SAR backscatter can be differenced to discriminate different surface characteristics, which often reveal information on surface age and weathering.

Cycle-1 and cycle-3, left-looking stereo, can be combined to provide stereo pairs from which high resolution (~200 m) digital elevation models can be derived. These are particularly useful in mountainous terrain where the altimeter data are difficult to interpret. Gravity data can also be used as a height field.

Fully utilising the wealth of data returned by Magellan in these ways can dramatically improve the visualisation and understanding of the surface of Venus.



Left-looking Magellan SAR image of Thetis Regio, Venus. Image resolution: 100m per pixel; image: 98km x 98km; wavelength: 12.6cm.

Comparing the Deccorelated Stretched images of Indian Remote Sensing Satellite (IRS-1A) and Landsat Thematic Mapper (TM) for lithological mapping

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The study area is the Karnataka-Andhara regions of southern India, which form s part of the Precambrian shield. The southern Indian Shield is essentially composed of greenstone belts and granulitic terrain. Image analysis techniques such as deccorelation stretching has been applied to four band Indian Remote Sensing Satellite (IRS-1A) in order to evaluate the potentials of the LIS-I sensor for recognition and mapping of lithological units. The first four bands Landsat Thematic Mapper datasets which are similar to the four band Indian Remote Sensing Satellite (IRS-1A) datasets were compared to produce the best colour image for detailed geological visual interpretation. The study revealed qualitative and quantitative similarities between the two both datasets.

CONFERENCE REPORT

Tectonic Geomorphology and sedimentary basin dynamics.

9th Workshop of the ILP Task Force: Origin of Sedimentary Basins.

The 9th workshop of the ILP (International Lithosphere Program) Task Force was held this year in Oliana, in the Catalunya region, northern Spain. To those readers unfamiliar with this organisation, the group meets every 15 to 18 months at a European venue (last year in Palermo, Sicily, next year in Izmir, W. Turkey) for a week of thematic lectures and related field excursions. The topics of discussion are related to sedimentary basin forming processes, ranging from the role of mantle:crust interaction, mantle flow, crustal deformation, the response of topography to these processes and the likely effects they have on sedimentary systems. The meeting was especially relevant to the remote sensing society as the theme this year revolved around the concepts of tectonic geomorphology, a topic that lends itself to various forms of remote sensing.

The convenors are headed by Sierd Cloetingh and Randall Stephenson from the Vrije University, Amsterdam together with local specialists from the site of the conference. The list of attendees tends to reflect this as many students from Amsterdam and (this year) Universities from Barcelona were presenting and helping with overall organisation of the conference. European academics are well presented at these meetings and this year, as the meeting was held in the "natural laboratory of the Pyrenees", several world-renowned structural specialists were present. However, a third of the participants were "global", coming from Australia, Canada, half a dozen from the US and a similar amount from the British Isles.

The conference was arranged with two sub-themes: Links between deep and surfacial processes, which had no geographic focus, but was biased towards Spanish or other European sites, and recent results from Europrobe (a pan-European initiative to study the deep structure of the European continental crust and upper mantle using seismic reflection, refraction and tomographic methods).

The second theme, while geologically interesting, was not the focus of applied remote sensers and the following concentrates on those papers that used satellite imagery and DEMs to illustrate the links between tectonics, basin formation and evolution.

The first session began with a keynote address by Mike Summerfield from the Geography Dept. at Edinburgh University. Some of you may know Mike and his talk, "Geomorphic responses to tectonics: distinguishing data from assumptions" was a clear, focussed and well-delivered introduction to the session. He introduced the concepts of "frames of reference", whether relative and unlinked to sea level or the geoid (i.e. on a local to regional spatial scale) or absolute, on a regional to continental scale determined by variations of the geoid or sea level. The aim of the talk was a critical assessment of the basis for referring to uplift to document the long-term denudational response to tectonics. This he illustrated using examples from South Africa and the Trans Antarctic. The talk recognised the historical development of physical geomorphology but mostly commented on methods of determining uplift from both fieldwork and hypsometry (the distribution of height with reference to a given datum). These aspects have obvious remote sensing connections. The evidence for and controls on chronology of denudation is also important, and were used by Summerfield to introduce the part played by cosmogenic isotopes in modern denudation studies. These reside in the top 2m of the earth's surface and their concentration is proportional to the length of time exposed to the sun: could they be detected remotely?: "Cosmosat"?

F. Van De Wateran gave a similar talk on the dating and sequence of fluvial terraces of the Swakop and Kuisep rivers in and around Namibia, mapped from fieldwork, aerial photos and topographic maps, while others integrated mapping data with AFTA (Apatite Fission Track Analysis) data. García-Castellanos et al presented a paper on the development of drainage systems in foreland basins by comparing computer-generated models with systems from nature: drainage systems depend on the stream power, capacity and tectono-sedimentary equilibrium. Forward modelling of existing drainage basins by hydrogeologists would have to take into account not only this but also the erodability or anisotropy of the bedrock and underlying subcrop. The common themes were DEMs, denudational processes, and the geomorphologic response linked to the region's tectonic history.

There followed a collection of papers including keynotes by Jean-Pierre Brun, Francois Roure and Eugenii Burov that explained the response of the upper and lower crust to both extension and compression. J-P Brun explained how different structural styles and uplift histories in narrow and wide rifts are related to the degree of coupling between the upper and lower crust. Images and DEMs were used to visualise the structure and geography of the quoted examples. Roure took us on a journey around the surface of the earth explaining crustal hypsometry as a function of tectonics, relating elevation to process. Burov, linking isostacy, erosion and tectonic process, demonstrated how hypsometric equilibrium is maintained in these systems and also showed that forward models that involve components of erosion can produce twice as much extension as those that don't.

This session was completed by several authors (Bertotti & Picotti) explaining the recent evolution of the landscape and topography of the Apennine system in Central and Northern Italy: much of the topography is the result of Quaternary to Recent extension, not the Mio-Pliocene compression that created the fold and thrust belt. A similar theme was expressed by Verges and Lewis in their descriptions of the Catalan Coastal Ranges, where DEMs were used to illustrate the topographic expression caused by inversion, post-orogenic rebound and late stage extension, all of which that have determined the landscape evolution of the Ebro drainage basin. The last talks of note that used both DEMs and Landsat TM data were discussions of the evolution of the Tien Shan and the Nanga Parbat ranges, given by Burbank and Verges respectively. Both authors used the data to chart the age and sequence of thrust activation and fold growth using geomorphological and hydrological analyses, elevation data and targeted field study. These last talks hammered home the need to combine field study, data integration and geological analysis to produce robust remote sensing practice.

You might now think "what has all this to do with the GRSG?" True, there were no talks about pixels, band ratios, mist suppression etc (all of which are useful), rather (some of) the talks showed how various applications of image interpretation and DEM integration are used to study basin evolution. There was also discussion on methods of 3-D structural modelling by combining DEM data with imagery to produce perspective views and block diagrams. What was being practised here was geological remote sensing: I fully realise that image processing is an integral part of lithological/mineral identification, but also that it is commonly data manipulation rather than interpretation.

The point I'm struggling to make is that, as the Geological Remote Sensing SIG, perhaps we should shift the emphasis away from image processing and manipulation towards user-applications, interpretation methods, case histories and integration. This will, hopefully, broaden the appeal of the group to other SIGs, members of the Geology Society, IMM, PESGB/AAPG etc i.e. to end-users. Let's not preach to ourselves, but to our customers, whether they are mining geologists, engineers, volcanologists, sedimentologists, structural/tectonic geologists or geodesists.

I am available to answer for my heresy at mike@npagroup.co.uk.

MISCELLANEOUS MATTERS

Satellites reveal Los Angeles under a slow squeeze

Downtown and West Los Angeles are moving toward the San Gabriel Mountains and the metropolitan area in between will be squeezed slowly over the next several thousand years, according to researchers at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. The measurements suggest that new mountains may be forming south of the high San Gabriel Mountains. While this research does not mean that an earthquake in Los Angeles is imminent, one possible conclusion is that earthquakes in Los Angeles area might be concentrated in the northern part of the basin.

The results come from the Southern California Integrated Global Positioning System (GPS) Network, an array of 60 GPS receivers that continuously measure earthquake fault movements throughout Southern California. The earthquake network began in 1990 with only four GPS receivers as a prototype funded by NASA. A further 250 are planned to add to the existing 60. It detected very small motions of EarthUs crust in Southern California associated with other California earthquakes in June 1992 in the town of Landers and in January 1994 in Northridge.

Finally, some remotely sensible humour…..

- Fred wants to put a bet on a horse in the Derby and he thinks that he ought to take a more scientific approach to his annual bet. So she rings up a few mates (an engineer, a mathematician and a physicist) and asks them to help.

  He first asks the engineer who replies: "hmm, couldn't possibly answer, too many variables, too poorly constrained".

  He then asks the mathematician, who thinks for a while then says: "I can give you the probability of the horse winning, but that's about it".

  Fred still thinks this isn't good enough and so finally he asks the physicist whether his horse will win. The physicist goes away, makes loads of calculations, comes back and says "yes, according to my model the horse will definitely win…….but of course, my model only applies to spherical horses in a vacuum".

- A theologian, a geologist and a geophysicist were travelling together on a train through deepest, darkest, loveliest Wales. There are leaves on the line and the train comes to a temporary halt during which time the theologian spies a black sheep in a field next to the train. “Oh goodness”, he cries, “a black sheep. All sheep must be black!”.

  “Don’t be ridiculous” cries the geologist, “ it only means that this particular sheep is black”.

  “Ah, I’m afraid you’re both wrong” says the geophysicist, smuggly, “the only correct assumption is that half the sheep is black”.

Today's Stock Market Report

- Helium was up, Feathers were down, Paper was stationary.
- Fluorescent tubing was dimmed in light trading.
- Knives were up sharply.
- Cows steered into a bull market, Pencils lost a few points and
- Hiking equipment was trailing.
- Elevators rose while escalators continued their slow decline.
- Weights were up in heavy trading, Light switches were off and
- Mining hit rock bottom.
- Diapers remained unchanged while Shipping stayed on an even keel throughout the day.
- The market for raisins dried up.
- Coca Cola fizzled while Caterpillar inched up a bit.
- Sun peaked at midday.
- Balloon prices were inflated, and once again, Scott Tissue touched a new bottom.

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