Highlights

- **Geophysical survey of Fiji**
- **GPS use in GIS projects**
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Fiji and South Pacific GIS/RS news

The Newsletter of the Fiji GIS/Remote Sensing User Forum
Issue 98/02
July, 1998

News Updates: FLIC lends support to year-end conference, User Group starts in New Caledonia, and GIS/RS News goes colour!

Welcome to this our second edition of the revitalised GIS/RS News. Our first edition for 1998 was well received--thanks for all the nice comments. It is good that we have this type of communication going again. Good communications within the GIS community in the Pacific is so important, especially given the relative youth of our GIS community.

Thanks go out to those who contributed to this edition. Without input, there will be no newsletter. We received some queries on exactly what might make up a good article. As mentioned, it can vary greatly. News about personnel changes, such as people moving from one organisation to another or new people being hired is important. New projects, no matter how small, are interesting. Your fellow GIS workers would like to know about changes in technology or systems when they happen. If you are at a meeting or conference and hear of something that is interesting or read of some new ideas, send them along if you think they are being missed by others in the Region.

If you do not feel comfortable writing the article yourself, we can offer asssistance. From idea development, to technical commentary, to writing style assistance, we can help you get your ideas and news into print. Check out the bottom of page 2 to see how to get in contact with any of the editorial team. If you do not do it, who will?

Plans for the year-end GIS User conference received a big boost when the June meeting of the Fiji Land Information Council (FLIC) endorsed the idea after a presentation to FLIC by James Britton of USP. James had taken the ideas discussed at the February and March User Forum meetings plus the overall aims, objectives, and benefits of a conference and had put them together in a presentation designed to inform FLIC about the conference and gain their support.

After the presentation, members of the Council indicated strong support for the conference and their appreciation that such a conference was being planned. Support from FLIC is important as the public sector organisations are key to the ultimate success of the conference. If they do not send people to speak at and attend the conference, the conference will not acheive its stated goals.

The next stage in the conference organisation is developing the papers and presentations. This will be discussed at the July Fiji GIS User Forum meeting at USP. The conference hopes to bring as many members of the Fiji GIS community together as possible for a year-end presentation and discussion session over two days in December. While this first conference is focussing on GIS Users in Fiji, anyone is welcome and if this conference goes well, we have plans to expand the focus for 1999.

News has come in about a fledgling GIS user group forming in New Caledonia. Christian Jost of Université française du Pacifique in Noumea sends word that the first meeting of the group should happen in July sometime. Hopefully, we will have more information by the next edition. In the meantime, welcome to the Pacific GIS/RS community—"bienvenue!"

Lastly, a note about our latest technological upgrade: colour! In order to increase the value and readability of the GIS/RS News, we have added colour to certain pages. This is especially helpful in rendering remote sensing images and other colour-specific graphics. It does however, increase our production costs, so take care of this issue please! When you are finished with it, please pass it on to a friend.

Contents

Publishing

Fiji and South Pacific GIS/RS News is published through the facilities of SOPAC and The University of the South Pacific in Suva, Fiji. Besides acting as the newsletter of the Fiji GIS and Remote Sensing User Forum, this publication serves as an information and news link between individuals and organisations across the South Pacific Region who are interested in GIS, Remote Sensing and related disciplines. Articles focus on how GIS is developing within the Region and feature news on individual projects and organisations, new trends, technological problems, human resource issues, successes and failures. We encourage all types of contributions on a variety of topics from both new and established members of the GIS community both regionally and internationally. If you have an idea for an articles, please contact any member of the editing team listed below for advice and development help.

Fiji and South Pacific GIS/RS News is available over the Internet through the SOPAC Website: `www.sopac.org.fj/publi/GISRS-News/default.asp;` and you can download with Adobe Acrobat Reader.

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Instructions for submission

If at all possible, please provide unformatted digital content. Graphics should be in separate files in their native formats. You can send these via email, or by floppy disk (IBM or Mac format) to any address above. We can work with most text and image formats. If you have any questions about submitting articles, please contact the editorial team listed above.

Meeting Report: April

Geological Applications Highlighted at MRD

Fiji GIS/Remote Sensing User Forum
Minutes of April 1998 Meeting
Conference Room, Mineral Resources Department, Nabua
Tuesday, 21 April, 1998

Welcome

Prakash Narayan opened the meeting at 14:30.

All 19 attendees introduced themselves, and special welcome was made to members attending for the first time.

Representatives from: FLIS, Forestry Department,. Lukemine, MRD, NLTB, SOPAC, Bureau of Statistics, Telecom, USP

Updates

FLIS:

FLIC has accepted *GIS/RS User Forum* request to have James Britton present outline of intended December conference to Council at July meeting.
FLIC meetings are now once every two months, instead of monthly.

Projects:
NLC Mapping: Sixty-four NLC sheets 95% complete, out of a total of 432 sheets have been captured.
Pilot Projects in Progress: Fiji Police/GIS/MapInfo. Crime Analysis and Accidents—Rashmi Rita gave short update and overview.
Valuation and Lease Administration systems are to be integrated. Jone Senioli is currently involved in this project with Terralink, NZ.

Property Addressing:
An action group has been set up to formulate a policy for systematic street addressing.
Any member of the User Forum with any input or ideas on this issue is asked to contact FLIS support centre.

Forestry:

Arc/Info plantation 10:000 forest plantation mapping project ongoing; however, MapInfo software is now supporting project for various database queries and output. Work continues on the plantation and inventory database linkage.
Logging plan mapping continues, with 1,800 ha. mapped this last month.
Logged area updates for 1997 is now completed, and logged out data has been updated to the system showing logged out areas on two main islands.
New pricing system now approved by Ministry of Finance. Most services now provided by MSD-Forestry are on an available user-pay price schedule.
Pilot project with NLTB continues, but currently awaiting full NLC data conversion to InfoCAD from old NLTB InfoMap system.
Training continues with two staff members working towards diplomas at USP and GIS/Remote Sensing specialist attending 10-week remote sensing course in Japan from May 5th.
Appreciation expressed to SOPAC for assistance with hardware maintenance. SOPAC helped repair a hard disk drive in Forestry's main system.

Lukemine Enterprises:

Indicated there has been some problems with delivered Trimble equipment, however, Trimble had taken full responsibility for the problems.

NLTB:

NLC project continues.
Preparing thematic maps for phase II of ALTA.
Restructuring plans currently in process at NLTB.

SOPAC:

Conducting workshop March 10-12 in the Cook Islands on GIS for marine resources and disaster relief managers.
FEA have begun project similar to work already underway in Solomon Islands.
Working on cadastral mapping project in Nuie.
Distributing MapInfo 4.5.
Working on Lagoon Modelling project.

Bureau of Statistics

Polygonisation process continues.
Census data available in August

Telecom:

Phase II of project (block wiring) starting.
All other projects on time.

USP:

Mid term break week, courses course continue with over 50 students studying GIS.

Presentations

The expectations of GIS and Remote Sensing at MRD.
Bhaskar Rao, George Niuumataiwaiu, MRD

Acquisition of digital geological data
Pramesh Kumar, MRD

The organisation of data
Prakash Narayan, MRD

A tool to manipulate the data(GDM Software)
Isireli Nagata, MRD

Mining Application
Pauliasi Matai Waqanokowoko, MRD

Automating GIS applications
Prakash Narayan, MRD

GIS human resources
Vijen Prasad, MRD

Other Business

Represenatatives of Fiji Telecom expressed concern over the progress of the National addressing project.
FLIS representatives indicated that committee had met with Permanent Secretary as chair. This would form action group for addressing issue. Further meetings were envisioned.
Several groups wondered if it is possible to access FLIC meeting minutes.
This will be discussed at FLIC meeting

Next Meeting

At Telecom on 13 May, 1998.

Close

Meeting Report: May

Large Turnout at Telecom

Fiji GIS/Remote Sensing User Forum
Minutes of May 1998 Meeting
Telecom Fiji Limited
Tuesday, 13 May, 1998

Welcome

S. P. Shandil opened the meeting at 14:25.

Forty six people present with representatives from Agriculture, Air Surveys Dept., Environment, FEA, Fiji Museum, FLIS, Forestry Department, Lukemine, National Trust, NLTB, Police Services, Private Sector Representative, PWD, SCC, SOPAC, Bureau of Statistics, Telecom, & USP. Guest Representatives from Australia-Air Surveys.

The Managing Director of Telecom Fiji Ltd. (TFL), Mr. W. Thompson gave a welcoming address to the User Forum. His address noted how Telecom is keen to support the activities of the User Forum and to help in the development of GIS in Fiji. He stressed how the GIS sector needs government help in development. He also noted how pleased he was with GIS developments at TFL. Mr. Thompson highlighted some of the challenges ahead, including the need for polygonised data and a sound addressing system. He closed with a warm welcome to the User Forum members.

Updates

Air Surveys Section:

Just completed airphoto coverage of several major towns.
On-going data capture for mapping at 1:25,000.

Agriculture:

Conducted workshop at ForSec.
Completed soils mapping of Viti Levu and working on Vanua Levu.
Obtained data from FLIS and shared data with MRD-Forestry.

Environment:

Just starting. Here to learn.

FEA:

Completed pilot project in Lautoka.
Completed workshop on GPS with SOPAC.

Fire Authority:

New, but hoping to learn and happy to be attending.

FLIS:

NLC Mapping project continues.
Rashmi Rita gave short update on crime analysis project.
Joint projects underway with Terralink, NZ.

Forestry:

Logging plan mapping continues.
Pilot project with NLTB continues, with data conversion near completion.

Lukemine Enterprises:

Still getting 50% DOA rate on Trimble equipment, however, Trimble is still taking full responsibility for the problems.

NLTB:

Completed preparation of thematic maps for phase II of ALTA.
Projects on hold pending restructuring plans currently in process at NLTB.
Transferred Agriculture Deptartment data to NLTB LIS.
Data verification with Forestry ongoing.

Police Services:

Just starting, but working on pilot project with FLIS (see FLIS section).

Private Sector:

Indicated that negatives for digital corrected airphotos were available from overseas.

SOPAC:

Various projects ongoing (see April Meeting).

Bureau of Statistics

EA boundary project on hold, but 75% of Viti Levu completed..
Problems updating base maps.
Working on Social Map of Fiji.

Telecom:

Phase II of project (block wiring) starting.
All other projects on time.

USP:

Courses continue. Field trip to FLIS, Telecom, SOPAC and Forestry coming soon.

Presentations

Progress on Street Addressing.
Rishi Ram

Field data collection for Telecom
S. Miller, Telecom

QC processes
A. Prasad, Telecom

Field View
R. Rao, Telecom

Citric Winframe
Anurag, Telecom

Outline of Airphoto mapping
Tony Slanker

Developments in Remote Sensing
Wolf Forstreuter, SOPAC

Other Business

None

Next Meeting

At SOPAC, 9 June, 1998.

Close

Meeting Report: June

June meeting at SOPAC

Fiji GIS/Remote Sensing User Forum
Minutes of June 1998 Meeting
SOPAC
Tuesday, 9 June, 1998

Welcome

Wolf Forstreuter opened the meeting at 14:25.

Forty six people present with representatives from FEA, FLIS, Forestry Department, Lukemine, NLTB, Police Services, Private Sector Representative, SOPAC, Telecom, & USP.

Updates

FEA:

Ongoing FEA - SOPAC GIS Project
Completed-Pilot survey with telecom and SOPAC carried out along Mead Road and considered a success.
Problem with Lautoka Base StationCompleted pilot project in Lautoka.
Completed workshop on GPS with SOPAC.

FLIS:

Digital capture of Oneata (W30) in progress, line cleaning of Vunisea (N32) and Tiliva (O32) in progress.
Conversion of 159 map sheets at 1:25,000 underway at Terralink--completion in July.
Fiji Topo revenue in April and May: $11,500.
NLC map sheet capture 18% completed.
Intergraph NZ consultants had session today with staff to clear up production problems.
CCMS revenue in April and May: $3,048.
National Election Mapping project in progress--currently working on 74 provisional maps with completion in June.
Survey Plan Verification 95% completed.
Police Pilot project almost complete.
Adressing Pilot Project is delayed due to lack of memebers at first meeting. Issue to be discussed at FLIC.
Two staff attended 15-week PC servicing course at FIT.
Five staff memebers attend Novell NetWare Systems administration course with Computech.

Forestry:

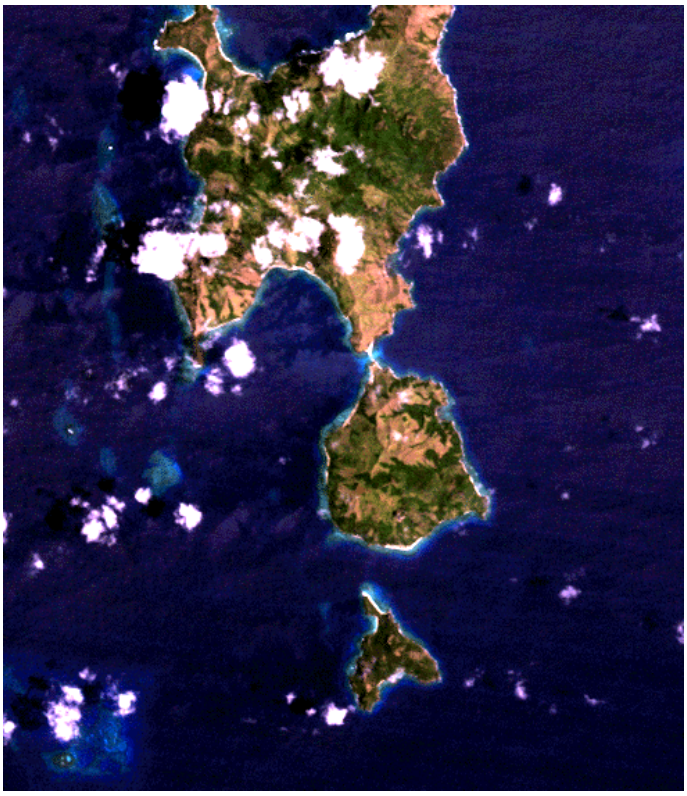
Logging plan mapping continues, showing contours, infrastructure, hydrography and +30% slope.

...continues on page 7

Satellite Image Replaces Map

By Andy Butcher
SOPAC

As part of their third year field work programme, SOPAC Earth Science and Marine Geology students visited Waya in the southern Yasawas Island chain to the west of Viti Levu, Fiji. The SOPAC Training Coordinator, Andrew Butcher, cursed his bad fortune when he found that a company interesting in developing a resort on Waya had beaten him to the last printed maps of the island at the government suppliers. His fortune changed when he caught a glimpse of exactly what he wanted-satellite images of the island that Wolf Forstreuter, SOPAC was processing and converting to MapInfo format.



Processed satellite image of Waya Island, Yasawas, Fiji. Landsat TM: blue band, green band, red band. This image derived from MSD-Forestry, Fiji

The image turned out to be a great help. By using the image to brief students about where they would be carrying out their geological mapping and what they would find, traverses where planned and carried out more efficiently. In addition, some features such as the sand spit joining Waya and Waya Sewa to the south were identified and visited. Of particular use was the identification of reef coverage around the island that assisted in the planning of where to drop students off and collect them by boat.

The copies that were printed now reside in the houses of two chiefs as reminders of SOPAC's visit to the island. Incidentally, the potential resort developers are now rather keen to swap their map for the satellite image!

For further information contact Andy at SOPAC, Phone: (679) 381 377, FAX: (679) 370 040, or e-mail:
andy@sopac.org.fj

GIS flowing into Water Utilities

By Edward Burke

GIS was one of the issues discussed at the newly formed Pacific Water Association held in Suva, Fiji, from 31 March to 4 April 1998. 16 Pacific Island water utilities plus two utilities attended the meeting from Australia.

A presentation titled "GIS for Utilities?" was given by Wolf Forstreuter, PREP/SOPAC GIS consultant. The talk focused on the advantages to water utilities of establishing and maintaining GIS using Wolf's experience with power utilities as an example.

Map location and tabular data can be linked so details on a particular water utility feature such a borehole, pump station, valve, etc. may appear on a computer monitor by a click of a mouse.

A short discussion followed the presentation with most utilities interested in learning more about GIS. Note that GIS using MapInfo, has already been established by the Tonga Water Board and the Solomon Island Water Authority.

June Meeting...continued from page 5

Field trips on collection of logged data and establishments of plots on logged out areas.
Entertaining request from The Hardwood Corporation for the preparation of sawmill plans, layouts and other material with work to start in July.
Hardwood plantation area updates for Viti Levu and Vanua Levu are extended.
GPS training in Colo-I-Suva for Northern Division Surveyor.
Appreciation expressed to USP for assistance with digitising operations.

Lukemine Enterprises:

Trimble agent in New Caledonia helping set up GIS user group.

NLTB:

NLC project continues.
Participated preparing Government-ALTA resettlement unit data, which is to be sold.
Trying to organise collection of aerial photomaps suitable for 1:5,000 mapping of Nadi, Nausori, Lami, and Lautoka. Trying to get cost charing with other groups.

Police Services:

Working on filing projects for GIS work.
Concerned about progress on street addressing.

Private Sector:

Examining cadastral mapping with raster backdrop, however, little interest beyonf Fiji Sugar Corp.

SOPAC:

Ongoing—Siltation problems in Monasavu
Ongoing—Dredging problems in Pohnpei and Fiji
Ongoing—Numerical Model of Majuro and Vila
Completed—Fisheries Project on 3-D visualisation for FAD sites
Completed—Pacific Cities Building Survey of Honiara, Solomon Islands
Ongoing—Near completion Pacific Cities Building survey of Vila, Vanuatu
Not started—Pacific Cities Building Survey of Nuku'alofa, Tonga
Ongoing—Suva backdrop 20% completed
Ongoing—FLIS map 65% available remaining area needs to be bought
Ongoing—Financial approval from European Union for ERDAS Imagineupdate and purchase of GPS base stations for Tonga and Solomon Islands
Availability of spaceborne image data on SOPAC homepage.

Telecom:

Phase 1 90% complete—102 users in three divisions will have online access to data.
Participated with SOPAC and FEA in Trail GPS survey of Mead road. Plan to use GPS techniques in Phase II cross wiring starting next week.
Also interested in progress on street addressing group.

USP:

Made presentation to FLIC about the year-end conference. FLIC was most positive about the conference and gave its full support.
Reminder that newsletter is coming out soon and items are always needed.

Presentations

Pacific Cities Project.
Monika Swami, SOPAC

The GIS-PACnet subscriber list—a help for GIS operators in the South Pacific
Franck Martin, SOPAC

Comparison of timber volume indicated by LRD and NFI with actual standing timber volume
Josua Waloko, MRD-Forestry

3-D Data Visualisation—an aid to fisheries for FAD site
Robert Smith, SOPAC

GIS backdrop—potential of space-borne image data for reef mapping
Wolf Forstreuter, SOPAC

New developments in Open GIS
Peter Lawas & Ken Mathers, Intergraph, NZ

Accessing GIS-related information on SOPAC's homepage
Franck Martin, SOPAC

Other Business

None

Next Meeting

At USP, 14 July, 1998.

Close

GPS as a tool in Disaster Mitigation Project

By Graham Shorten
SOPAC

The Hazards Assessment Unit of SOPAC is in the process of developing a MapInfo database which will enable a quantitative estimation of the risk facing development in a number of capital cities in the Pacific. This project, known as Pacific Cities, will consider all hazards, both natural and man-made, initially for Suva, Honiara, Port Vila and Nuku'alofa, but extending later to other cities including Lae, Apia and Luganville.

Several sub-projects are already well underway in defining and zoning earthquake and tsunami hazard for these cities. The MapInfo database includes a wide variety of information ranging from physiography and bathymetry through geotechnical and geological to subsurface seismic reflection and borehole data. Critical to the assessment of risk rather than merely defining the hazards alone, is the establishment of a database on the buildings and infrastructural assets of each city.

Recognising this, the Hazards Unit has set about carrying out a building assets survey of the four principal cities which is set for completion by July this year. Buildings are individually assessed by a specifically-trained team for a variety of features that relate to their susceptibility to earthquake, cyclone and flooding. Faced with a need to undertake the survey of literally thousands of buildings in each city, the Hazards Unit opted to use six, hand-held, Trimble GeoExplorer II GPS units for the task.

Apart from their convenience and high performance characteristics, these units have the facility for an electronic questionnaire to be completed while the position is being fixed. The results of the questionnaire remain attached to the position fix for each building asset feature, and are then exported and incorporated directly into the wider MapInfo database.

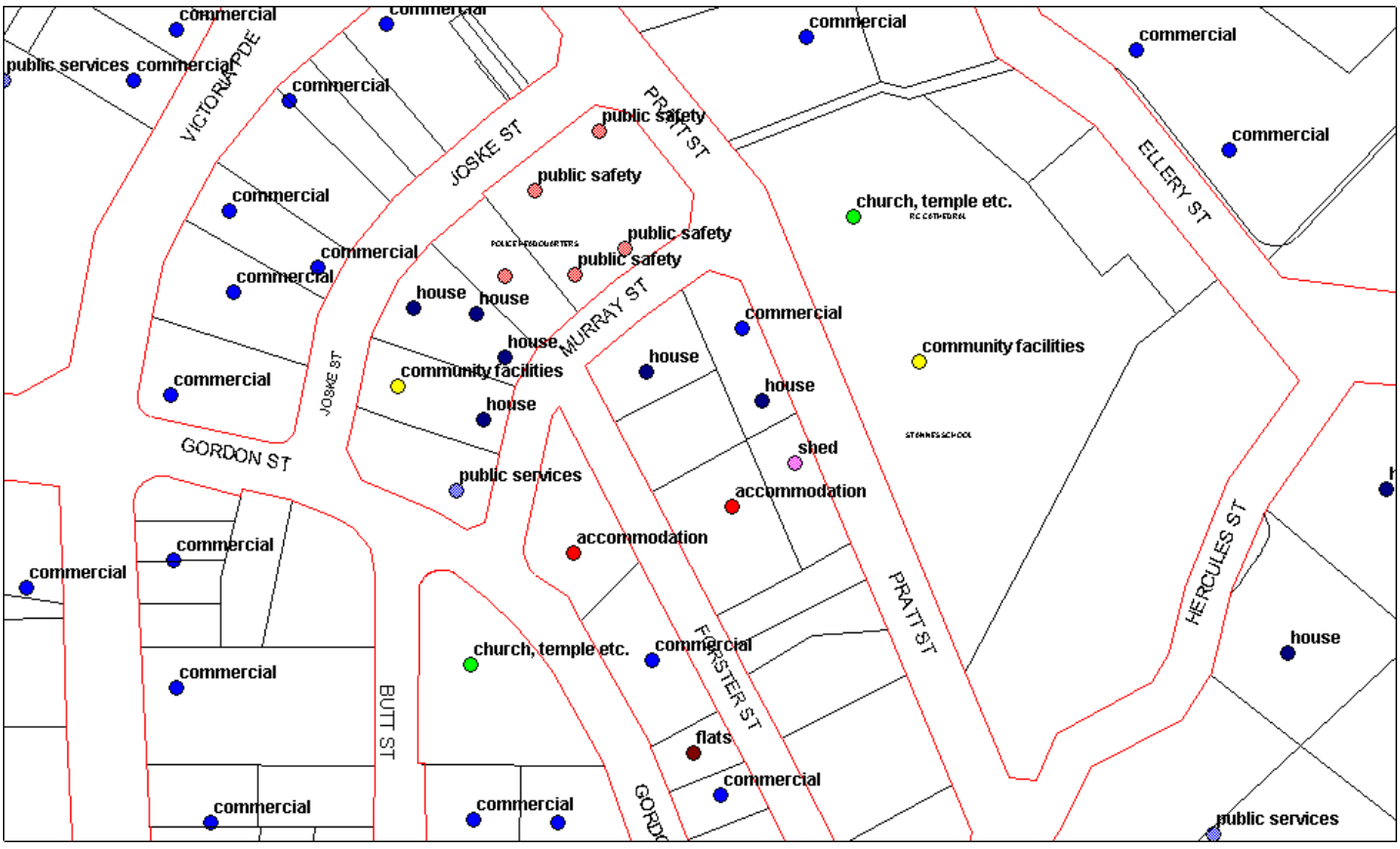


Figure 1: MapInfo output of buildings plotted over road and cadastral data. Buildings are coded to building type

From there, it is a simple matter to assess which buildings lie within hazardous zones, and how the characteristics of those buildings make them more or less susceptible to that particular hazard. Furthermore, MapInfo allows calculations of the total economic exposure of a city due to property destruction in a given disaster scenario and, with connection to City Council and census databases, an estimate of the risk to the population of a city.

At the same time, the Hazards Unit acquired a pair of Trimble 4600LS GPS survey units with centimetre vertical and horizontal resolution, to complement the operation of the GeoExplorer II units. One of these 4600LS units was upgraded to a 12-channel receiver to act as a high accuracy base station, both for the transfer of established survey to more convenient locations, and as a base for the six GeoExplorer rovers during building asset surveys.

The surveying units also have the advantage of being able to be used in kinematic mode where the second 4600LS unit acts as a rover on the move enabling, for example, construction of contour maps of low-lying areas where only sparse survey data previously existed. Apart from the convenience in data handling afforded by this combination of GPS technologies, GPS has come into its own in the Pacific Islands in one very important aspect.

Up to now, maps showing different types of data have been prepared on widely varying mapping systems, and even fundamental physical maps of some countries have not yet been located properly in a global geodetic system. It is imperative that future generations of workers from all fields related to disaster mitigation, preparedness and rehabilitation are able to locate themselves accurately on the same map base. This relies heavily on the adoption of a GIS such as MapInfo as a universal database, and the use of GPS to provide an absolute fixing of positions on a standard geoid.

The Hazards Assessment Unit of SOPAC currently operates with the services of USP graduates Litea Biukoto and Monika Swamy, Lasarusa Vuetibau seconded from MRD, Suse Schmall as a special projects consultant, program assistant Litia Waradi and head of unit, Graham Shorten.

For further information contact Graham at SOPAC, Phone: (679) 381 377, FAX: (679) 370 040, or e-mail:
`Graham@sopac.org.fj`

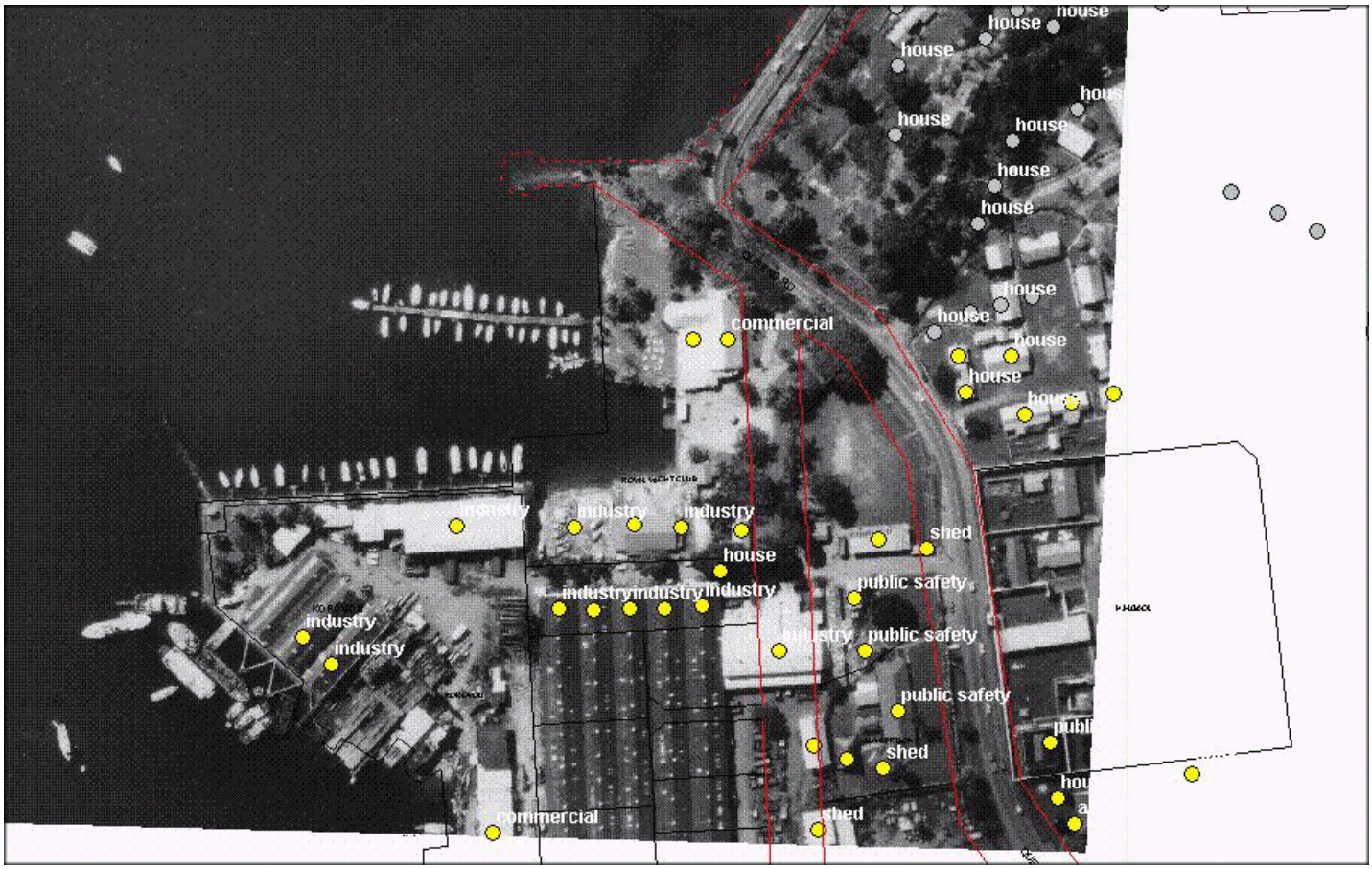


Figure 2: Map of the Yatch Club area in Suva harbour indicating potential hazard risk sites

AIRBORNE GEOPHYSICAL SURVEY – FIJI

By Bhaskar Rao
Mineral Resource Department

Summary:

June 2 marks the public release of data acquired by a regional airborne geophysical survey that covered the major portion of the Fiji landmass and prospective offshore basins. The coverage of the survey, which acquired airborne magnetic and gamma-ray spectrometric data and digital elevation data, is shown in Figure 1.

Figure 1: Gamma-ray spectrometry RGB (K-Th-U) colour composite of Viti Levu

Flying for the survey commenced in April of 1997 and was completed in September of the same year. Survey flying and data acquisition were closely supervised by the Australian Geological Survey Organisation (AGSO). Kevron Geophysics, who was also responsible for data processing, flew the survey. The project was initiated by the Government of Fiji and funded by the Government of Australia through the Australian Agency for International Development (AusAID). The objective of the survey is to provide a database to stimulate mineral and petroleum exploration in Fiji as well as to aid geological mapping, land use studies, geohazard evaluations and groundwater exploration in Fiji.

The results of the geophysical survey are being released as a comprehensive data package that includes point-located and gridded digital data, image maps, flight path maps and interpretation maps. The digital data is available on both magnetic tape (exabyte) and CD-ROM.

Apart from overseeing the acquisition and processing of the geophysical data, AGSO provided training in geophysical data processing methods, map digitising, data archiving, retrieval and in the use of MapInfo and Discover to MRD staff. Two staff spent an extended year in Australia undertaking an Honors course in Geophysics and undergoing training in processing techniques at AGSO, Canberra.

Survey Specifications

The survey acquired magnetic, airborne gamma-ray spectrometric and digital elevation data. The data were recorded using a fixed-wing twin-engine aircraft over offshore areas and low-lying islands (approximately 80 000 kilometers) and two helicopters over the rugged terrain of the major islands (approximately 80 000 kilometres). The survey elevation was 80 metres above the land and sea. The helicopter lines have a spacing of 400m and are oriented at 330 degrees from true north and the tie lines have a spacing of 4000m oriented 60 degrees east of true north. The fixed wing aircraft lines have a spacing of 800m over water and 400m over the low lying islands with tie line spacings at ten times the line spacing. For all of the fixed wing surveying except over the northern Lau Group of islands the line and tie line orientations are the same as for the helicopter surveys. Over the northern Lau Group the traverse lines are oriented at 45 degrees and the tie lines at 315 degrees due to the different orientation of the geology of this island chain.

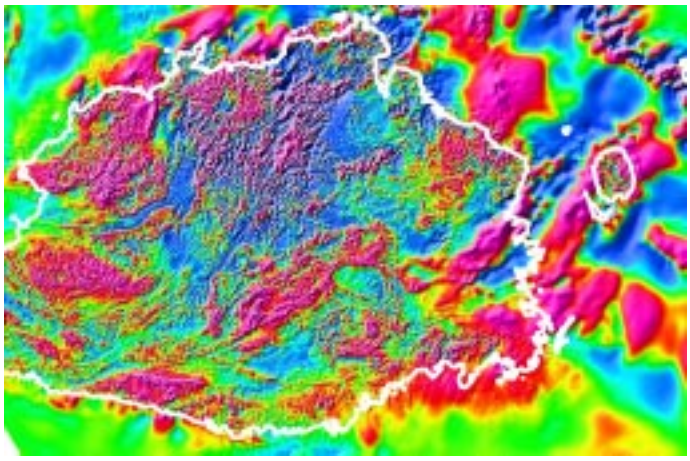


Figure 2: Total Magnetic Intensity (RTP) with north-west gradient enhancement of Viti Levu

Total magnetic intensity was recorded with an acceptable noise envelope of 0.2 nanoteslas. The radiometric (gamma-ray spectrometer) data were acquired with a 33 litre crystal over the full spectrum of 256 channels. The simultaneous recording of GPS elevations of the survey aircraft and the ground clearance as measured by a radar altimeter allowed the production of a digital elevation model.

AGSO applied in-field quality-control techniques that required the contractor to demonstrate the integrity of the data. Further verification checks were made during the processing phase, which included micro-levelling of data to ensure that the digital data sets would be suitable for high-quality image processing.

Survey Results

An initial interpretation of the survey results has been completed by AGSO. This interpretation has allowed the refinement of the surface geological mapping of Fiji as published in various geological maps. The interpretation has also defined many previously unknown fault systems. The most significant aspect from a mineral exploration perspective is that the geophysical data identifies characteristic signatures over known epithermal gold and porphyry copper deposits and that similar signatures are recognisable in areas where no deposits have yet been discovered. The interpretation has been able to delineate the subsurface extents of various major intrusions that appear to be genetically linked to the formation of the epithermal gold and porphyry copper deposits. In many situations volcanic vent systems have been mapped overlying these intrusions. Depth to magnetic source estimates have been produced for the offshore sedimentary basins to assist with evaluation of the hydrocarbon prospectivity of these areas.

Geophysical Data Products

The results of the survey are available as a comprehensive data package, which is available from the Fiji Mineral Resources Department (MRD) in Fiji. The MRD owns the airborne geophysical data and has copyright over the Fiji data package.

The data package comprises the following products:

- point-located digital data
- total magnetic intensity (micro-levelled)
- terrain clearance
- terrain height
- total count (air absorbed dose rate nGh^{-1} **)**
- equivalent potassium percentage
- equivalent uranium ppm
- equivalent thorium ppm

- gridded digital data
- total magnetic intensity
- total magnetic intensity reduced to the pole
- first vertical derivative of total magnetic intensity reduced to the pole
- digital elevation model
- total count (air absorbed dose rate nGh^{-1})

- equivalent potassium percentage
- equivalent uranium ppm
- equivalent thorium ppm

- image maps
- total magnetic intensity reduced to the pole, north sunangle (colour)
- 1st vertical derivative, reduced to the pole, north sunangle (grey scale)
- 1st vertical derivative, reduced to the pole in greyscale (north sunangle) superimposed over TMI in colour with no illumination (colour)
- 1st vertical derivative, reduced to the pole, east sunangle (colour)
- ternary gamma ray (colour)
- equivalent potassium (colour)
- digital elevation model with a NE sun angle (colour)

- contour maps
- total magnetic intensity reduced to the pole contours
- total count (air absorbed dose rate nGh^{-1}) contours
- equivalent potassium (percentage) contours
- equivalent uranium ppm contours
- equivalent thorium ppm contours
- digital elevation model (metres) contours

- flight-path maps
- interpretation maps and interpretation report

- Geophysical interpretation maps (MapInfo format) showing solid geology indicated by the geophysical results, major faults and structures, plus the distribution of major intrusions occurring beneath the surface.

Depth to magnetic source estimates are supplied for the offshore basins. A report is available describing the methodology used to produce this map and the most significant features identified by the interpretation.

For further information contact:
Bhaskar Rao (Director), Mineral Resource Department, Private Mail Bag, Suva, Fiji. Telephone: 381 611 (679), FAX: 370 039 (679). Email: brao@mrd.gov.fj.

Satellite Image Data of Fiji as MapInfo Backdrop

By Wolf Forstreuter
SOPAC

Background

During Fiji's national forest inventory (1991-1992), Management Services Division, Forestry (MSD) ordered coverage of Landsat Thematic Mapper (TM) image data. MSD cor-rected these images geometrically to the Fiji Map Grid (FMG) and cut the images to files covering exactly one sheet of the new Lands Department map series 1:50,000. Recently, the SOPAC GIS-Power Utility project converted these files to TIF format and created MapInfo TAB files. Both steps are necessary for MapInfo to import the images as a GIS backdrop. Now, the image backdrop is available for all parts of Viti Levu and some parts of Vanua Levu. In addition, a user can import backdrop for the Bligh Water area and the Yasawas.

Accuracy

The accuracy is limited to thematic image backdrop of the scale 1:50,000. Whenever pos-sible, MSD performed the geometric correction separately for every map sheet. Dealing with geometric corrections in this way was necessary, because the FMG parameters are not known by Lands Department at this time and MSD could not be integrated into ERDAS software. By using ground control points (GCPs) separately for every map sheet, the error of a plane without projection is minimised.

Like Lands Department, when correcting aerial photographs, MSD was not able to identify GCPs for map sheets covered by water only. To overcome this problem for the Bligh Water area, MSD identified GCPs on the islands of the Yasawa group and on Viti Levu and cor-

rected on the corresponding Landsat (covering 170 x 180 km) image in one sweep. Then the operators cut the corrected image file into smaller files showing one map sheet only.

Image Enhancement:

The selected TM channels 1,2 and 3 provide the visible part of the light spectrum. Channel 1 covers the blue, channel 2 the green and channel 3 the red portion. This selection out of the seven possible Landsat bands is good because the image backdrop appears as if the human eye would see the landscape from 600 km height. Furthermore, the blue channel is best to distinguish between different water depth. Reefs can been identified clearly.

Image enhancement had limitions, because the data distributor first rectified the scenes to UTM projection. Then MSD rectified again to FMG. If the operator carries out the image enhancement after the geometric correction, a destriping is impossible. Destriping is a process, which removes the scanning line differences caused by the sensor. A more optimised image contrast enhancement would allow more contrast between different water depth. However, because of enhancing the contrast between the scanning lines at the same time, the optimisation is limited.

Landsat Imagery Maps Shallow Caspian Coast

This article is copied from the Landsat Data User Notes 1997, observations by Wolf Forstreuter

Falcon Information Technologies, Inc., of Dallas, Texas, used Landsat TM imagery to create a highly accurate water-depth map along the shallow coast of the Caspian Sea. The map was needed by Oryx Energy Company, which was engaged in oil exploration activities in the area.

Recent sea level changes in the Caspian had made all printed bathymetric maps obsolete, presenting navigation challenges for the movement of exploration equipment along the shallow, muddy coastline. Falcon had provided Oryx with satellite-derived geologic maps for onshore projects, so Oryx asked if the value-added firm could generate a new map of water depths.

Falcon's president knew that bathymetric maps in the clear water of the Caribbean had been made with satellite imagery, but was unsure whether it could be done in the muddy, turbid Caspian. To make the project even more of a challenge, Oryx requested a bathymetric accuracy of one meter in the maps.

In general, water-depth maps are created from satellite images by correlating known water depth measurements at several control points with variations in spectral signature related to light reflecting off the sea floor. Results are extrapolated to estimate depths throughout the image.

The challenge to applying this same process in muddy water was separating the spectral signature of light interacting with the sea floor from spectral reflectance caused by suspended sediment. Falcon technicians used TNTmips, a commercial image processing software from MicroImages of Lincoln, Nebraska, to mask out the extraneous spectral information and obtain the sea floor reflectance they wanted.

The technicians then derived a correlation between reflectance and control-point measurements to create a colour image map of the Oryx project area with shaded colours to represent various depth increments. The water depth accuracy of the first map Falcon created was one-third of a meter. A second map, created from TM imagery acquired on a less windy day when the water was not as turbulent, had an even better accuracy: one-quarter meter. Based on the success of this project, image-processing experts believe the technique can be applied in waters at least 10 meters deep.

Comments by Wolf

Having satellite data for the South Pacific it should be possible to map reefs accurately at the scale 1:50,000. As opposite to aerial photographs only a small number of ground control points is necessary for geometric correction. Large areas could be mapped within a short time.

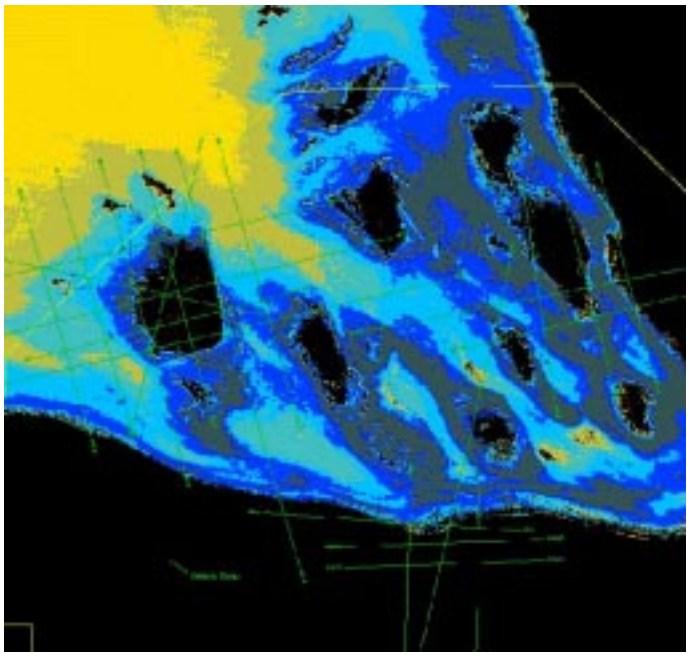


Figure 1: Processed imagery illustrates variation of water depth as colour variations. Variation in reflectance is based on suspended sediments in water.

Not every sensor is suitable for reef mapping. To understand this, an explanation about light and water is necessary: Sensors such as scanners or cameras register the sunlight, which is reflected by the object of the surface. Water is different from solid objects on the land surface—only a small portion of the sunlight is reflected by the water surface and most light enters the water. On the way into the depth, particles and water molecules absorb but also reflect the light. Finally, the beams of light reach the sea bottom, which again absorbs a part of it and reflects the rest.

Airborne cameras have a disadvantage that they record the glitter of the water surface due to opening angle of the objective and the angle of the sunlight. This glitter overpowers the reflection coming from deeper water layers. Satellite scanners in space do not show this effect.

Even in clear water, light absorption in water increases exponential with the depth. In good conditions the sensor will record objects such as reefs in up to 15m depth. Because of this, it is important to have satellite images recorded during low tide!

The amount of light absorption by water depends on the wavelength. The maximum of reflection from objects under water is in the wavelength of 0.47mm (blue light). Therefore it is important that the sensors used for reef detection record blue light. The following satellites have sensors which record in this wavelength ranget:

a) Landsat IV (not working anymore, data from 1991 and 1992 available)
b) Landsat V (cannot download images from the South Pacific)
c) Landsat VII
d) MOMS 02
e) EarlyBird
f) IKONOS
c) to f) see "Available and Future Satellite Images"

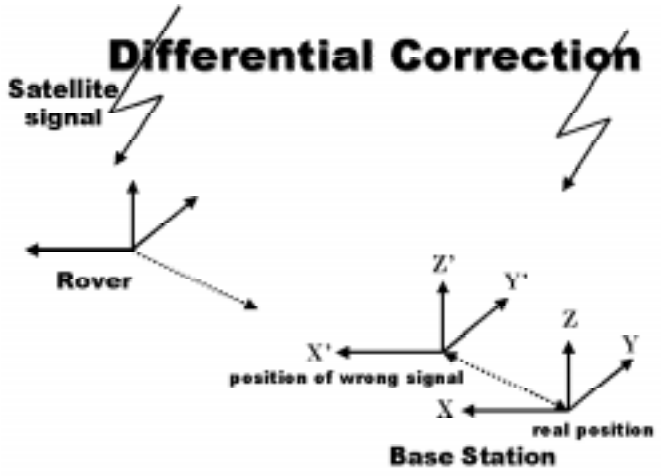


Figure 1: Principle of differential correction

GPS Correction in Fiji

By Rupeti Levaci, FEA and Wolf Forstreuter, SOPAC

The use of GPS increased greatly in the past few years. From a very limited number of GPS instruments in Forestry and the Mineral Resources Department to a relatively high number: SOPAC (6) Fiji Pine (1), Fiji Forest Industries (1), MSD-Forestry (4) surveying consulting companies GLISPAC (1) and Sinclair Knight Merz (1), University of the South Pacific (2) and Emperor Goldmine company (2).

However, the application is limited if only a GPS rover is employed. It is essential to correct the data using base station files recorded at the same time. The reason is the inaccuracy of received position data due to US military restriction. The satellites periodically send incorrect position information.

Reminder: Differential correction overcomes this problem. The base station receives data of a position, which is already exactly known. This data then allows the calculation of the inaccuracy of the position signals, which is stored as Dx and Dy. This information then can be used to correct the rover signal received up to 400 km distance away. A direct link between rover and base station is not necessary; the rover data can be corrected any time later, on the condition that the base station and rover receive the data at the same time.

Management Services Division, Forestry at Colo-i-Suva provided the only base station in Fiji for a long time. If a user wanted to use base station data, he was required to get there and download the file on his floppy. Also MSD-Forestry is linked again to e-mail msd@sopacsun.sopac.org.fj and is able to deliver the requested files via this media. Now, FEA runs its own base station. The station is based in Lautoka. Furthermore, FEA is also equipped with e-mail access Rupetti.Levaci@fea.com.fj. The Community Base Station (CBS) has its own room in order to avoid interruption of data recording by unauthorised persons. The receiver is connected to a computer, which operates the data recording, by the GPS base station software. Every hour the software creates a separate file storing all positioning data received during that time. A small computer is sufficient to run the CBS software , however, it is essential that the computer is designed for the CBS only. If somebody uses the computer for other duties the data recording might be interrupted, which will cause problems for the survey carried out at the same time.

Figure 2: Antenna of the base station installed at FEA, Lautoka. The cable is connected with the Base Station

SOPAC and FEA did a test survey in Lautoka. The team recorded the positions of all power poles belonging to one feeder. A data dictionary built with PFINDER office software allowed the storage of information together with the positioning data such as: Pole Number., Insulation broken-yes/no, Conductor loose-yes/no, Xarm broken-yes/no, Pole leaning-yes/no, Pole broken-yes/no, Stay broken-yes/no, and Pole on ground-yes/no.

FEA purchased the Pro XL GPS rover unit, which allows a fast data input and provides better accuracy compared with the Geoexplorer used in Forestry.

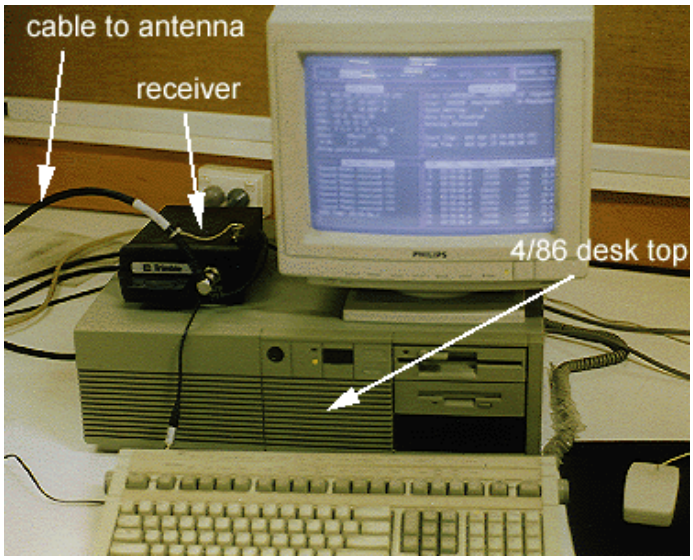


Figure 3: The Community Base Station (CBS) at FEA in Lautoka. The antenna at the roof of the FEA building is connected to the receiver, which is plugged to the serial port of a small 4/86 desk top operating the CBS by Trimble software

FEA is still using PFINDER software and not PathFinder. Nowadays Windows-driven ones are supplied automatically when buying a rover unit. PFINDER is less handy to use, nevertheless it fulfils all necessary steps of differential correction. The result (see fig. 5) displayed on top of the geometrically corrected images of Lautoka shows that both rover and CBS work correctly.

For the next survey, the team will compare the differential correction performed by CBS data from MSD-Forestry and FEA Lautoka.

For further information contact wolf@sopac.org.fj *or* Rupetti.Levaci@fea.com.fj

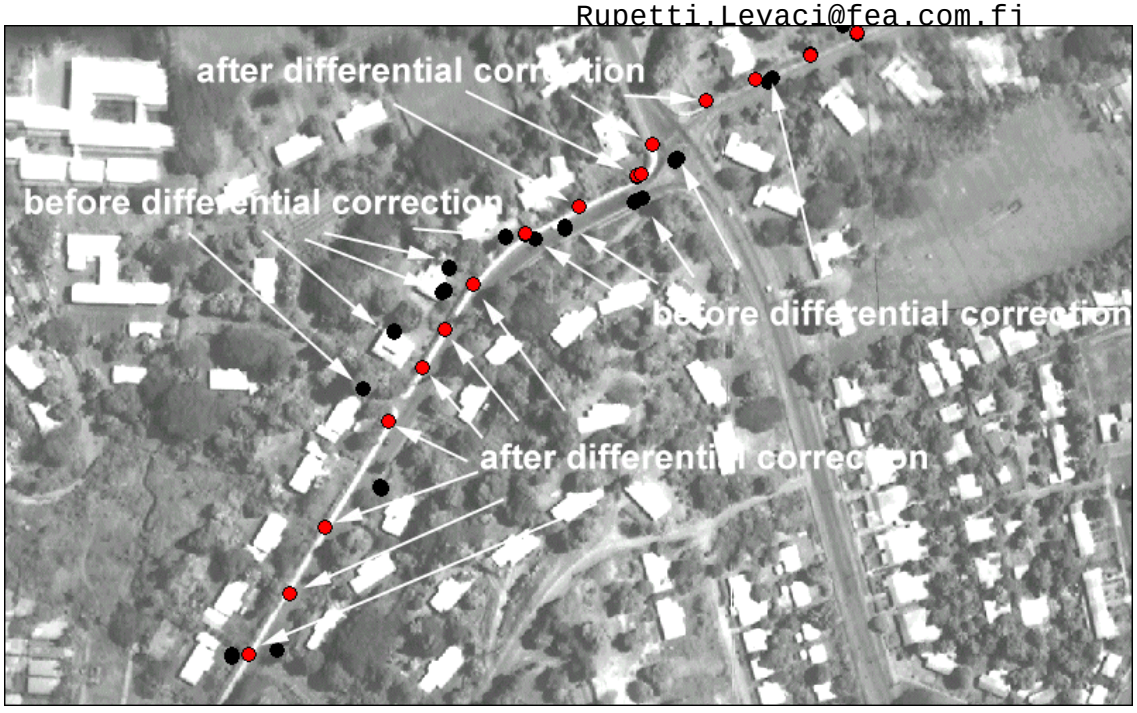


Figure 4: Position of GPS surveyed power poles before and after differential correction with GPS base station data in Lautoka.

Instrumentation and Data from Indian Satellites

By Prakash Narayan
Mineral Resources Department

Abstract

An optimum and effective management of natural resources calls for a thorough and routinely updated information about the environment and associated dynamic phenomena. The aim here is to provide a global view of the Indian Space program, importance of systematic and periodic environmental data collection using space instrumentation. As a multi-discilipanarly approach this can help to decide on which satellite or which channel correspond better to one's specific application needs.

Insat System

The Indian National Satellite(INSAT) is the first operational space system for telecommmunication, radio and TV broadcast and meteorological applications. INSAT was commissioned with multipurpose geostationary satellite, INSAT-1B, in August 1983. INSAT is a joint venture of Department of Space(DOS), Department of Telecommunication, India Meteorological Department, All India Radio and Doordarshan. The first generation INSAT satellites, procured from USA, carried twelve C-band telecommunication transponders, two high-power S-band TV broadcast transponders, a Very High Resolution Radiometer(VHRR) for meteorological earth imaging and a data relay transponder for relay of meteorological, hydrological and oceanographic data from unattended land and ocean based platforms. INSAT-1D, lanunced on June 12, 1990, is the last of the INSA-1 series which is still in service.

The second generation, INSAT-2 series of satellites, are designed and built by Indian Space Research Organization(ISRO). The first satellite in the series, INSAT-2A, was launched on July 10, 1992 and the second, INSAT-2B, on July 23, 1993, both by the European launch vehicle, Araine. These two satellites incorporate twelve C-bands and six extended C-band telecommunication transponders, two high power S-band TV broadcast transponders, a VHRR instrument with 2km resolution in visible band and 8 km resolution in infrared band, a data relay transponder for relay of meteorological, hydrological and oceanographic data from unattended platforms and a transponder for satellite-aided search and rescue operations.

The third satellite, INSTAT-2C, was launched on December 7, 1995 by an Ariane vehicle. This satellite incorporates twelve C-band transponders, six extended C-band transponders, three Ku-band transponders and C X S band transponders for mobile satellite services. INSAT-2D, identical to INSTAT-2C, is planned for launch in 1996-1997. The follow-on satellite, INSTAT-2E, which is also under fabrication, will have seventeen C-band transponders, a VHRR similar to that on INSTAT-2A and INSTAT-2B but with additional water vapor channel and a Charge Couple Device(CCD) based camera operating in visible, near-infrared and short-wave infrared bands.

Indian Remote Sensing Satellite-IRS

The Indian Remote Sensing satellite(IRS) system became operational with the launch of IRS-1A, on March 17,1988, on board a Soviet Vostok rocket. The second satellite, IRS-1B, identical to IRS-1A, was launched on August 29, 1991 and is still operational. The payloads on board IRS-1A and 1B, include two cameras- Linear Imaging Self Scanners-LISS-I with a resolution of 72.5m and LISS-IIA and LISS-IIB both with a resolution of 36.25m. LISS-I provides a swath of 148km, while the composite swath of LISS-IIA and LISS-IIB is 145km. The cameras operate in four spectral bands in the range of 0.45 to 0.86æm. IRS satellites are placed in a 904km polar sun-synchronous orbit with an orbital period of 103 minutes. The satellites return to their original orbital trace every 22 days enabling repeated collection of data over the same place and at the same local time.

The third satellite IRTS-1C, was launched on December 28, 1995 by a Russian rocket, Molniya. It has three cameras on board: (i) A Panchromatic camera(PAN) which is a high resolution camera operating in Panchromatic band with a resolution of 5.8m and swath of 70km; it can be steered up to 26 deg across-track, thus enabling stereoscopic imagery and better revisit capability.

(ii)A Linear Imaging Self-scanning Sensor(LISS-III) operating in four spectral bands - three in Visible/Near Infrared(VNIR) and one in Short Wave Infrared(SWIR) range. It provides a ground resolution of 23.5m in VNIR bands and 70.5m in the SWIR band, with a swath of 141km and 148km, respectively,

(iii) A Wide Field Sensor(WiFS) a coarse resolution(188.3m) camera, covering a wide swath of 810km. Besides, the satellite carries a tape recorder to collect data even when it is not visible to any ground station. IRS-1D, similar to IRS-1C, is planned for launch during 1997-98.

IRS-P2 and IRS-P3 launched by India's Polar Satellite Launch Vehicle(PSLV) on October 15, 1994 and March 21, 1996 respectively, are the first two satellites in the IRS-IP series intended for technology proving missions. IRS-P2 carries LISS-II camera similar to IRS-IA and IB. IRS-P3 carries a WiFS camera similar to that of IRS-1C but with an additional spectral band in short wave infrared region. Besides, it carries a Modular Opto-electronic Scanner(MOS) of the German space agency, DLR, and an X-ray astronomy payload. IRS-P4, planned for launch by PSLV-C1 will carry an Ocean Color Monitor and a Multi-frquency Scanning Microwave Radiometer.

The satellite control center located at Bangalore, along with ground stations at Lucknow and Mauritius, regularly tracks and monitors IRS satellites. The data reception station of National Remote Sensing Agency(NRSA) at Shadnager near Hyderabad receives the satellite data and processing and distribution of data is carried out by NRSA at its facilities in Hyderbad.

Coverage pattern

An Image Referencing Scheme has been evolved for IRS-1A in order to facilitate convenient and unique identification of any of the geographical regions of interest and cataloging of data products. This scheme is designated by paths(sequentially numbered from east to west for all 307 orbits in a coverage cycle) and rows(the line joining the corresponding scene centers of different paths forming a contour, parallel to the equator). A worldwide referencing scheme has been designed which should enable the user to identify the scenes corresponding to the region of interest.

Conclusion

Earth Observing Satellites assist in effectively managing the country's natural resources. Remote Sensing satellites are used for several applications such as agricultural crop acreage and yield estimation, drought monitoring and flood mapping, land use and land cover mapping, waste-land management, water resources management, ocean/marine resources survey and management, urban development, mineral prospecting, forest resources survey and management.

Data from the Indian Remote Sensing Satellites are available worldwide through a tie-up with EOSAT Corporation of the USA.

Complied from brochures kindly obtained from ISRO Technical Liaison Unit of the Indian Embassy in Paris. For more information contact Prakash Narayan, Mineral Resource Department, Private Mail Bag, Suva, Fiji. Telephone: 381 611 (679), FAX: 370 039 (679). Email: prakash@mrd.gov.fj.

Understanding watershed water run-off in Fiji.

By Osea Tuinivanua MRD Forestry and Giovanni Ricci, SOPAC

Though at its preliminary stage, pragmatic discussions to multi-laterally gain scientific and practical management water run-off of Fiji watersheds has been conceived between the MSD Forestry Department and SOPAC.

Scientific understanding of the chain effects of forest logging on the watersheds needs to be acquired by the essence of existing technology and expertise. Extensive logging activity influences a range of physical factors such as soil run-off coefficient, soil stability, rainfall impact and infiltration rate. The visual evidence of frequent flooding, waterway sedimentation, erosion and coastal degradation are results of this imbalancing activity being caused by the community.

Combination of local knowledge and appropriate technological applications can unfold understanding of cause and effect situation and designed management to reduce impact. The following outlines a possible approach.

Are more detailed data collection of rainfall intensity, river and stream flow in response to rainfall events and flooding frequency and level, will provide essential data for model design and calibration. This will be discussed between Forestry, SOPAC and PWD.

The analysis of land form, geology, soil and land use including agriculture development and forest management can be enhanced while data is already available. Especially the understanding of forest cover including density, species and distribution in relation to relief is prerequisite to watershed factor influencing water movement. Such understanding will be enforced.

SOPAC is currently reviewing and developing practical models are biased towards changing forest cover as a manageable influencing factor on water run-off, soil stability and waterway sedimentation processes.

If such a model proves to be applicable it will be used to assist in appropriate and sustainable management of forest cover in the watershed. Then forest cover will not be managed for sustainable timber supply the protective role of forest cover due to water run-off would be focussed.

For further information contact: Osea Tuinivanua, Management Services Division, Forestry Department, P.O. Box 3890 Samabula, Suva, Fiji Islands, Fax: Fax: +679-320311, e-mail: msd@sopacsun.sopac.org.fj

Year 2000/Gps Week Number Rollover Policy

By Kevin McConell
Lukemine Enterprise

The Problem

Trimble Navigation Ltd have issued a policy directive relating to the "year 2000" concern as it relates to Trimble GPS customers and products.

There are, in fact, 3 concerns relating to GPS equipment. The "year 2000" one is familiar to most persons. Coupled with this is the one of the year 2000 being a leap year, and some software may not recognise February 29, 2000, resulting in failure, malfunction or data corruption. These two problems are referred to in the Trimble Policy Statement as the "Y2K Problem".

The third problem arises from a date issue peculiar to GPS technology. The US Government's GPS satellites broadcast time in the form of a "GPS week number", and a time offset into each "GPS week". Week numbers started at 0 on January 6, 1980, and will end with week 1023 on August 21, 1999, at which time the week number will re-set or "roll over" back to 0. This is "week number rollover" or "WNRO".

As a result of WNRO a GPS receiver may erroneously interpret the week number, causing gross position fix errors. Also, receivers that process and display calendar dates based on "weeks since 1980" may generate date calculation errors.

Trimble's Products

Trimble has sold almost a million GPS units, comprising hundreds of GPS products with thousands of versions of software and firmware.

Recognising the potential for Y2K and WNRO problems, Trimble has reviewed it's products and has determined that they fall into three basic categories:

Compliant—a product is "Compliant" if it perfoms with minimal, or no, interruption or user intervention. It will not produce errors processing date data.

Upgradeable—a product is "Upgradeable" if it can be made Compliant via existing software or firmware updates that are installable by Trimble upon return of the product to Trimble's factory, or by the user, without hardware modification.

Noncompliant—a product is noncompliant if it is neither Compliant or Upgradeable.

Note that a particular product may be Compliant, Upgradeable or Noncompliant for Y2K but not WNRO purposes, and vice versa.

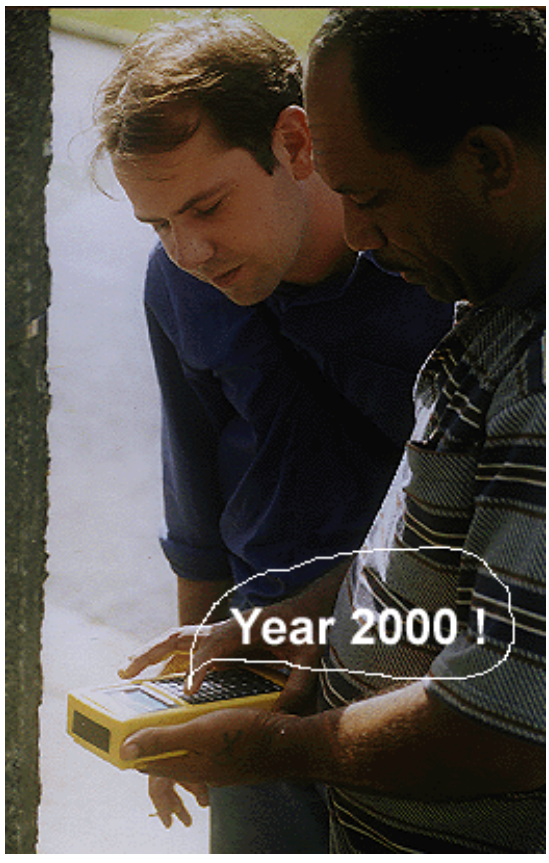
Trimble Policy

As Trimble completes it's compliance review of each product, the information of it's status will be published on Trimble's web site. Products not listed should be assumed Noncompliant unless and until they are listed otherwise.

Upgrades will be provided for Upgradeable products, upon request, without charge where the standard warranty is in effect, and at a reasonable charge otherwise.

Information regarding upgrade paths available for Noncompliant products will be made available upon request.

The brief version of a statement was received by LUKEMINE ENTERPRISES, the Fiji Trimble dealer, in early May 1998, is for information only. Phone or fax Kevin McConell at (679) 370858, or email lukemine@is.com.fj *for details.*



Feature Article

Bamboo in Fiji—an update

By Linda Miller

The April Issue of the GIS/RS Newsletter offered the reader a tremendous variety of information about data and projects and new technology. As an individual, hopeful of utilising technology to assist in resource development, one had to wonder how to access usable quality information from the mass of digital data available from so many different and possibly unrelated sources.

My last article on bamboo introduced the potential to develop this amazing plant into a high yield sustainable natural resource. The plant with a thousand uses - but how best to develop its use in the Pacific? How to take this existing resource with a limited scope of traditional uses and expand awareness and availability of the myriad of practical uses possible? Create furniture factories, develop bamboo plywood or parquet flooring, fresh harvest bamboo shoots, bamboo houses, fences, or flutes?

Sustainable development of a resource requires a well thought out strategy to match the environmental reality with the market potential. We cannot encourage any increase in use of a resource, especially if tied to a market, without first knowing the sustainable quantity available.

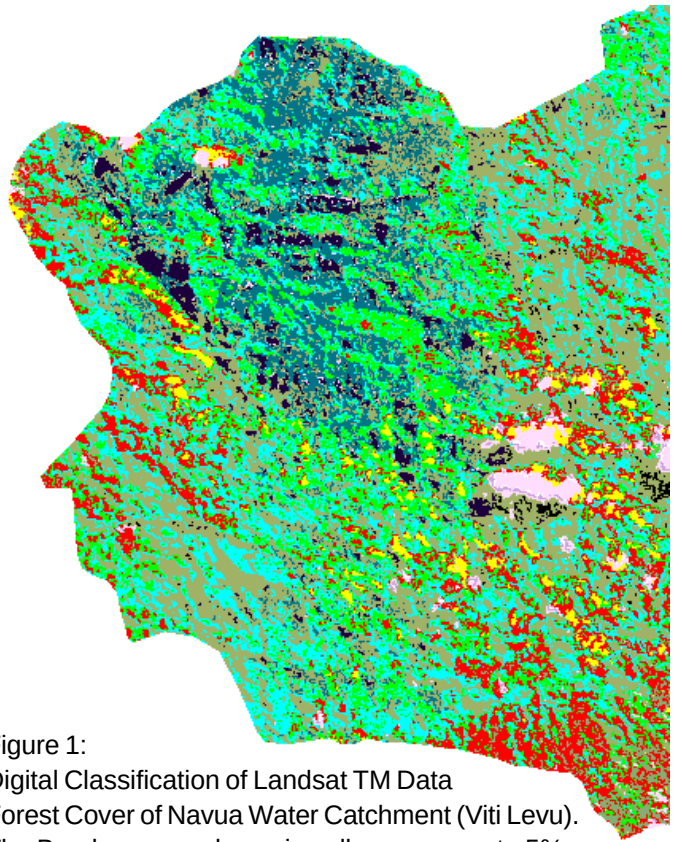


Figure 1:
Digital Classification of Landsat TM Data
Forest Cover of Navua Water Catchment (Viti Levu).
The Bamboo area shown in yellow sums up to 5%, athough all small patches less than 1-2 hectare are not shown on 1:50,000 scale!

Bamboo is a natural habitant of tropical forests, but is found in larger stands in areas, which were previously logged, over harvested or have degraded soils. The images provided by Osea Tuinivanua, from MSD-Forestry Dept. show that it is possible to differentiate stands of bamboo from other forest cover. With help from MSD, this information can become the stepping stones in creating a much-needed updated resource assessment of bamboo in Fiji.

The concern is how best to integrate these images into usable information. Using ground surveys to verify the satellite data is a logical next step. Co-ordinating a multidisciplinary team for the ground survey which includes forestry, agriculture, botany, etc. could create in one journey the data needed for mapping bamboo growth with a comprehensive analysis of the quantity, quality and the best uses for the different types of bamboo.

The nest stepping stone is the transport factor. Can these bamboo stands be accessed by roads or waterways? Can harvested bamboo be transported out or must it be processed on site? The stepping stones continue: who owns the land, are there villages in proximity which could benefit from new jobs, is there space to cultivate larger plantings of bamboo in adjacent lands, which topographic features encourage the strongest growths of bamboo, where are the newly logged areas where bamboo can be incorporated into natural forest regeneration or timber plantations as an interim crop or windbreak for seedlings, are there degraded areas that need bamboo to prevent erosion and to regenerate soil, are there marine areas being damaged by run off where bamboo could be planted to hold the river bank,· etc., etc. Each question leads to another step in the development of bamboo as a sustainable natural resource.

In the April newsletter, the following projects were mentioned and each one applies to the development of bamboo:

· Forest plantation mapping
· River systems
· Mataqali data integration
· Logging plan mapping
· Topo sections for field checks
· Mahogany Stand definition project
· Marine Resources - coastal zone degradation
· Land degradation in Malawi-Landsat
· Advanced classification possibilities

If bamboo can be factored into analysis of these projects systems, the different GIS projects can be accessed to co-ordinate all that data with the help of dedicated research projects, student projects, inclusion in database installations, etc. The resulting information will offer facts which can then be used to develop bamboo in a sustainable and profitable way.

GIS-Pacnet
A mailing list for GIS and RS in the Pacific

By Franck Martin
SOPAC

GIS-Pacnet@sopac.org.fj is a mailing list, which has been created to help Internet users with the specific problems of Geographic Information Systems and Remote Sensing in the Pacific. This list is open to all people, organisations interested in the above fields. It acts as a mutual support group between all the subscribers. You have access through this list to information pertaining to availability of satellite images, Global Positioning System accuracy and availability, latest developments in GIS...

This list is based on the support from its subscribers. At the moment the list includes more than 30 people in many different fields and countries, and still growing. They are:

- Pacific Professionals will enter in contact with experts
- International experts will enter in contact with local colleagues to explore opportunities of work programs
- Students will access to a wide range of information and support.

To have access to this list your only requirement is to have e-mail access to the Internet. You will send a subscription message as explained later, and you will start receiving the messages from all others subscribers of the list. Of course your participation is essential. If you have any question or want to reply to any problem from another subscriber, just post your message to GIS-Pacnet@sopac.org.fj and it will be distributed to all subscribers.

The following is the welcome message, which regularly is posted to all list memebrs to remind people of how to subscribe and unsubscribe to/from the list.

```
Welcome to the GIS-PACnet mailing
list:  GIS-PACnet@sopac.org.fj

IMPORTANT: save this message for fu-
ture reference.
```

This list is provided as a forum to exchange news and technical information between Pacific users of Geographical Information Systems (GIS) and Remote Sensing (RS).

Leave your comments here and any points that you wish to discuss with other members. When you send a message to `GIS-PACnet@sopac.org.fj`, it will be automatically replicated and distributed amongst the users of the mailing list, yourself included. Please don't reply only to the sender but to `GIS-PACnet@sopac.org.fj` for all to profit from your input.

To subscribe, send a message to
`List-Request@sopac.org.fj`
with the following body:
SUBSCRIBE GIS-PACnet <your e-mail address>

To unsubscribe, send a message to
`List-Request@sopac.org.fj`
with the following body:
UNSUBSCRIBE GIS-PACnet <your e-mail address>

Please allow me one or two day to add you to the list, as I have to manually add your name. Please do not distribute large files through this mailing list as many people don't have a free e-mail, please try to keep your messages short (<5k)

For any comments that do not belong to GIS and RS and this mailing list, you can reach me directly at
`franck@sopac.org.fj`

Cheers, and have fun.

GIS Workshop in Lautoka

By Olivier Dupperay
SOPAC

In April 98, the Pacific Regional Energy Program (PREP) organized the Workshop, "GIS for power utility" in Lautoka. The participants, technicians from Fiji Electricity Authority (FEA), Salomon Island Electricity Authority (SIEA), Tonga Electricity Power Board (TEPB) and Tonga Water Board (TWB) received courses and training in the following Fields:
- Access Database.
- GIS MapInfo and MapBasic.
- Raster Image Rectification Introduction.
- GPS.

The goal was to provide a global GIS system for power utility including GPS surveys MapInfo maps with MapBasic personalization and Access Database. All the participants noticed the difficulties and the interest of Raster Image Backdrop

The use of raster image data as a Geographic Information System (GIS) background layer is increasing worldwide. GIS applications enable non-cartographers to add spatial reference to their data that creates a greater need to update

the maps and requires increased detail of information. A way of shortening the production time of these detailed maps is through employment of aerial photographs or satellite images.

Advantage of GIS Backdrop

These remotely sensed images allows for the spatial technical information to be placed into the natural environment, in our case the elements of a power utility are displayed on top of the corrected aerial photograph. The benefits of having this backdrop or underlay include:

· Field teams will have a better orientation than working with only cadastral maps due to the additional information in the raster images.

· Improved view of most construction sites, as trees that grow in path of a power line are visible on the image.

· A customer can be connected in the most effective way as the image shows all buildings, car parking areas, minor roads and other necessary items not shown in the cadastral map.

And, if the cadastral maps are not available, the utilities can build an efficient workspace only with aerial photographs and Ground Control Points (GCP).

GIS WORKSHOP IN RAROTONGA

Les Allinson
SOPAC

A one week Geographic Information System (GIS) workshop was held at the Ministry of Foreign Affairs with 18 participants from both government and private sectors. The workshop commenced Monday 23 March and was conducted by two staff from the South Pacific Applied Geoscience Commission (SOPAC), a regional organisation located in Suva, Fiji.

In the week following the workshop SOPAC has provided further assistance to participating organisations that include the Ministry of Marine Resources, Ministry of Outer Islands Development, National Disaster Management Office and the Water Division from the Ministry of Water, Environment and Physical Planning.

An important topic of the workshop was an introduction to rectification and registration of aerial photographs for subsequent inclusion as backdrops in maps to assist in visualisation of data. An example of an aerial photograph of Aroko is shown in Figure 1 with coastline, roads and rivers. The shift in the backdrop image of the motu to the map may be due to accretion and erosion and is typical of a time difference of several years between a survey and an aerial photograph.

SOPAC has recently celebrated its 25th anniversary and has been working with Cook Islands since its foundation. An ongoing task has been assistance with deep-sea mining and the adoption of GIS has allowed the visualisation of the exclusive economic zone, seabed imagery and abundance of polymetalic nodules.

Other SOPAC tasks in Cook Islands have included ground water assessment under the Water and Environment Programme, assistance to the National Disaster Management Office through workshop conducted by the Disaster Reduction Unit and data management and communications for the Ministry of Marine Resources under the Information Technology Unit.

Regional tasks undertaken by SOPAC involving GIS have been hazard mapping of cities for vulnerability studies, asset management and planning for Power Utilities and mineral resource databases.

Figure 1: Aroko map with aerial photo backdrop

Available and Proposed Satellite Images

By Wolf Forstreuter
SOPAC

Introduction

This article covers all image data, which user can actually purchase now or within the near future for mapping at a scale of 1:50,000 or larger. Historic data such as Landsat IV, which has been used in the Pacific, is not mentioned. Also Radar data will be covered later. For the time being, the following satellites / sensors are able to provide image data: IRS-1C, IRS-1D, SPOT, theoretically KVR-1000 (SPIN-2) and MOMS-2P. The satellites QuickBird, IKONOS-1 and Landsat VII will provide images very soon. SOPAC can assist in data purchase.

JERS-1

JERS-1, the ***J***apanese ***E***arth ***R***esource ***S***atellite was launched on 11 February 1992 and has kept observing global data by Synthetic Aperture Radar (SAR) and Optical Sensor (OPS). The satellite recorded images of Fiji. These were used by participants during the hands on training in the seminar held in Pacific Harbour, 1996. However, according to the Japanese data distribution centre, the mission data recorder is now out of order and cannot be reactivated. Therefore it is now impossible to obtain data from the South Pacific.

IRS-1C

IRS, the ***I***ndian ***R***emote ***S***ensing Satellite program operates, as the name suggests, from India. SpaceImagingEOSAT handles the data distribution outside of the sub-continent. The satellite has two interesting sensors on board, LISS-3 and WiFS (Wide Field Sensor).

SpaceImagingEOSAT advised the newsletter that the onboard tape facilities allow recording scenes from the South Pacific. LISS-3 covers the green, red and the near infrared portion with a spatial resolution of 23.5m, resampled to 20m. An additional infrared band is available with a spatial resolution of 70 m. Panchromatic data is recorded with a spatial resolution of 5.8m, resampled to 5m. WiFS data has a spatial resolution of 189 m and only records the red and the near infrared band, but the swath width covers 774 Km. SOPAC will most likely purchase the first scene for a Pacific Island Country. MSD-Forestry also is in contact with SpaceImagingEOSAT for data purchase of panchromatic images of Viti Levu (Fiji).

Special acquisition is free of charge.Coverage has been frequent since India launched IRS-1D in September 1997. This satellite has the same equipment onboard as IRS-1C and this duplication increases the repetition rate. It is possible now to receive an image of the same area every three days. Since Swedish Space Corporation (SSC) entered partnership with SpaceImagingEOSAT in April 1997, the Indian satellites can downlink the image data stored on onboard tape to the antenna in Kiruna. This increases the onboard memory and enables the satellites to take more data from the South Pacific.

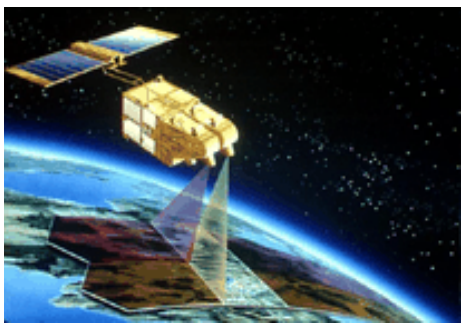
Resolution:

green	0.52 - 0.59 µm	20m
red	0.62 - 0.68 µm	20m
near infrared	0.77 - 0.86 µm	20m
middle infra-red	1.55 - 1070 µm	70m
panchromatic		5m

The image size is 141 km x 141 km the customer buys quadrants of 72 km x 72 km.

SPOT

SPOT 4 was successfully launched on Tuesday, 24 March 1998 and has already recorded the first images. This is an additional SPOT satellite in space, which can deliver data from the South Pacific. The satellites SPOT 1 and SPOT 2 are still operating. The first satellites of the SPOT series have three bands covering the green, red, and near infrared portion and a panchromatic band. The Short-wave infrared band is the major development for SPOT-4. There is also a new "vegetation" instrument which operates in the same four spectral bands as the high resolution visible infrared bands (HRVIR), but at a reduced, 1km spatial resolution.

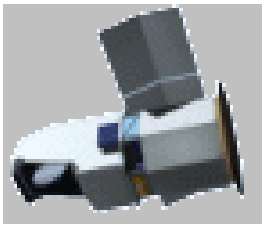


The HRVIR bands:

green	0,50 to 0,59 µm	20m
red	0,61 to 0,68 µm	20m
near-infrared	0,78 to 0,89 µm	20m
short-wave infrared	1,58 to 1,75 µm	20m
panchromatic		10m

SPOT satellites have a tape onboard able to record data from South Pacific Island Countries and download whenever they fly over France or Kiruna in Sweden. However, the customer has to pay extra for special acquisition. The image size of a SPOT scene is 60 km x 60 km. MSD-Forestry bought a number of SPOT scenes from one of the SPOT Image distribution centres in Australia.

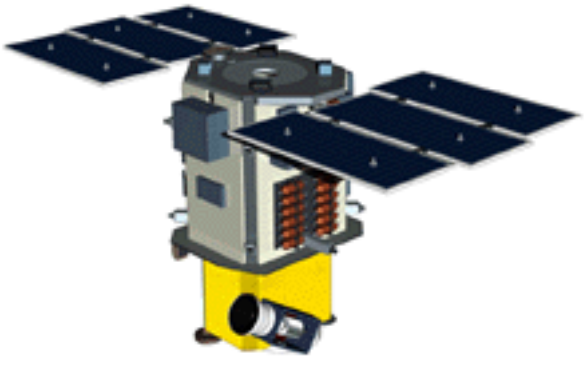
EarlyBird



EarlyBird belongs to EarthWatch Incorporated. This company was formed in March 1995 by the merger of the commercial remote sensing efforts of different private companies. They launched the satellite on Christmas Day 1997, in Svobodny Cosmodrome, Eastern Russia. Fifteen minutes after launch, an EarthWatch ground station in Tromsø, Norway received a downlink signal confirming that the satellite successfully separated from the launch vehicle and had automatically initialised the onboard processors. A happy Christmas! The EarlyBird sensors were capable of recording images of 3m resolution in pan mode and 15m multispectral mode. The sad story..... Four days later the EarthWatch engineers lost the communication contact with ***EarlyBird*** **.....That's life**! EarthWatch dismissed many people from the job. Later an insurance company paid money, which now will go into the development of QuickBird.

QuickBird

The satellite with the name QuickBird is another space vehicle of EarthWatch. Its has a 0.82m pan and 3.28m multispectral sensor onboard and will be launched 1999. So far, the exact date is not known. The average revisit will be 1 to 4 days depending on the latitude. Reef detecting and true colour images possible, stereo images possible. Image size 22 km x 22 km. Data storage on onboard tape: 64 images.



Resolution:

blue	0.45 to 0.52 µm	3.28m
green	0.52 to 0.60 µm	3.28m
red	0.63 to 0.69 µm	3.28m
near-infrared	0.76 to 0.90 µm	3.28m
panchromatic	0.45 to 0.90 µm	0.82m

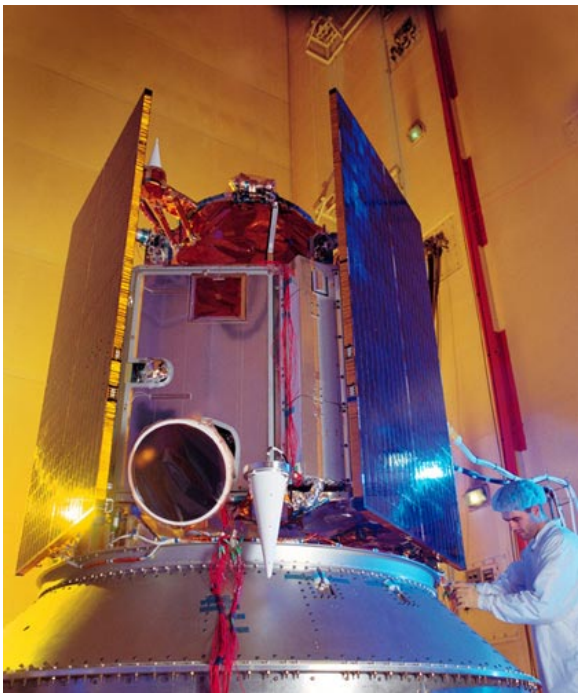
KVR-1000 Images

KVR images have the best spatial resolution of civil remote sensing image data. These images are photographic pictures taken from low altitude Kosmos satellites. These satellites do not return to Earth after their mission, only the camera and the film come down by parachute. The customer buys digital data sets derived from scanning these panchromatic photos. The images have a central projection, however, due to much higher altitude compared with aeroplanes effects such differential shading are negligible. KVR-1000 images have been recorded from Viti Levu (Fiji), in 1991 and 1992 (see "Available High Resolution Images for Fiji", Newsletter 9405).

Now, there are also satellites available, which return to earth completely after their mission. The companies Aerial Images, Inc., and SOVINFORMSPUTNIK recently announced the successful recovery of an imaging satellite, in March 1998. The satellite circled the Earth for 45 days taking highly-detailed images of the Southeast United States and major population centers around the world and will provide images with 2m resolution. The images will be available by mid summer this year under the name SPIN-2.

IKONOS 1

IKONOS 1 will supply images of the Earth that enable people to resolve objects on the ground as small as one meter in diameter. The one-meter satellite is part of a large and expanding constellation of satellites and aerial platforms that produce CARTERRA products for a variety of applications. SpaceImagingEOSAT wants to become the world's largest, most diverse supplier of Earth information products and services. The satellite is supposed to be launched from USA in late 1998, however, this is postponed to end of this year.

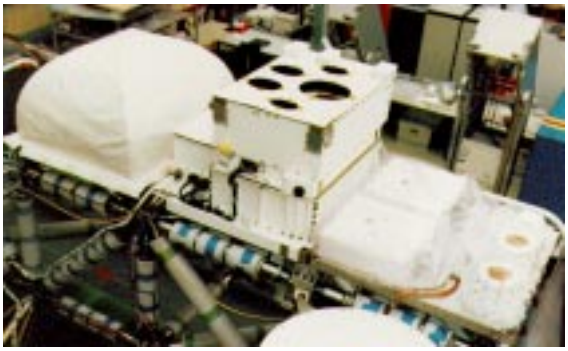


IKONOS 2, an identical twin to IKONOS 1, is also scheduled to launch by end of this year. The satellites will provide data of one meter resolution in panchromatic mode and 4m resolution in multispectral mode. The blue portion of the spectrum is covered. The on-board tape recorders have the capacity to store images covering 12,100 km^2.

blue	0.450 to 0.515 µm	4m
green	0.525 to 0.605 µm	4m
red	0.630 to 0.690 µm	4m
near-infrared	0.760 to 0.900 µm	4m
panchromatic		1m

MOMS-02

The MOMS-02 sensor was installed on the Russian space station MIR. This sensor can provide panchromatic images



with 4.5m spatial resolution and multispectral images of 13m resolution. The sensor using the push broom principle (like a photocopy machine) and can look forward, downward and backward through different objectives. This allows on time stereo images (For further details see B. Koch in Newsletter 9407). The data would be ideal for reef mapping covering the blue light with better resolution than any other sensor in space, now.

Resolution (in nadir direction):

blue	0.440 to 0.505 µm	13.5m
green	0.530 to 0.575 µm	13.5m
red	0.645 to 0.680 µm	13.5m
near-infrared	0.770 to 0.810 µm	13.5m
panchromatic	0.520 to 0.760 µm	4.5m

After repairing MOMS the system is working again and can record data from the South Pacific. The direct link from MIR to earth is not working. The recorded image data has to be transported by space shuttle, data order is required to get images from South Pacific Island Countries. Last space shuttle flight from MIR to earth, Monday 08.06.98.

Landsat VII

NASA had planned the launch of Landsat 7 for July, however, two of the four power modules thematic mapping instrument failed in recent testing. The launch probably will be delayed to December 1998.

Resolution:

blue	0.450 to 0.515 µm	30m
green	0.525 to 0.605 µm	30m
red	0.630 to 0.690 µm	30m
near-infrared	0.750 to 0.900 µm	30m
short-wave infrared	1.550 to 1.750 µm	30m
thermal infrared	10.40 to 12.50 µm	60m
mid infrared	2.350 to 3.090 µm	30m
panchromatic	0.520 to 0.900 µm	15m

True colour images or reef mapping is possible due to the blue channel. The onboard tape drive can store 100 images.

You always find an updated version of this article on the web site!

www.sopac.org.fj/presentations/GIS/default.asp

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