Highlights

- **High Resolution Remote Sensing Data**
- **Articles from Vanuatu, Marshall Islands, Samoa, Fiji Islands, Tonga, new Caledonia**
- **Pacific Islands Software Standards**

Highlights

- **Different GIS Applications**
- **Remote Sensing Techniques**
- **Application of High Resolution Images**
- **Regional GIS&RS related Meetings**

Pacific Island
GIS/RS news

The Newsletter of the GIS/Remote Sensing Users in the Pacific
Issue 1 /2001

High-resolution satellite images improve GIS of Pacific Island Countries.....

Pacific Island Countries generally have a high demand for satellite data because aerial photographs require the transport of plane and crew to the islands and the payment of stand-by costs during cloudy weather conditions. Thus maps of many Pacific Island Countries are outdated by several decades. When purchasing satellite images the customer just pays for the cloud-free image data, even so, only very few countries have used space-borne images so far. There are two reasons for this:

1) decision makers do not know the advantages and availability of satellite information; and
2) satellites providing images for Pacific Island Countries were not able to supply image data suitable for mapping at 1:10,000 scale which is required for small island countries.

Now, this data is available from IKONOS and from EROS-A1 satellites and decision makers are becoming aware of the new opportunity. IKONOS data is on order for Tongatapu (Tonga), Majuro (Marshall Islands), Kosrae (Federated States of Micronesia) and Manihiki (Cook Islands). EROS-A1 data is on the way for Jaluit Atoll (Marshall Islands). Thus the newsletter explains the potential of this remote-sensing data and some important applications.

More than half of the articles deal with remote sensing and GIS backdrop. We hope that there will be a competition in the market for high-resolution satellite images as soon as two additional satellites: OrbView-4 and QuickBird start delivering data. This is scheduled to happen during the last quarter of 2001. Remote sensing will then be even more interesting which should definitely be reflected by the number of articles on the subject in this newsletter.

It took quite a while to prepare this issue of the newsletter for printing for several reasons. To overcome this situation we plan:

1) to establish a web site where we will publish the articles as soon as they arrive at SOPAC. If we have a sufficient number we will compile the printed version.
2) to take less care in converting all articles into BBC English, which takes a lot of the time from the few people at SOPAC or USP speaking English as their mother tongue.

Mostly the articles are understandable and content is more important than perfect grammar.

We are also making a very special effort to increase the number of articles from small Pacific Island Countries.

Download your digital version from SOPAC's web site ..!

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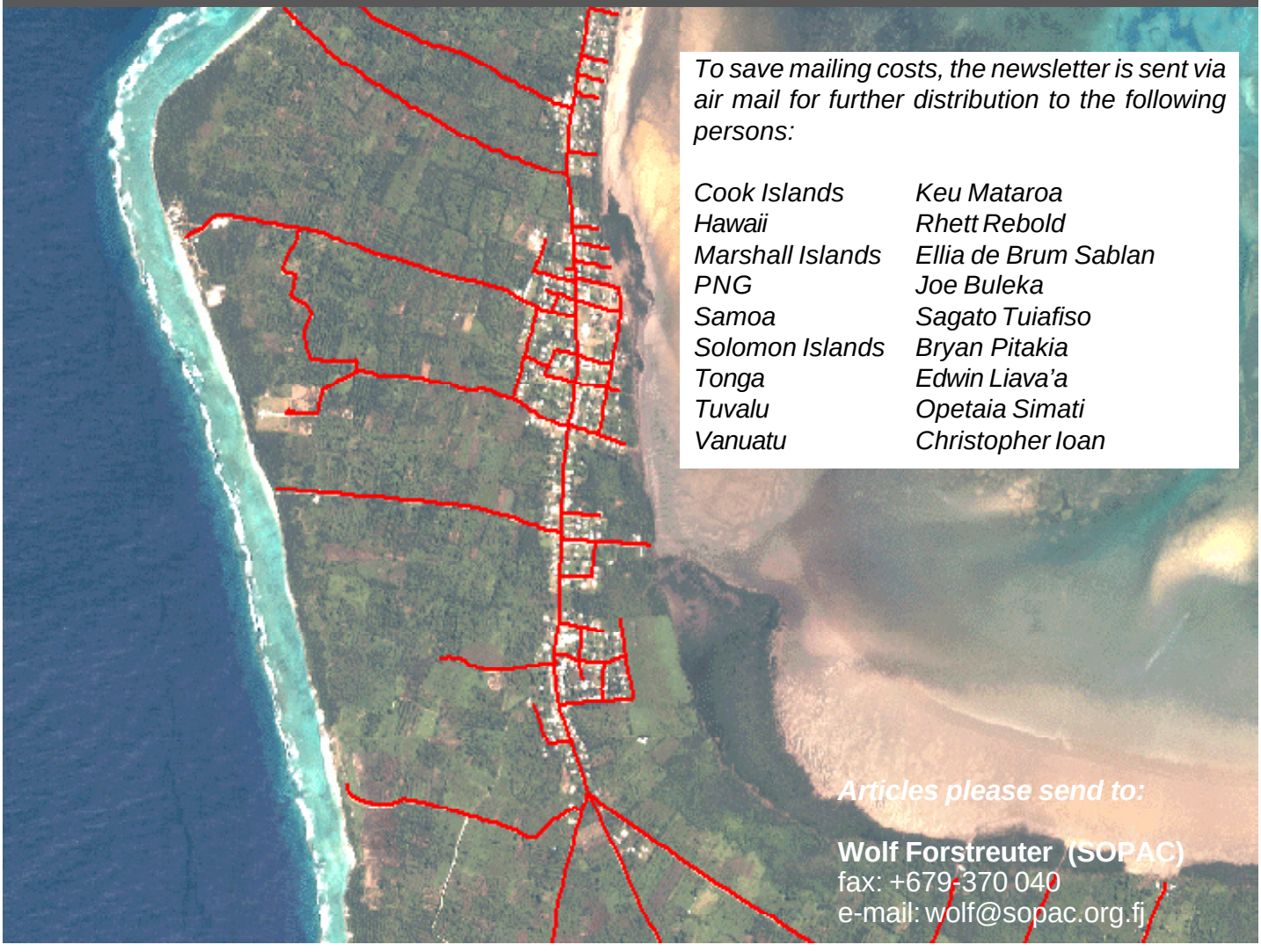
IKONOS multispectral image data plus GPS road survey of TEPB



To save mailing costs, the newsletter is sent via air mail for further distribution to the following persons:

Cook Islands	*Keu Mataroa*
Hawaii	*Rhett Rebold*
Marshall Islands	*Ellia de Brum Sablan*
PNG	*Joe Buleka*
Samoa	*Sagato Tuiafiso*
Solomon Islands	*Bryan Pitakia*
Tonga	*Edwin Liava'a*
Tuvalu	*Opetaia Simati*
Vanuatu	*Christopher Ioan*

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Year 2000 Fiji GIS/RS User Conference a success

James Britton, USP

Over 100 different individuals, some seasoned GIS and RS users, others just hearing about GIS for the first time, participated in Fiji's third GIS User Conference. The User Conference, which was sponsored by the Fiji GIS & Remote Sensing User Forum (FGRUF) and hosted by The University of the South Pacific (USP), saw presentations from over 15 organisations involved in GIS and Remote Sensing activity. The three-day conference was a mix of special presentations focussing on management and regional issues, update sessions from each of the organisations and special technical sessions that highlighted advances in specific projects. Guests from outside Fiji made three special presentations. In all, 24 presentations were made. Guests included Mr. W. Ganileo of the Land Use Planning office in Vanuatu. He outlined the VANRIS concept and set-up and had a live demonstration of the VANRIS system. Mr Marc Beardsworth of Meritec Limited, New Zealand, outlined the GIS component of their organisation's institutional strengthening project with PWD. Mr Martin Hewitt of Geo-Systems in New Zealand outlined advances and trends in GPS and GIS over the new few years. Besides finding out what has been happening in local GIS offices around the country and regionally, the User Forum is a venue for users to get together and consider the overall advances they have made and the challenges still facing the GIS/RS community as a whole. Conference participants broke into small groups and worked through a short SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis process. The results were combined in open forum and the issues discussed in detail. From what was said it still seems the main problem confronting the advancement of GIS is the lack of awareness of GIS by managers within the organisations trying to implement GIS. In some cases, it was noted, reluctance to change is the main problem. The consensus was that much more has to be done to highlight the benefits of GIS implementation—both to managers and the public. Solutions included a workshop aimed specifically at managers and increased publicity about GIS in the media. Other concerns included a lack of stable funding which was linked to the concern noted above. Participants noted the need to keep training staff to deal with migration, staff movements and increasing use of GIS/RS. It was felt that more opportunities should be created for learning. Longer-term concerns included access to data and continued co-operation between organisations. It was felt that there was pressure to start a cost recovery approach to data distribution, which would stifle GIS development. Increased communications was needed to let people know what was going on in GIS and to educate individual users of GIS. It was noted that a higher awareness of what was going on in other organisations was important in educating managers. The User Conference closed with the User Forum Annual Christmas Party at the Suva Tennis club where the finer points of GIS, RS and Meke dancing were discussed in great detail. All agreed that the User Conference had been a great success.

Delegates examine paper presentations during tea break at the 2000 GIS and Remote Sensing User Conference in Suva

A final report is under review by the User Forum members and this will be made available on the USP GIS website: www.usp.ac.fj\~gisunit
The User Forum is considering the possibility of a 2001 User Conference. If this goes ahead, an invitation will be made to all GIS & Remote Sensing users across the Pacific to attend.

The organising committee wishes to acknowledge the financial and logistical of the User Conference sponsors. They are the Fiji Department of Lands, Fiji Telecom Ltd., the Fiji Sugar Corporation, Geo-systems of New Zealand and The University of the South Pacific.

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Pan Sharpened Image of Suva Peninsula

Wolf Forstreuter, SOPAC

Introduction

Pan sharpened image products have been in use since IKONOS image data is on the market,. The user handles a coloured image product providing the resolution of the panchromatic IKONOS image data. This article explains in a simplified way how such an image product is generated. Pan sharpened images are a combination of high-resolution panchromatic (pan) image data with lower resolution multispectral images. It is also possible to combine data other than IKONOS. This article will explain the combination of black and white aerial photographs recorded from Suva of 1m resolution with multispectral Landsat TM data of 30m resolution.

The technique is based on the transformation of an RGB (Red, Green and Blue) image into the IHS (Intensity Hue and Saturation)components is not new. R. Haydn developed this method in 1982 in the beginning of the eighties.

The Aerial Photographs

The black and white aerial photographs used were recorded in 1998 from the Suva Peninsula. SOPAC

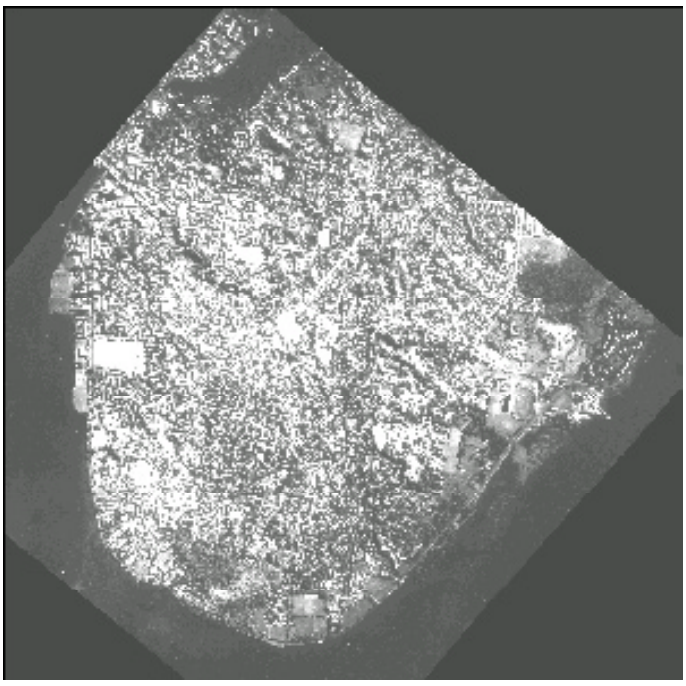

Figure 1: *The image displays the black&white aerial photograph recorded 1998 from Suva Peninsula. The photographs are scanned, geometrically rectified and resampled to 1m resolution.*

backdrops for the Fiji Electricity Authority. At that time the rubbersheeting module was not implemented in the ERDAS image processing software and the image was rectified into several parts and separately geometrically corrected and then stitched together. These overlaps were visible then but would be avoided with software available today. To reduce image size on computer the resolution of this panchromatic layer was reduced from 0.5m to 1m.

The Landsat TM Image

The Landsat TM image was recorded in 1999 and jointly purchased by USP (University of the South Pacific) and SOPAC. The part covering the Suva Peninsula

Figure 2: *The image shows the bands blue, green and red of a part of a Landsat TM scene recorded in 1999 from Suva Peninsula. The image was geometrically rectified and resampled to 25m resolution.*

was rectified using Suva's road map 1:15,000 as reference. During this process the 30m resolution was resampled to 1m employing cubic convolution as resampling method. Out of the 8 bands the three visible were selected for further processing.

The Image Merge

The normal image display is the overlay of the Red, Green and Blue component. An image can also be explained as IHS, Intensity or brightness, Hue or colour frequency and saturation or pureness of the colour. ERDAS or Adobe PhotoShop allow converting an image pixel by pixel from RGB into IHS. The most important image information is the brightness, which can be understood as the black and white image

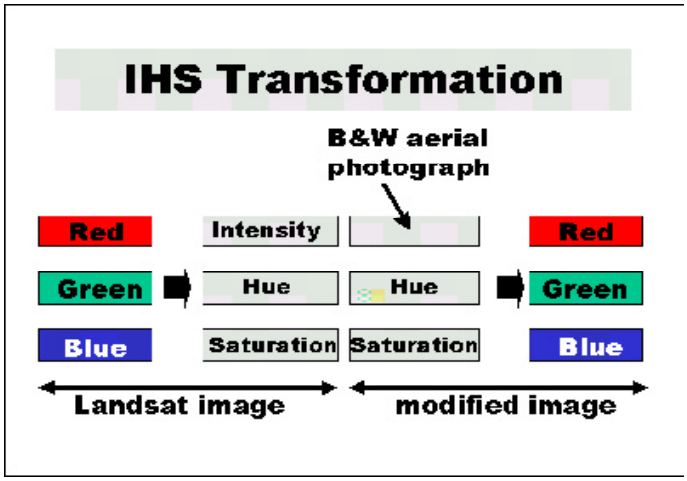

Figure 3: *The graphs shows the technique of IHS based image merge. The three layers of the Landsat TM image (see Figure 2) are first converted from RGB to IHS, then the Intensity layer is replaced by the aerial photograph (see Figure 1) and finally the image is retransferred to RGB.*

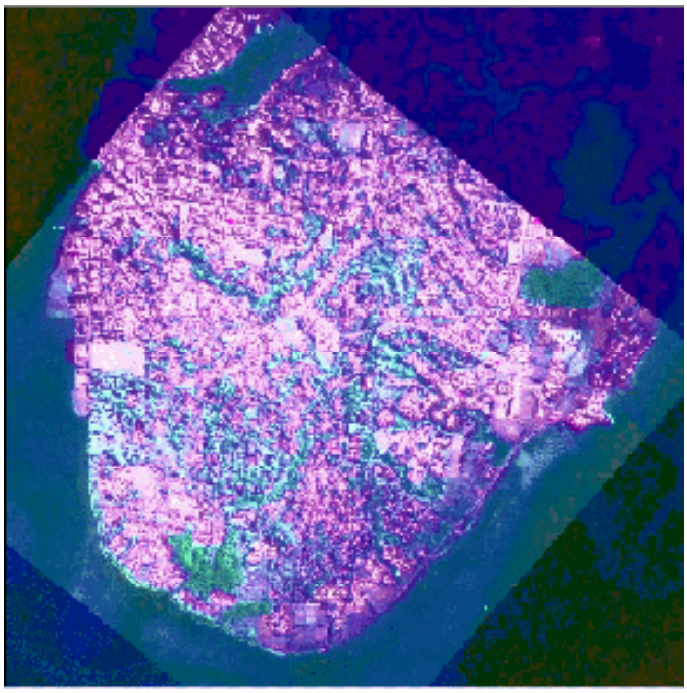

Figure 4: *The image shows the display of the IHS merge of the 25m resolution coloured Landsat image data and the scanned black&white aerial photograph.*

carrier. The trick is to replace this brightness layer by a layer of better resolution to enhance image quality. In this case the digital black and white photographs were used for replacement. As a final step the IHS image were transformed back into the RGB component.

Result and Application

The resulting pan-sharpened image shows the resolution of the layer derived from the aerial photographs and the colours of the Landsat image. Such a product is ideal for utilities requiring GIS image backdrop of high resolution but at the same time showing vegetation and houses in different colour. Such an image is not suitable for vegetation analysis requiring the full spectral range for image rationing and vegetation indices. However, most users only need a coloured high resolution image backdrop for their GIS display.

The example of the pan-sharpened image of Suva Peninsula derived from a colour image suitable for 1:50,000 scale and a pan-aerial photograph suitable for 1:5,000 scale. In this case the pan information was older than the multispectral information. However, changes in urban areas within short periods such as one year occur mainly at large scale such as 1:5,000 or 1:10,000 scale, mostly they are not visible in data of 1:50,000 scale. For further application the opposite will be carried out which was demonstrated in the given example. Employing this merge technique, cost-effective, up-to-date, high-resolution pan data can be purchased and less up-to-date colour images of lower-

Figure 5: *The image shows Mead Road, a subset of the HIS merge of Suva area.*

resolution satellites. EROS-A1, an Israeli satellite provides data of 1.8m spatial resolution which only costs 1/4 of pan IKONOS data. For the colour component, cost-effective satellite sources such as Landsat can be purchased every five years. Landsat image data costs $US 600 for 185 x 170 km.

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GIS Backdrop for VANRIS

William P.Ganileo

Introduction

VanRIS is a database that holds spatial data on all the islands of Vanuatu. The project, which was done by CSIRO and ORSTOM in the early 1950 and 60's, holds a collection of data types in the forms of polygon, line and point. The biggest data is the Resource Mapping units (RMU), which is in polygon mode. This is the most important data for the country, where our land use planning purposes is based entirely on.

The database is built in MS Access and uses MapInfo tables attached to it. It has now been developed into it's latest version, 3.2.0. This version has some new data added to it but has not been used by the government departments yet due to some inconsistencies with the data types. Somehow the coastline for the whole country has shifted. Because of the problem, and some new data have just been collected and updated, we have decided not to release V3.2.0 yet. We want to complete V3.3.0 and then release this instead of V3.2.0 as this version will have more new data and more accurate.

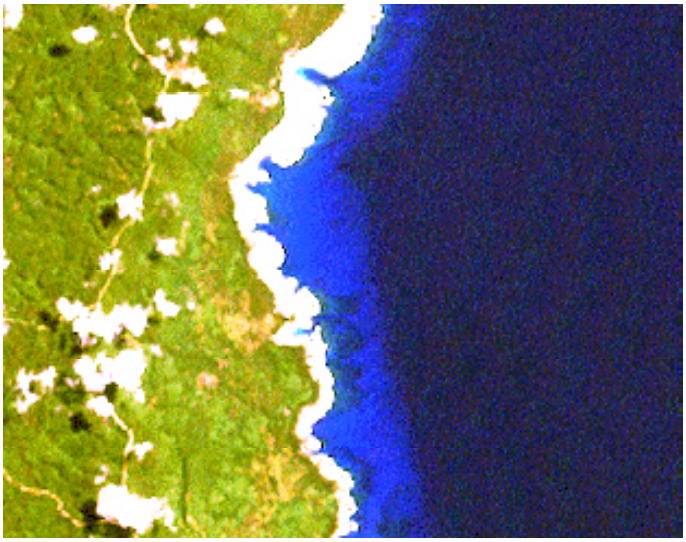

Figure 1: *The image backdrop shows the middle part of Pentecost. The shallow water zone is clearly visible due to channel selection Landsat TM blue, green and red.*

Image Backdrops

We have recently received on CD-ROMs, Image backdrops from SOPAC financed to assist Vanuatu's Disaster Management Office. These backdrops cover the following islands: Ambrym, Aoba, Lopevi, Maewo, Malekula, Paama-Lopevi together and Pentecost. The backdrops have also helped us with our planning. The backdrops were produced from Landsat TM 7 image data provided by the Pacific Disaster Center in Hawaii. There are two types of backdrops a) backdrops with the combination of Landsat channels green, red and infrared which are optimised to show different land cover types and b) backdrops with the combination of Landsat channels blue, green and red which are

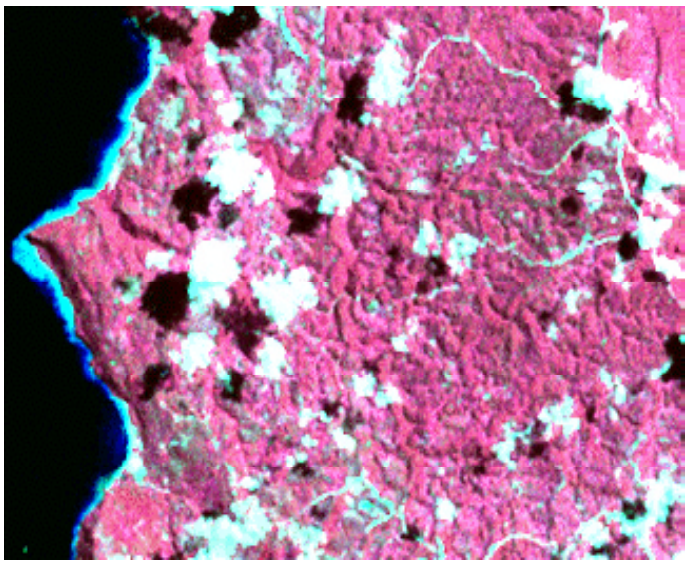

Figure 2: *The image backdrop shows the middle Western part of Pentecost. The difference of land cover is clearly visible due to channel selection Landsat TM green, red and infrared.*

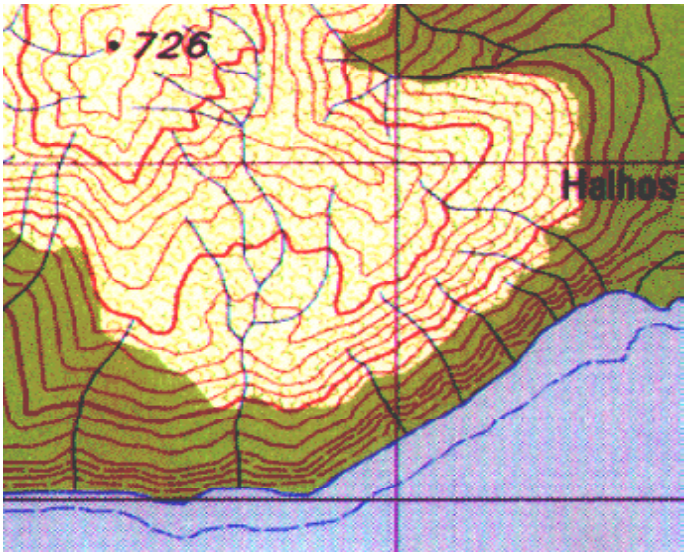

Figure 3: *The map backdrop shows the South Easr part of Lopevi Island.*

optimised to show features in shallow water such as reefs.

Map Backdrops

Included in the CD-ROMs given by SOPAC to the Land Use Planning Office, are Map Backdrops for the islands Paama-Lopevi and Pentecost. The other islands of Vanuatu do not have Map backdrops yet due to the accessibility of appropriate maps at a particular scale. The map backdrops show all features of the corresponding topographic maps and are used for image rectification and on screen digitising.

Applications

Both, image backdrops and map backdrops can be displayed on the computer screen. This allows on screen digitising of areas of interest. There is no digitising table required and all errors related to digitising of physical maps do not influence the work progress. These errors are mainly caused by map shrinking or expanding when brought from a room of different moisture or temperature into the computer room. Image interpretation, analysing reefs, land use, infrastructure or vegetation is normally performed on prints and then digitised. This creates additional sources of inaccuracy when printing to hard copies, delineating features on these prints and finally during digitising. With image backdrops available, all users can do their analysis on simple desktop computers. Expensive peripherals such as digitising tables are not necessary and more technical users such as fishery specialists, foresters, agronomists and finally disaster managers can be activated which increases the spatial data quality. In addition, everybody speaks the same language.

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Application of IKONOS Image Backdrops

Edwin Liava'a, TEPB

Introduction

In the early stages of the TEPB GIS, digital cadastral Information available only covered parts of Nuku'alofa. Arial Photography Image Backdrops were then corrected and stitched together to form the base for continuance of digitizing our existing assets i.e. Poles, Lines, Transformers and Customers. However, these images covered only the Nuku'alofa Area and not the entire Tongatapu.

During the Second Phase of the EU-Lome-funded project, TEPB was most fortunate to acquire a GPS Base Station with Rover unit. This enabled us to do our own GPS Data Collection of the Road Network in Tongatapu. Furthermore, it revolutionized our existing method of collecting information for our GIS, which was done using visual inspection and a measuring device called "Tru-Meter". New and Updates of existing information were collected using the GeoExplorer II with a Data Dictionary for all our assets categories. These positions were then Differentially corrected, exported then imported into the GIS Platform. Unfortunately there were areas especially in the outer/ rural villages whereby our GPS Roads Survey did not cover some of the roads network. Due to these shortfalls the IKONOS Image Backdrops were of so much appeal for our GIS.

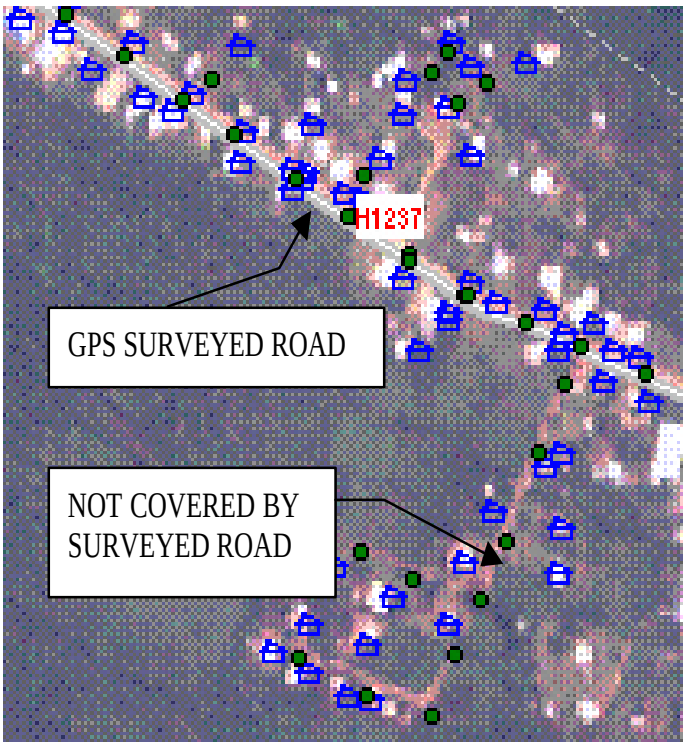

Figure 1: *This image shows the roads which are covered by the GPS surveyed.*

Application of IKONOS Image Backdrops

Applications

- Identify new and existing Roads in areas not covered by our original GPS Roads data Collection (Figure 1).

- Assist Data Collection with an overview of latest information on populated and especially remote areas by identifying houses from the IKONOS Image Backdrop before going out on the field (Figure 2).

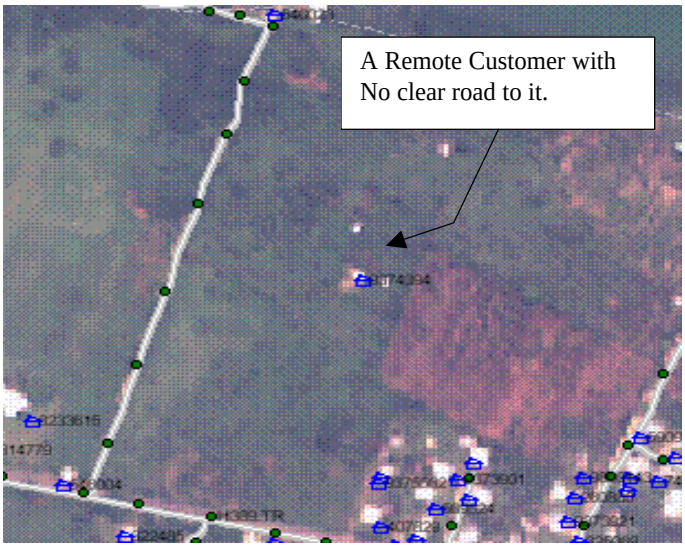

Figure 2: *The IKONOS Backdrop allows an overview of latest informaition on populated and especially remote areas to identify houses before going out on the filed.*

- Clearer Overview of Swampy Areas with soil resistivity, which can be used for Customer Protection by increasing the Earth Rods on premises within these areas (Figure 3).

- Identify Areas with Thick Vegetation for Clearance from our Transmission and Distribution Network (Figure 4).

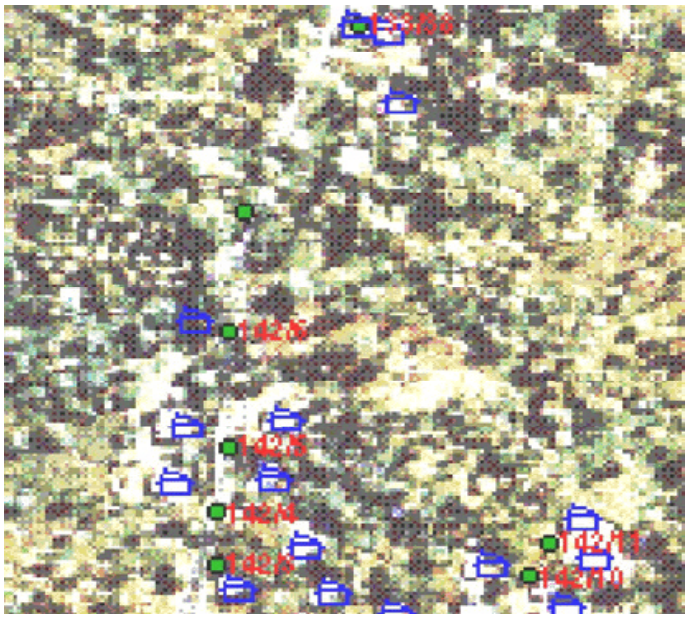

Figure 4: *The IKONOS Backdrop is used to identified areas of thick vegetation for clearance.*

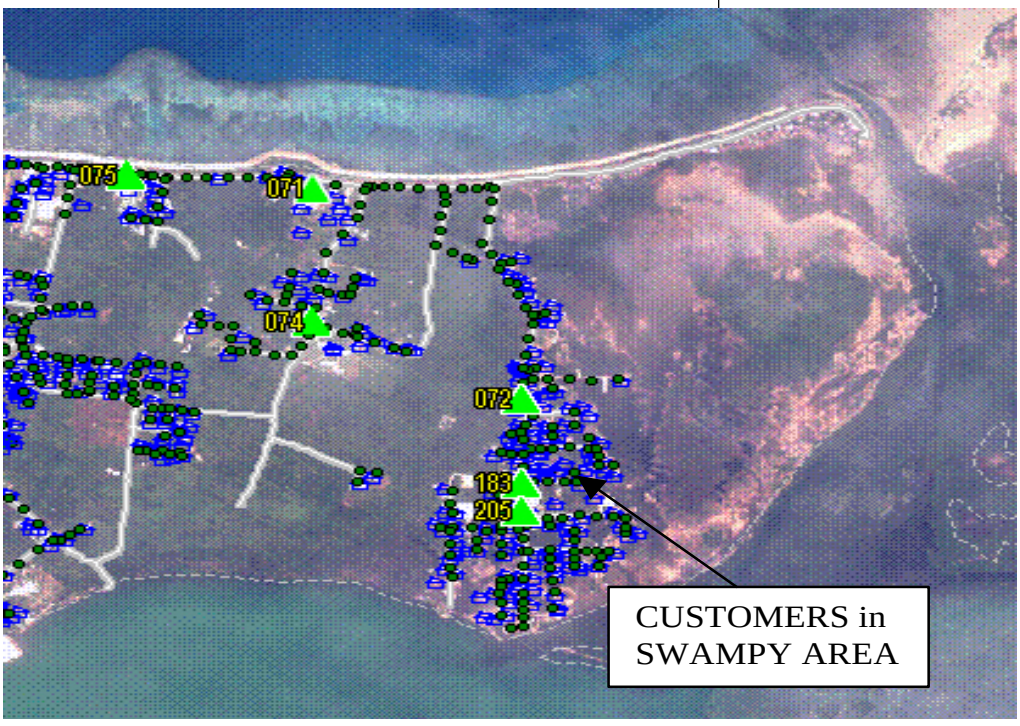

Figure 3: *The IKONOS Backdrop shows clearer overview of swampy areas with soil reistivity.*

Conclusion/Future

It is our dream and future endeavor to acquire the complete set of images for the Island of Tongatapu, Ha'apai and Eua. We take this opportunity to express our sincere gratitude to the team at SOPAC for all the effort and the great work they have done, thus making it possible for us to exploit this technology within our GIS.

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Telecom Fiji and USP cooperation on GIS training and development

James Britton, USP

As part of a multi-year training agreement, Telecom Fiji Limited (TFL) will assist in the continued development of the Geographical Information Systems (GIS) education infrastructure at The University of the South Pacific (USP). The training initiative is designed to assist TFL's GIS Section in its planned transition from its current Microstation-Intergraph Framme environment to the new Intergraph GeoMedia Professional software.

This agreement will see TFL fund hardware and software upgrades and specialised software support training to key USP and TFL staff. In return, USP will provide GIS training to TFL GIS staff in the Geography department's GIS Lab during non-semester times of the year. As a result, TFL's GIS staff can be trained on the new systems more quickly using local training facilities. The program will also use local trainers rather than overseas staff who may not know about Telecom's operations or the learning habits of staff.

Telecom's total commitment to the project is about $250,000 over a period of three years. Of this, about $60,000 will go to fund new hardware, $10,000 to training and the remainder will cover software purchases and licensing over the three-year period.

GeoMedia Professional, which is Intergraph's latest generation of GIS software, will come with several built-in modules specifically designed for the telecom industry. It is also built around the "Open GIS" concept, which allows different GIS systems to use data built by other systems (for example, MapInfo) in an integrated manner—a process referred to as "inter-operability". This solves a basic problem in GIS for utilities in Fiji. Because of its size and needs, TFL requires the high-end and specific powers of a system like GeoMedia (or the current Framme technology). On the other hand, a public utility just implementing GIS would opt for a more generic and easily implemented system, such as the more commonly found MapInfo GIS. This might create data incompatibilities. Working with GeoMedia TFL staff can seamlessly use the MapInfo data along with their own data. So, for example, a GIS user at Telecom could look at electrical, sewer and water network data at the same time, even if this data was created using three different GIS systems. By examining the data together, Telecom staff can ensure their phone lines will not interfere with other utility components, such as power lines—something that is especially important in dense urban environments where cabling is often all underground. The end result is better service to the customer in developing new lines and maintaining existing ones.

Students who take GIS courses at USP will also benefit. The first benefit is an upgrade of the aging GIS computer lab at USP. To run the Geomedia software we need more powerful computers and the Windows NT operating environment. This agreement will allow us to fund this upgrade.

Students will also be exposed to a wider range of software in the lab. Students will use Idrisi to easily explore a wide range of introductory GIS concepts. MapInfo will remain the workhorse GIS for the methods and techniques courses. Short exposure to GeoMedia will allow students to see some of the emerging concepts in the new GIS platforms. Importantly, TFL staff taking USP courses will be able to do their project work on systems they will use in their day-to-day work. As other organisations that currently use Intergraph software move to Geomedia over the next few years, it is hoped that students from those organisations will benefit by the agreement, too.

The agreement is a vote of confidence in the future of Fiji and GIS by TFL—something badly needed after the events of last year. The sponsorship is not a donation, nor is it a consultancy. It is a unique co-operation agreement and represents a variety of complimentary benefits for TFL and USP. Most of all, it moves USP away from going 'cap in hand' to overseas aid donors and shows that Pacific Island organisations can put together unique training and education proposals that support operations using local resources. In this particular situation, these opportunities provide benefits to USP GIS students. Many of these students are drawn from other organisations in Fiji and around the region. These organisations will benefit by having their staff exposed to an up-to-date and full range of GIS environments. The large majority of GIS users in the Region will use MapInfo, but their overall understanding of GIS will improve if they are exposed to other systems as well. As a result, this agreement benefits more than just USP and Telecom.

As always, the really important discussion went on in the tea breaks

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A Database for Spatial Representation and Querying of Whole-Rock Geochemistry Information for the Fiji Islands

T.I.H Rahiman, P. Narayan, MRD

Whole-rock geochemistry information on rocks of the Fiji Islands was complied into a user-friendly database for easy storage, spatial representation, easy retrieval and to facilitate future data entry of new samples analysed.

The composition of rocks is given by whole-rock geochemistry. Whole-rock geochemistry information comprises major-element analyses and trace-element analyses. Useful petrological parameters such as CIPW norms and Mg# (magnesium number) can be generated from such information.

Rock samples are collected and analysed to generate rock-geochemistry information. There are various techniques used to carry out the analysis. Previously it was determined by classical methods such as titration and AAS, which gave only major elements and a few trace elements. AAS is available at the Fiji Mineral resources Department (MRD). Modern analyses techniques include ICP-MS and XRF, give major elements and up 40 trace elements. These newer techniques are only available overseas and are very expensive.

Whole-rock geochemistry information is used as a tool in geological interpretation, particularly for classification of igneous rocks, determination origin of rocks, defining tectonic settings and also for regional mineral exploration work. In the current geological literature, the island arcs of the Pacific are of special interest to researchers. The island arcs provide understanding of modern igneous rocks and tectonic systems, which can be used as clues for studies in more ancient terrains. These studies may include search for mineral deposits, or more theoretical studies such deciphering geological origin of terranes and rocks.

The Mineral Resources Department (MRD) of the Fiji Government is the custodian of geological data on the Fiji Islands, including whole-rock geochemistry information. MRD holds thousands of records of whole-rock geochemistry data that date back to the early 1900s. This information is from work done by MRD geologists, exploration companies and universities through research projects.

Whole-rock geochemistry data has been previously kept by MRD in hardcopy and spreadsheet databases. The hardcopies have been prone to physical deterioration upon frequent use while spreadsheets have not been able to provide dynamic spatial representation.

There was an urgent need to compile, package and update in a user-friendly ready-access format.

A hard copy record was kept and maintained by P. Rodda (1981) until the early 1980s. It contained up to 600 records. A digital database was created in Foxpro format by Dropsy (1994). The database contained a mixture of whole-rock geochemistry and mineral exploration assay data. There was no provision for separating the two. Wheller (1995) created a database for samples from Vanua Levu in ArcView format. It contained only 200 records. A literature survey carried out this year showed that there was over 2000 on-land samples and several hundred offshore samples for which whole rock geochemistry data was available for Fiji.

Microsoft Access was used to develop the whole rock geochemistry database (Figure 1). It has a simple structure consisting of six tables. The sample general information table contains information on location, rock description, geological information and data source. The major elements table contains major element geochemistry in percentage. The trace-element table contains trace element geochemistry in ppm. The CIPW Norms and Petrological Parameters contain useful parameters which are derived from the major and trace element tables. The isotopes table contains information of isotopic analysis. These tables were linked to each other using sample_id as the primary key.

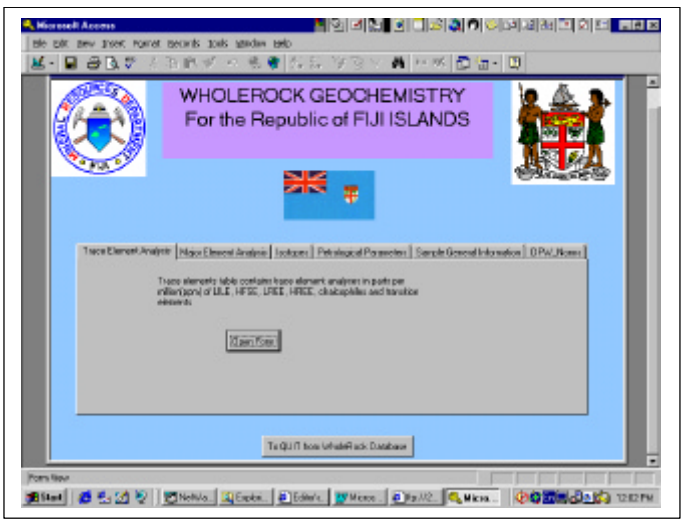

Figure 1: *The new Fiji whole-rock geochemistry database in Microsoft Access*

The whole-rock geochemistry database was linked to GIS for spatial/geographical display of samples. This was done through the MapInfo DBMS (Database

Management Systems) support. MapBasic software was used to customize the database to enhance user friendliness. This was done by adding the "WholeRock Sample" menu to MapInfo's menu bar.

Several queries were added to the WholeRock Sample menu to extract specific information of interest. These in built queries generate frequently used information such as rock classification based approximately on TAS (Total Alkali Silica) diagram and island-arc associations of rocks (tholeiitic, calc-alkaline, shoshonitic) and provide the possibility for users to select samples that have elements with specified quantities. Customised buttons have also been created for useful map-viewing operations such as zooming into regions of Fiji, displaying data at standard map scales, and different projections (Figure 2).

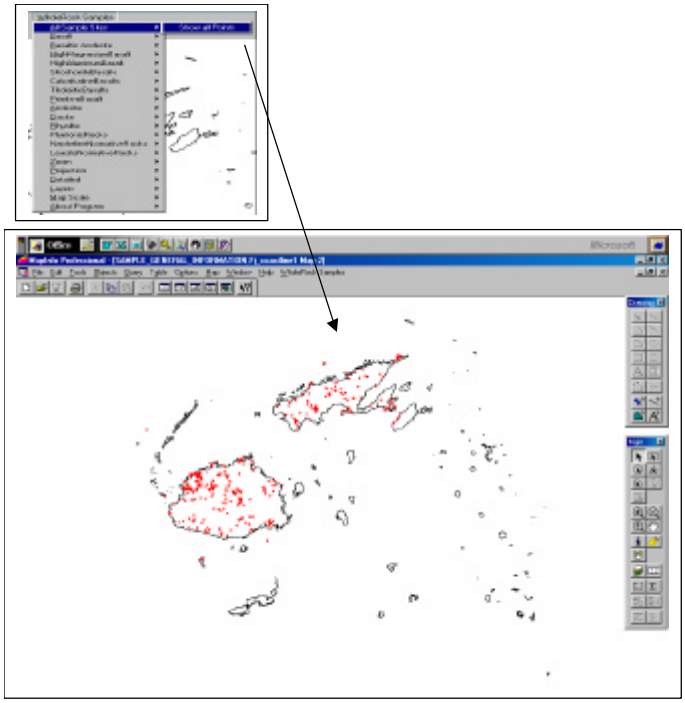

Figure 2: *The Customised "WholeRock Samples" menu bar, which allows in built queries to generate frequently used information in spatial display*

By bringing whole-rock geochemistry information to the digital spatial domain it is possible to view this information with base information such as coastline, roads and rivers, that provides a geographical reference for samples. This system also opens the opportunity for users to use whole-rock geochemistry data with other spatial data such as geology, geophysics and satellite imagery for helping with and enhancing geological interpretation.

References

Dropsy, H. 1994, Catalogue of MRD databases, Mineral Resources Department BP Note 67/6

Rodda, P. 1981, MRD Information Systems, Mineral Resources Department Report No. 23

Wheller, G. 1995, Vanuarox, a geoscience information project for ArcView 2, Mineral Resources Department.

Pacific Regional Geodesy Meeting of PCGIAP in Suva

Russell Howorth

The Pacific Regional Geodesy meeting of the Regional Geodesy Working Group of the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) was held in Suva and attended by several representatives from Pacific Island Countries and the Australian Surveying & Land Information Group (AusLIG). One of the conclusions of the meeting was to reaffirm the need for a regional focal point, and the meeting further agreed that SOPAC be approached again. As a next step the needs analysis completed in 1999 would be reactivated in order to be able to prepare a provisional work plan which could be discussed with possible donors. This exercise would be completed before the end of Augiust in time for consideration by the SOPAC Governing Council when it meets in Majuro at mid-Cotober. As a first step SOPAC has established an email subscribing list, GI-PacNet (GIS Infrastructure for the Pacific), which is hosted on a SOPAC server. This own Pacific list was necessary to avoid noise in the well established Asian GIS communities. All country representatives to PCGIAP are on the list.

If you want to subscribe, send an e-mail to:

sympa@list.sopac.org.fj

In the body text you write:

subscribe GI-PacNet [your e-mail address]

Please, just your e-mail address no brackets!

Enhanced Rapid Risk Assessment using GIS Tools for the Fiji Meteorological Service

Simon Montilal

The primary agency for weather and climate monitoring and prediction, and meteorological research in Fiji is the Fiji Meteorological Service (FMS), a Government Department. Located in Namaka, Nadi (Figure 1), FMS has been in operation since 1975 and serves both on a national and regional scale covering most of the tropical Southwest Pacific. Prior to 1975, meteorological services for Fiji and many other countries of the region was the responsibility of the South Pacific Air Transport Council, an organisation jointly formed after the 2nd World War by New Zealand, Australia and Britain.

Figure 1: *The Fiji Meteorological Building in Namaka,Nadi*

The Fiji Islands like many other countries in the humid tropical Pacific is prone to weather and climate-related natural disasters. Over the decade 1990-2000, such natural disasters cost the Fijian economy well over F$0.5 billion. Almost a third of this economic loss was as a result of a single event, the 1997-98 drought.

The Fiji Meteorological Service has the equipment, skills and information access to enable forecasting of drought conditions up to 12 months before their onset. In the case of the 1997-98 drought, FMS predicted the event 6 months ahead of time. However, one of the criticisms the FMS received was that the forecasts weren't fully understood by the end users.

The Climate Division of FMS has recently embarked on a program to improve forecast presentation, user understanding and response. As one of the major activities, it sought assistance from SOPAC for a four-week training course initially and follow-up assistance with GIS. The project was initiated in early December 2000 with the aim of introducing members of the FMS to the basics of GIS and Remote Sensing, in particular the use of MapInfo and MapBasic computer software packages.

Using MapInfo, FMS aims to improve the presentation of the rainfall forecasts in its monthly weather summary, thus shifting from a tabular format to a map display which will ultimately improve the visual impression of the rainfall forecast and make the product more comprehensible to the users.

Also using MapInfo, FMS plans to digitise historical tropical cyclone tracks (Figure 2). In the past, these tracks (some of which date back to the early 1900's) were hand drawn since presentation and analytical applications were limited. Over the coming months, track and intensity maps will be drawn using information from meteorological archives. This will allow tropical cyclone patterns during cold and warm phases of the El Niño Southern Oscillation to be analysed and presented in a user-friendly format, thus expanding the historical tropical cyclone database for customers.

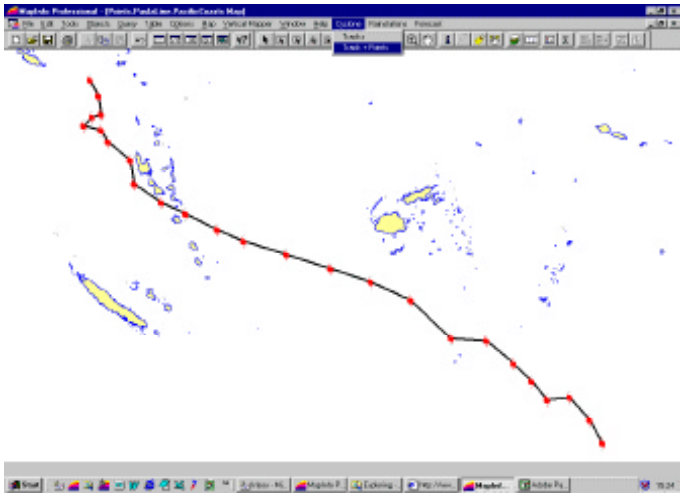

Figure 2: *This map shows the track of the cyclone Paula.*

The other major component of the FMS/SOPAC project involves creating an on-line information system. This will allow climate staff easier access to the National Climate Network and other cooperative stations. At present, records of 286 open climate and rainfall stations are stored in the FMS CLICOM database. Such an information system has been created with the use of MapInfo (Figure 3). By clicking on any station represented by a coloured circle, staff can access information like station location, history, ownership and elements reported. Information on data quality is likely to be added at a later stage.

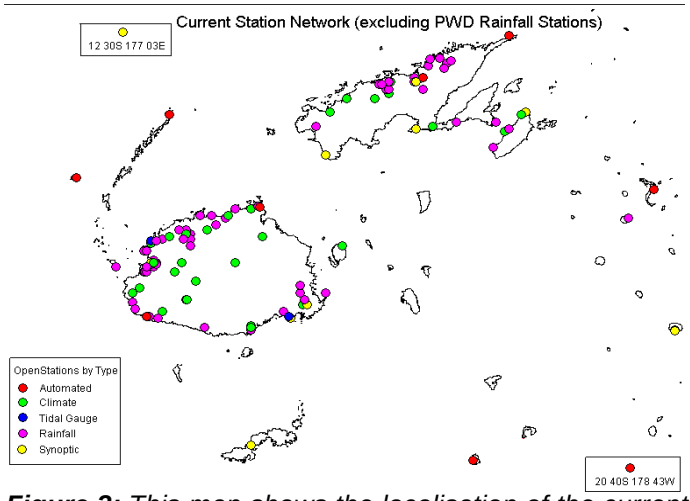

Figure 3: *This map shows the localisation of the current station network. Each type of station is shown by a diffrent colour.*

There are many other possible uses for GIS and Remote Sensing within FMS. In the case of Remote Sensing, drought vulnerability and risk maps can be created as disaster response planning tools. At present only the Climate Division uses MapInfo. Opportunities exist for the Forecasting Division to also use MapInfo for Synoptic Station records, tropical cyclone tracking in real time, and for digitising daily weather charts which are used by the local media and many others.

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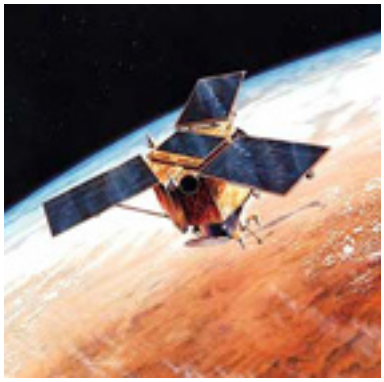
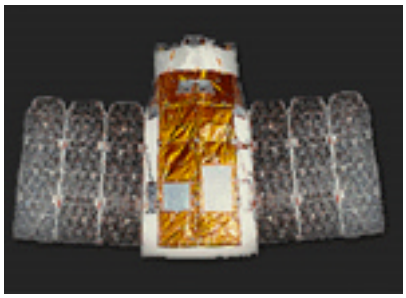
High-resolution satellite image data for Pacific Island Countries

Wolf Forstreuter

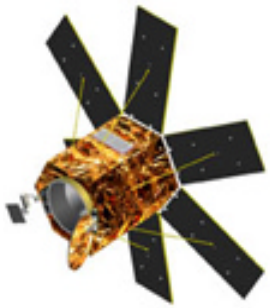
This article provides an overview of space borne image data actually available for Pacific Island Countries, which can be used for mapping at 1:10,000 scale. All systems, which do not record or cannot store data from the pacific, are not mentioned.



Since more than one year the American satellite ***IKONOS*** provides image data. The spatial resolution is 4m for the multispectral channels blue, green, red and infrared and 1m for the panchromatic channel. The user in Pacific Island Countries has to purchase a multi user license, which costs $US 40 per km², and a minimum area of 100 km². Before a minimum data purchase of $US 6000 was necessary, this is still in discussion between SOPAC and the data selling companies. The data arrives on CD in GeoTIFF format direct readable by image analysis software such as ERDAS Imagine.



The Israeli satellite ***EROS-A1*** orbits since December 2000. This satellite provides only panchromatic (black and white) data. The resolution is with 1.8m less than IKONOS, however, it is sufficient to pan sharpen IKONOS multispectral images or other multispectral image data and the data only costs $US 10 per km² and the minimum data purchase is only $US 1000. This data provides a very interesting alternative to IKONOS pan. The image arrives on CD and can be imported as generic binary data. The image is stored as unsigned 16 bit. The image CD contains a detailed description of the image data.



The satellite ***OrbView-4*** will be launched on 22 July 2001 and the data will be marked by SPOT Image. Like IKONOS the satellite will provide multispectral images with 4m resolution covering blue, green, red and infrared. The panchromatic data has 1m resolution. In addition to IKONOS the satellite will record Hyperspectral data in 200 different bands with 8m spatial resolution. The data cost is not known yet.

The launch of ***QuickBird*** 1 failed like the launch of IKONOS-1. QuickBird 2, a twin of QuickBird 1 will be launched on 18 October 2001 with new potential. The orbit will be lower than originally planned for QuickBird 1, which will lead to better spatial resolution. The panchromatic data will have 6.1m resolution and the bands blue, green, red and infrared 2.5m.
For further information contact:
www.sopac.org/projects/GISRS/RSNews/index.html

Samoa Statistics Department Develops GIS Capacity

James Atherton, GIS Consultant

A Geographical Information System (GIS) is currently being developed by the Samoa Department of Statistics. The project was initiated with seed funds from FAO in November 2000 and will be completed in late 2001, in time for the next national census. The GIS project involves the digitisation of 158 census map sheets (96 on Upolu island and 62 on Savai'i island) including 878 Enumeration Areas (EAs) and approximately 30,000 households. The FAO have funded computer equipment, MapInfo 6.0 software, purchase of GIS base data and the employment of a GIS consultant for 40 days to train staff in digitising and the development and maintenance of the GIS database.

The aims of the GIS project are many, but in particular to:

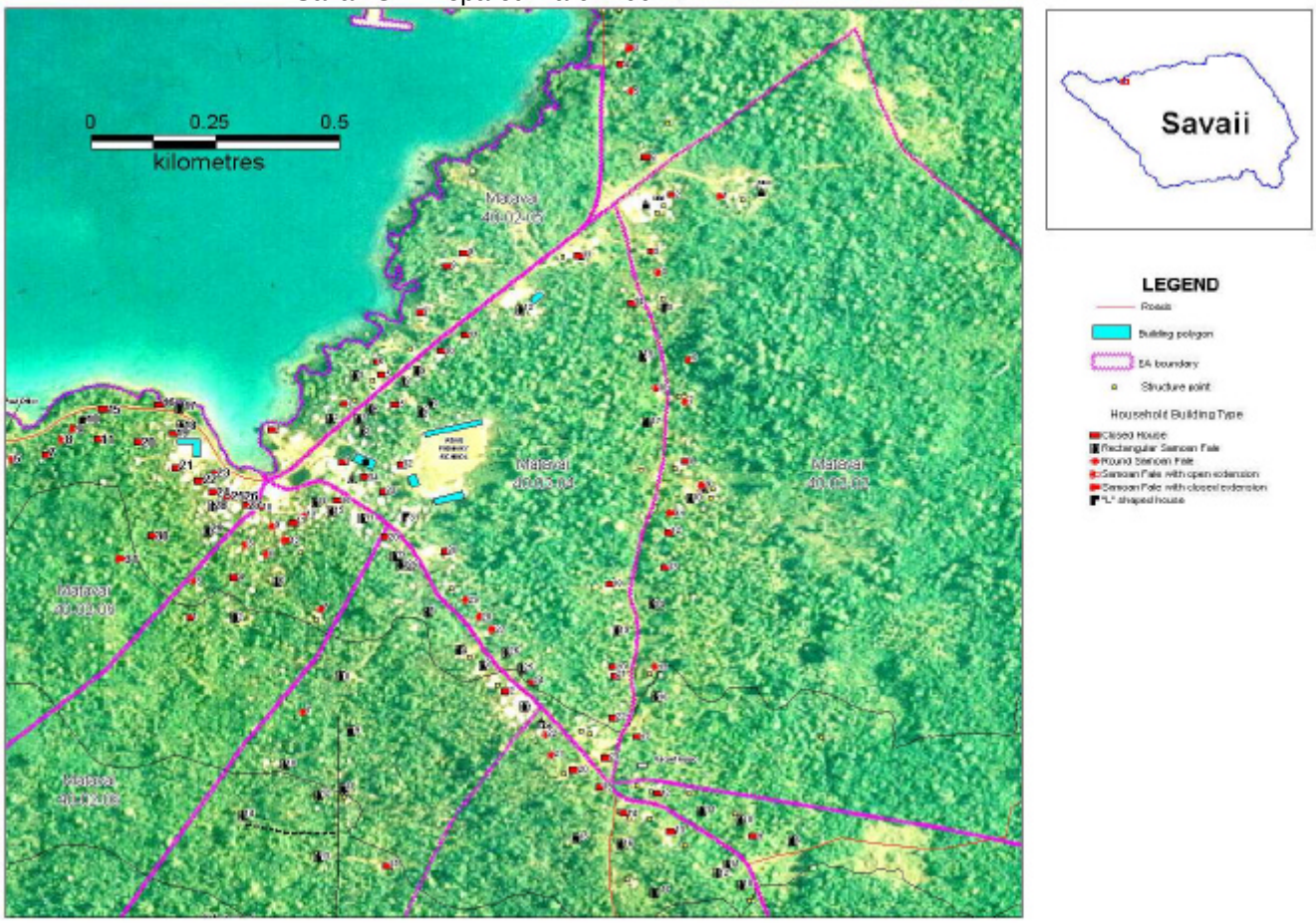
- Facilitate census planning and household interview sequencing;
- Ease the correction/update of census maps (such as EA boundaries, location of households etc);
- Improve flexibility to plot census maps at a variety of scales and areas;
- Improve map presentation options (eg pie charts, colour coded theme maps, etc) for census reports;
- Establish a spatial data exploration and analysis capability for census data.

The project has benefied from the recent completion of an aerial photographic survey of Samoa by an Australian mapping firm. The outputs of this survey include digital orthophotographs at 1:5,000 and 1:50,000 scale and new digital map layers of roads, rivers, contour lines and major buildings for the whole of Samoa. A sample map output produced from the Statistics GIS is shown below.

Samoa joins many statistics departments around the world who are now using GIS techniques to improve survey planning, data exploration and map presentation.

For further information contact:
jatherton@apiaman.com, james@sprep.org.ws

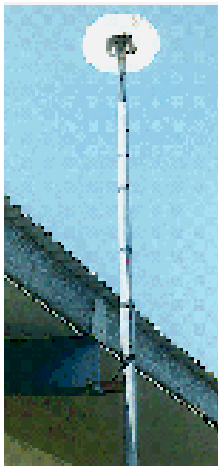
Department of Statistics GIS Database
Savaii-G4. Prepared March 2001



Network of GPS reference stations in Pacific

Stephane Calmant, IRD

The Global Positioning System (GPS) is now very popular in the Pacific. Indeed, this satellite-based system enables worldwide referenced coordinates to be available in remote area. Also, it proves to be accurate and convenient. Then, GPS Reference Station is being installed all around the Pacific archipelagos to support the local survey operations. Because Pacific is one of the most active place on Earth for volcanism and seismicity, it would be a major plus to also use these Reference Stations (RS) for scientific studies. IRD wish to push forward this objective.



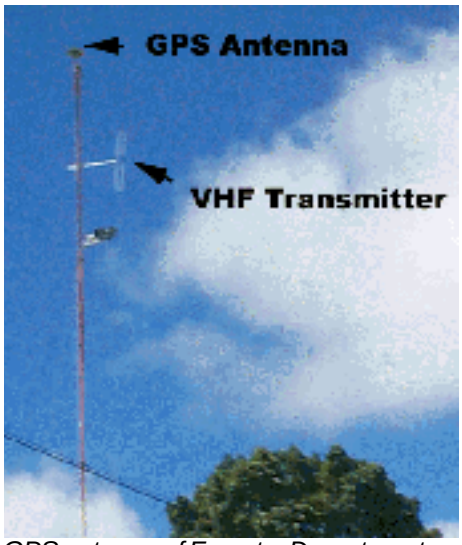
GPS antenna of Fiji Electricity Authority - Lautoka

GPS antenna of Marshall Islands Environment Protection Authority

Most hight grade Reference Stations collect the entire GPS messages. These messages contain all the GPS information, whether you want to use them for low-accuracy quick surveys of high-accuracy scientific geodesy. The difference lies in the data you collect in the GPS messages and make available to your customers. Usually, public data from Reference Stations are 1-to 5-second messages, for lane L1, Code and Doppler. Scientific use requires 30 second only data, for both L1 and L2 lanes, 24 hours per day 365 days per year.

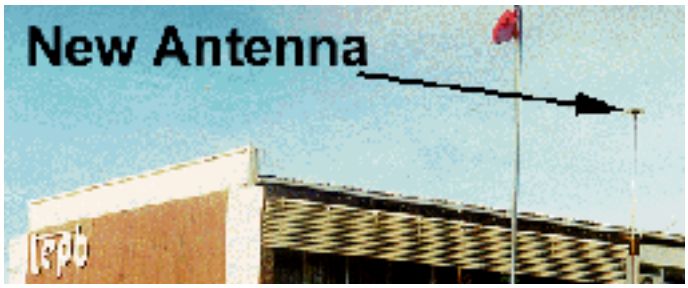
The latter data have no commercial value. On the other hand, provided by all the Reference Stations to a data Centre and a computation Centre, these data would enable the computation of daily coordinates for each station at the centimetre level of accuracy. The same can be done for topography where the base station is used as a reference for the coordinates of a whole survey. This high-accuracy network of continuous stations in the Pacific would help improve the results for all scientific work based on GPS in the region.

GPS antenna of Solomon Islands Electricity Authority



GPS antenna of Forestry Department on a mast of 25m. A VHF transmitter is installed already for online GPS at a later stage.

GPS-RS in the Pacific, a project aimed to establish a network of the GPS R/S in Pacific should start in the 2nd semester of 2001, in the folling way:
1- As a first step, a list of RS meta-data throughout Pacific will be established (who owns the station, who maintains it, is people interested in participating to that project, phone and Email records, type of station and installation...).
2- Secondly, all RS participating to the project will be tuned to also collect and store sciences oriented data.
3- In operational mode, these data should be regularly sent to the data centre, archived and computed for daily solutions are distributed to the community.



GPS antenna of Tonga Electrical Power Board

The mentioned Trimble GPS reference stations established by SOPAC projects all only provide single frequency data. However, AusLIG investigate providing a way to link these stations to a global network, which will inncrease the accuracy on a single frequency data.

People interested in this project can contact:
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stephane.calmant@noumea.ird.nc.
and/or Wolf Forstreuter, SOPAC Wolf@sopac.org

EROS-A1 Satellite Images

Wolf Forstreuter, SOPAC

The satellite EROS-A1 is the first satellite of a series of Israeli satellites, which provide high-resolution panchromatic images. ImageSat International (ISI), an Israeli company established in 1997, manages this satellite image data. EROS-A1 was successfully launched in December 2000 and has been providing images since January 2001. ISI has sent a sample image to SOPAC for investigation into its potential to assist the mapping of Pacific Island Countries. EROS-A1 has a polar sun-synchronous orbit of 480 km altitude; all images will be recorded at the same local time, no matter the day, month, or year. The EROS satellite can turn up to 45 degrees in any direction as it orbits, providing the power to take shots of many different areas during the same pass. The satellites' ability to point and shoot their cameras also allows for stereo imaging during the same orbit.

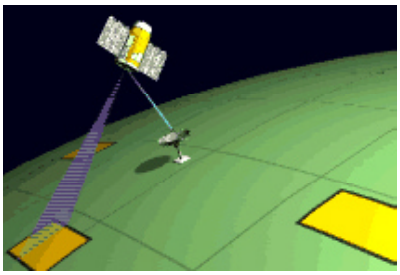


Figure 1: *The satellite is able to turn up to 45 dgrees as it orbits. Many different areas can be recorded during the same pass and stereo images can be produced within the same orbit.*

The sample image was of Hiroshima, where coastline, urban areas and forest vegetation is visible on the mainland and on several small islands. Sample images from Pacific Islands do not exist so far. The image arrived on one CD and covers about 12.5 km by 31.5 km.

The CD contains 4 files. One file is a quick look in JPEG format and another is a thumbnail. A metadata file specifies the image data in terms of number of rows, number of columns, geographical coordinates, recording time, etc. The final image data file therefore does not need any header it consists purely out of image information in 16 unsigned bit data range. ERDAS software reads this data as generic binary without any problems.

The image data are only available in panchromatic mode and have a spatial resolution of 1.8 m.

The image data currently costs $US 10 per square km, which is one quarter of the price required for panchromatic IKONOS data for Pacific Island

Figure 2: *The image size received from ISI is 7,000 x 14,000 pixels equivalent to 12,5 x 25 km as the pixel size is 1.8m (area coverage see Figure 4) The customer pays $US 10 per km² and determins the image size with a minimum data puchase of $US 1000.*

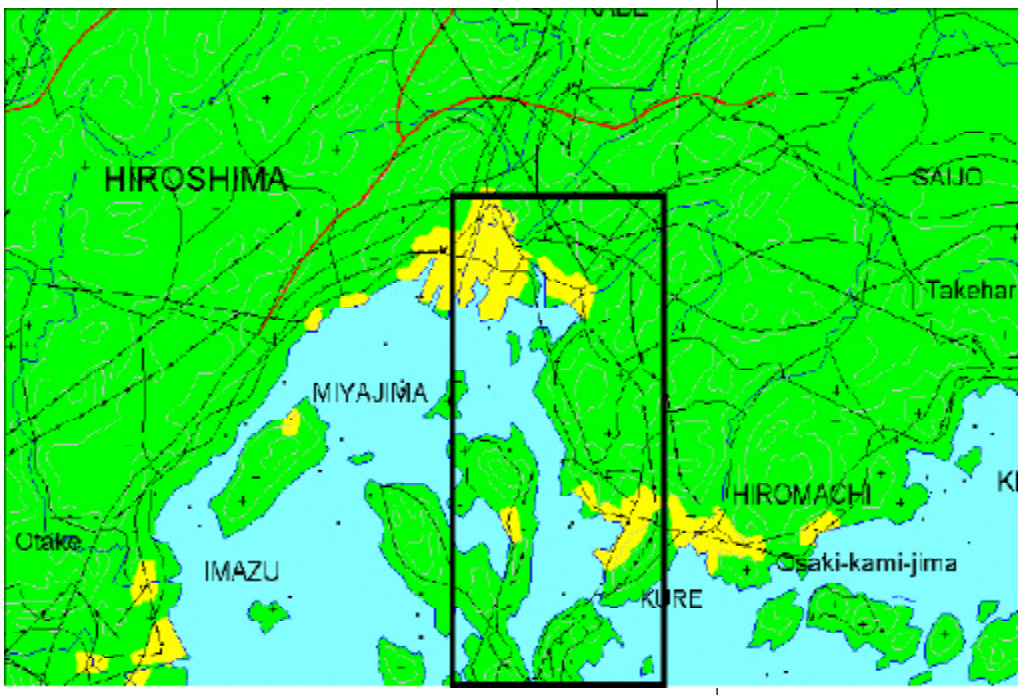


Figure 3: *The image (see Figure 3) was recorded from Hiroshima, Japan on 26 March 2001. The black rectangle drawn on the map (Digitall Charts of the World) shows the area covered (12.5 x 31.5 km).*

Countries ($US 40 per square km). The minimum data purchase is $US 1000 (IKONOS $US 6000). The onboard tape recorder allows for record images from all Pacific Island Countries.

Linear elements are clearly visible. Not only small roads but also the white lines are visible, see figure 4. Figure 5 shows a shipyard where features such as ship construction details and parking cars can be recognised. Information on water depth is limited in a panchromatic image. However, after contrast enhancement different depth in shallow water can be seen, see arrows in figure 6.

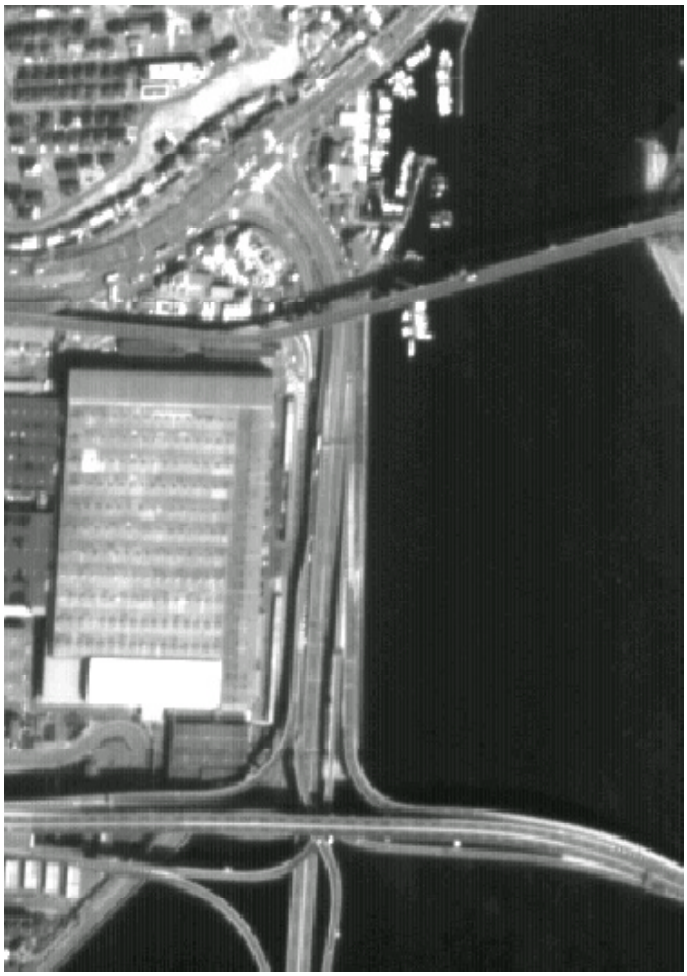


Figure 4: *Linear elements such as roads are clearly visible. Even the white lines on the high ways can be recognised (if the print comes out nicely).*

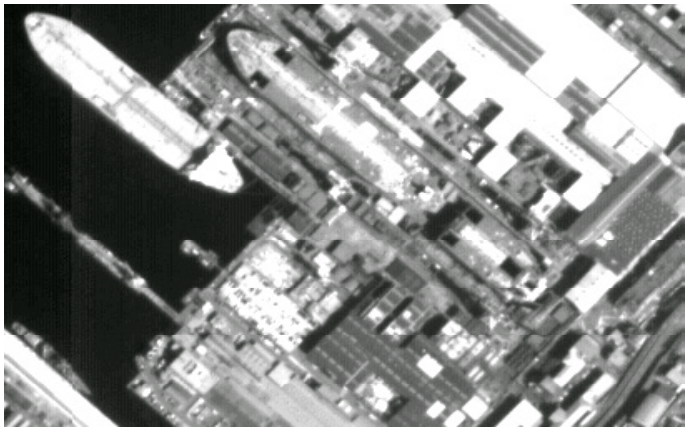


Figure 5: *Details can be recognised in this shipyard.*

Figure 6: *Water depth is difficult to see in panchromatic images. However, employing contrast enhancement shallow water can be delineated from more deep water (again, if the print comes out nicely).*

GIS display of shipping lanes, a MapBasic Program

Myriam Gallois, SOPAC

Introduction

Pacific Ocean Pollution Prevention Program (PacPol) a project where SOPAC carried out the GIS data display and an external consulting was supposed to do all database establishment required the visualisation of the routes taken by vessels crossing the South Pacific and the display aof thematic maps showing the tonnage and the frequency. The external consultant was supposed to provide the data in an Access formay that can be imported into Mapinfo. This basic data of shipping lines did never arrive and SOPAC had to invent a procedure written in MapBasic flexible enough to allow online mapping whenever new or updated shipping lines arrive.

Creation of the shipping lanes

The shipping lanes are created on-line by using the MapBasic statement Create Line. This statement picks up in the table (containing the information of shipping lanes) the coordinates of the starting and ending point necessary to create the lines.

```
Tablename = "Test.tab"
TableStr = Path + Tablename

Open Table "\\Wolf-nt\Harbours\Reefs.TAB" As Reefs
Open Table TableStr As SubRoutes Interactive

Create Map For SubRoutes
   'Make the table SubRoutes Mappable

Map From Reefs Max
Map_Win_id = FrontWindow()

Set Map
   Center(178.88, -17.03)
   Zoom 6000 units "km"

Add Map Layer SubRoutes
Set Map Layer SubRoutes Editable On
   'Make the table Editable
```

Figure 1: *This part of the program shows how to make the tables editable and mappable.*

The first step is to make the table containing the shipping lines, the date the external consultant must provide, mappable and editable (Figure 1); these options are part of the statements Create Map and Set Map.

The second step in that the Fetch Statement sends the program to the record 1 of the table.
The function Create Line is included in a loop: Do While Not EOT ()…Loop, in this way the program runs as long as the end of the table is not reached. For each record, a line is created and stored in an object variable (Figures 2 & 3).

```
Sub CreateLines

Dim Map_win_id As Integer
Dim X1, Y1, X2, Y2 As Float
Dim LineObj as Object
Dim SID as Integer        'RowId
Map_Win_id = FrontWindow()

Set Map Redraw Off

Fetch First From SubRoutes

Do While Not EOT(SubRoutes) 'EOT = End of Table

   X1 = SubRoutes.XBegin
   Y1 = SubRoutes.YBegin
   X2 = SubRoutes.XEnd
   Y2 = SubRoutes.YEnd
      'address the fields of the table.
```

Figure 2: *This defined the location of the coordinates needed to create the lines.*

```
   Create Line
      Into variable LineObj
      (X1, Y1) (X2, Y2)
      Pen MakePen(2, 2, BLACK)

'  ++++++++++++++++++++++++++++++++++++++++++++++++++
'  The Update Statement modifies rows in the table

   Update SubRoutes
      Set Obj = LineObj
      Where RowId= SID

   Fetch Next From SubRoutes

Loop

Set Map Redraw On
```

Figure 3: *The lines are stored in an object variable.*

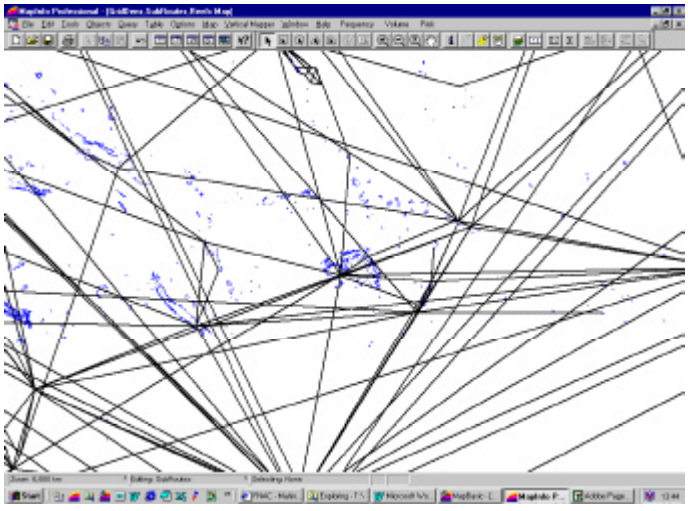
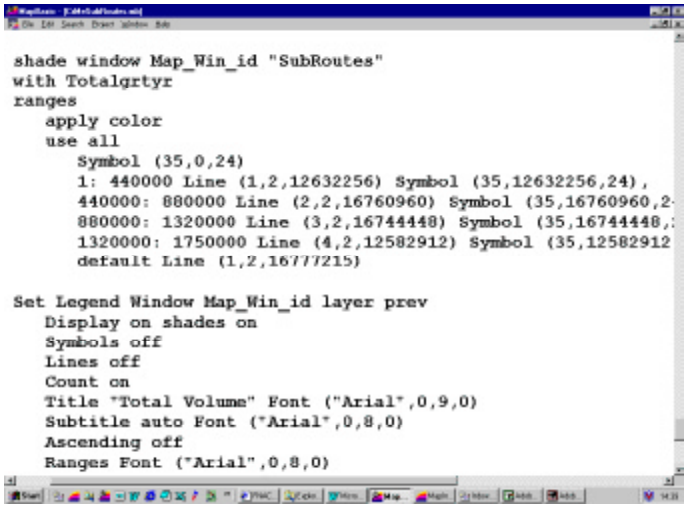


Figure 4: *The display of the shipping lanes. (it is a temporary data set provided by the external consultant therefore the shipping lines crossing the islands)*

Thematic Maps

The Shade Statement is used to create the thematic maps (Figure 5).In this function, the ranges, the colors



```
shade window Map_Win_id "SubRoutes"
with Totalgrtyr
ranges
   apply color
   use all
      Symbol (35,0,24)
      1: 440000 Line (1,2,12632256) Symbol (35,12632256,24),
      440000: 880000 Line (2,2,16760960) Symbol (35,16760960,2
      880000: 1320000 Line (3,2,16744448) Symbol (35,16744448,
      1320000: 1750000 Line (4,2,12582912) Symbol (35,12582912
      default Line (1,2,16777215)

Set Legend Window Map_Win_id layer prev
   Display on shades on
   Symbols off
   Lines off
   Count on
   Title "Total Volume" Font ("Arial",0,9,0)
   Subtitle auto Font ("Arial",0,8,0)
   Ascending off
   Ranges Font ("Arial",0,8,0)
```

Figure 5: *In the "Shade Statement", the range.*

and the type of symbols of the thematic maps are defined.

The thematic maps realised show the frequency and the tonnage of the vessels transporting container and oil between the different islands of the South Pacific (Figure 6).

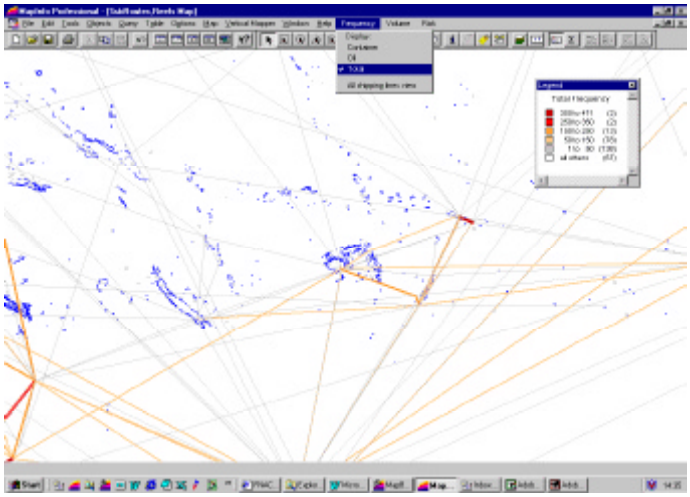


Figure 6: *Thematic map showing the frequency for the vessels carrying containers and oil.*

To make the display of different thematic maps easier there is a MapBasic programmed add-on menu to the normal MapInfo status bar.

Conclusion

By using MapBasic Procedure, it is possible to create a map on-line. The thematic maps will reflect any up-date made in the Access table.

For further information contact:

Myriam Gallois: myriam@sopac.org

1:50,000 Image Backdrops

Edmond Chang

In addition to advertising comments on the GIS-PacNet email subscribing list, digital maps as backdrops are invaluable keys to other spatial information. Furthermore it is provided free in digital form with compliments of SOPAC - a generous gift to GIS users. Now, it is possible to register to FMG aerial photos of Viti Levu in including enlargements. These photos then can be used with any cadastral data or DCDB. It is a surveyor's dream come true.

Figure 1: *An example of a GIS topomap Backdrop.*

For more detailed image and higher resolution you will need to have two sessions of photo image scanning for a larger working scale. Imagine being able to map a rural village at a scale of 1:2000 with NLC boundaries without even physically visiting the site. As long as there is no backdrop produced from aerial photographs with sophisticated software there will be some errors because of terrain and image distortion if we were just scanning and registering aerial photographs. Of course you must allow for some error tolerance because of height and image distortion.

In the future, if there are image backdrop produced from aerial photographs or satellite image data at 1:10,000 scale it would be a major break through…

For further information contact:

E. Chang: echang@is.com.fj

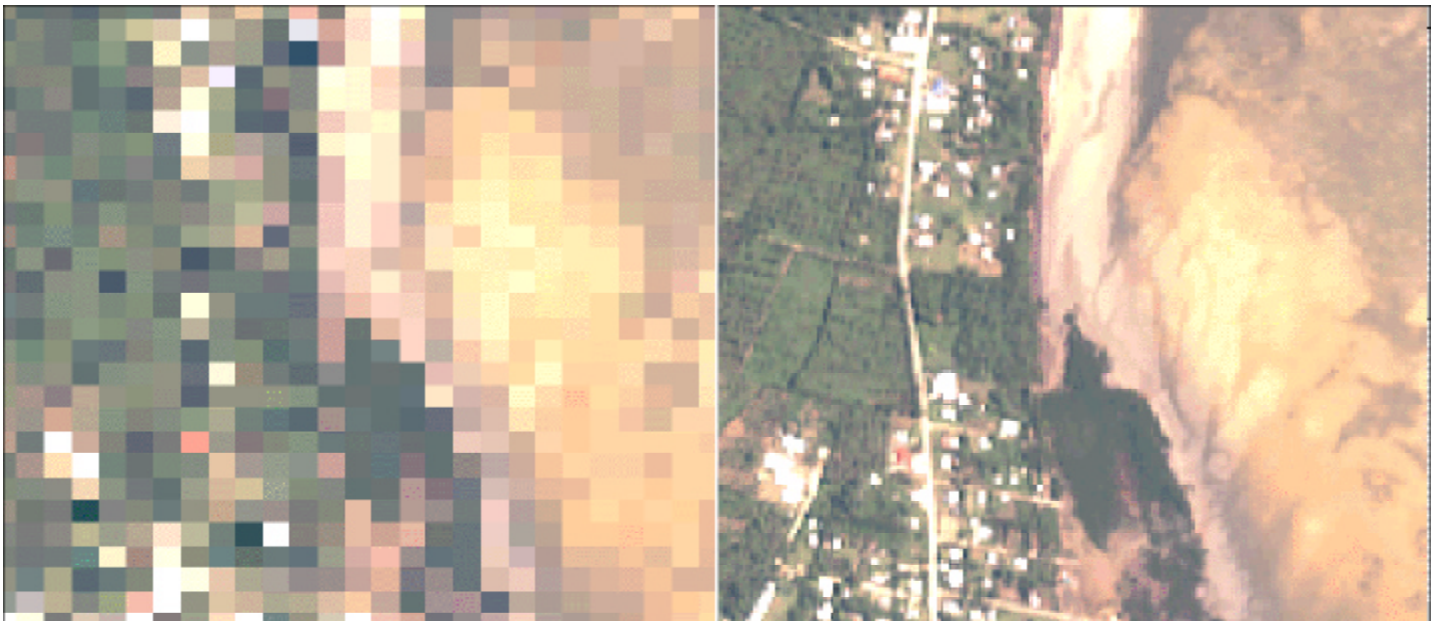


Figure 1: *Left, Landsat image data with 30m resolution which does not allow to map at larger scale than 1:50,000. If zooming in further, the image information do not increase. Right, the same area recoded with multispectral 4m IKONOS data. Single trees, the shape of the houses and small tracks are visible. Such image backdrop is ideal for thematic mapping at 1:10,000 scale as required by utilities for GIS image backdrop.*

Potential of IKONOS Image Data to Visualise Land Degradation and Coastal Erosion

Wolf Forstreuter, SOPAC

Introduction

The last newsletter reported about the IKONOS image data purchase for Tongatapu, Tonga. SOPAC received the images, which show impressive detail. The image data has proved to be an ideal GIS image backdrop employed by utilities as described an article in this newsletter . In addition, this image proved to be the ideal tool for rectification of historical aerial photographs to evaluate coastal change.

Image Data Preparation

The image data was delivered on CD in form of two GeoTIFF files, containing the band blue, green, red and near infrared. The image data display provided details never recognized with Landsat TM data such as single trees, the shape of the buildings and small tracks. Figure 1 shows the comparison of Landsat TM and IKONOS multispectral image data.

Although the image data was already rectified to WGS84 it did not match exactly with a Tonga Electrical Power Board (TEPB) GPS survey. Differences up to more than 10m were noted. ERDAS rubbersheet module enabled a fast and accurate image rectification.

Rectification of Historical Aerial Photographs

Often in historical aerial photograph where there is no or very little infrastructure and only vegetation or coastline features the details of which when compared to a corresponding map provide insufficient detail in which to attempt any rectification. This is where IKONOS image data proves to be invaluable. Since the IKONOS image is already provided with an

Figure 2: *IKONOS images allow the identification of sufficient GCPs for rubbersheet image correction which overlays the historical aerial photographs exactly over the recent image or map*

orthogonal projection and with the high resolution the rectification of historical photos can be accomplished easily using the ERDAS rubber sheeting process. With the high-resolution quality of the image, physical features both in the image and photo can be readily identified over a wider area thus providing an adequate number of GCPs systematically distributed over the aerial photograph that is to be rectified. An example of this process is illustrated in figure2.

An Application of GIS Image Backdrop Produced from Historical Aerial Photographs

An application of this process to evaluate land degradation and associated coastal erosion is described. In figure 3 the area in question as recorded in 1968 black and white aerial photography shows an intact coastline that appears well vegetated although some mangrove deforestation is apparent in the form

of two small clearings at opposite ends of the shoreline depicted in the center of the photograph. Twenty years later on in figure 4 , 1990 colour photography shows

Figure 3: *The situation 1968, very few clearings are visible and the coastline is intact.*

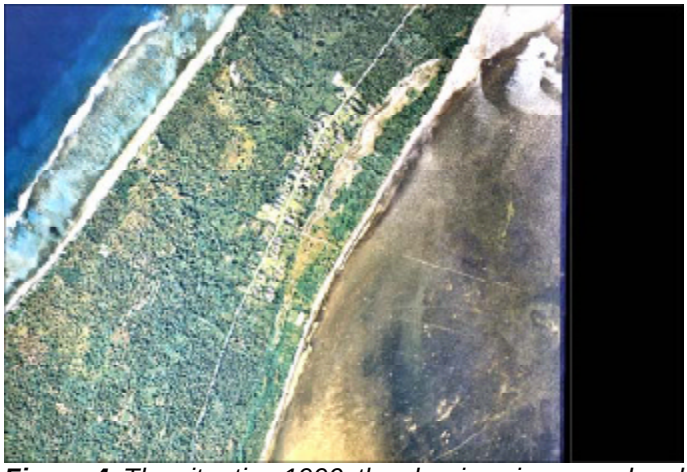


Figure 4: *The situation 1990, the clearings increased and open water stands near the village. The coastlie is still intact.*

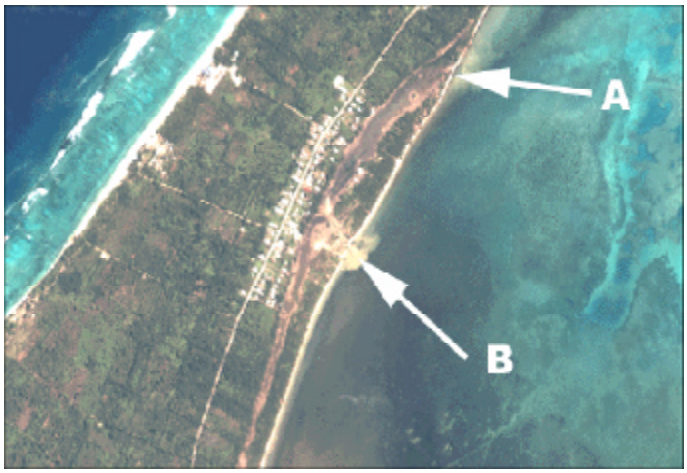


Figure 5: *The situation 2000 (IKONOS image), the clearings increased further, the last mangrove towards the sea has been removed (A) and the sea water erodes the area closed to the village (B).*

the deforested areas has increased significantly and the area between the village and the remaining coastline vegetation appears to have become inundated with seawater. Evidence for this is the appearance of tidal channels that parallel the village shoreline but coastal erosion has not yet appeared to have commenced. In November 2000, figure 5 the IKONOS image shows the situation to have deteriorated significantly. Here coastal vegetation has been completely removed in two places at either end of the village and the sea has completely inundated the area sufficiently to now impact on the village shoreline stability thus causing erosion. This is evidenced by the formation of a tidal delta sediment at point “B” in figure 5.

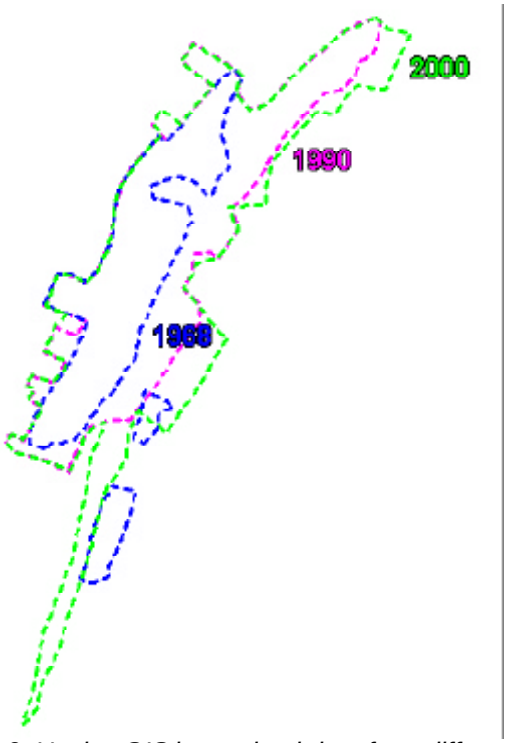


Figure 6: *Having GIS image backdrop from different years in MapInfo environment, the increasing deforestation can be clearly deliniated and compared.*

With the historical aerial photography and converting it into GIS backdrops using the IKONOS image as the reference the deforested areas can be delineated and a time series of events placed in perspective, as shown in figure 6 thus allowing a qualitative assessment of the problem.

The problem has now been identified and based on this a management strategy can be formulated, remedial action implemented. With this baseline data in place monitoring to confirm that the natural system has responded as expected to the implemented action can be gauged from afar. The value of this process is not only in the evaluation of the problem but it provides an excellent platform on which to base educational material to demonstrate at community level and educate *“How people do impact on the environment”*.

Regional Standards for GIS Software MapInfo Professional and MapInfo MapBasic

Leslie Allinson, SOPAC

SOPAC as the recognised lead regional organisation in the field of GIS and Remote Sensing is often requested to provide recommendations for software products for this field. SOPAC recommends MapInfo products as the regional standard for GIS and this document outlines the background for this decision and the features and advantages of MapInfo Professional and MapInfo MapBasic product pair that will be referred to as MapInfo/MapBasic.

Background

There is ongoing discussion between the ICT (Information and Communication Technologies) managers of the regional organisations of the Pacific region in evaluating and selecting appropriate technologies for their member countries.

The objectives are to provide a set of recommendations and standards that ICT managers in member country governments can use as reference when acquiring equipment that would include software and hardware products and to enable the regional organisation to adopt a common set of software products that are cost effective, scaleable and sustainable and allow seamless exchange of information.

The recognised forum for developing and updating these recommendations and standards is the annual Pacific Information and Communication Technologies Strategies Meeting (also known as the IT-PACNET Meeting) that is a working group of the Council of Regional Organisations in the Pacific (CROP). CROP brings together eight main regional organisations in the Pacific region:

- Forum Fisheries Agency (FFA)
- Pacific Islands Development Programme (PIDP)
- South Pacific Regional Environment Programme (SPREP)
- South Pacific Applied Geoscience Commission (SOPAC)
- Secretariat of the Pacific Community (SPC)
- South Pacific Tourism Organisation (SPTO)
- The University of the South Pacific (USP)
- The Pacific Islands Forum Secretariat

MapInfo/MapBasic is the recommended regional standard for developing and deploying GIS applications and was again selected at the IT-PACNET 2001 Meeting hosted by the Pacific Islands Forum Secretariat in April.

The FFA selected MapInfo for Windows in 1989 as a low cost solution for displaying fishing vessel activity on desktop computers networked to servers with vessel catch, effort and location data and transfer and scale these systems to the government fisheries sectors in the member countries. Other organisations such as SOPAC, SPC and SPREP also adopted MapInfo for display of data by location.

SOPAC adopted MapInfo/MapBasic in 1993 and since developed GIS applications using this product pair that include:

- Forest Product Export Marketing
- Hazard Evaluation
- Land Cover Change
- Lagoon Monitoring
- Meteorology Services
- Mineral Resources
- Pearl Farming
- Power Utilities
- Research Vessel Monitoring
- Seabed Mining and Exploration
- Water Utilities

The majority of these were developed for specific sectors and countries and while there may be some duplication across countries it has usually been found that end users have unique requirements that can be addressed by customising an application using the MapBasic programming language.

There are therefore a significant number of users who have received MapInfo and MapBasic training and are then able to further develop the application to meet the changing needs of their sector.

In addition USP employs MapInfo/MapBasic as the core software for GIS Units in their degree courses.

MapInfo/MapBasic Features and Advantages

The features refer to widespread deployment and user acceptance as well as actual product specifications while advantages refer to ESRI's ArcInfo/ArcView/Avenue products.

Features

- Regional standard.
- Core teaching software for GIS Units at USP.
- Significant number of trained users.

- SOPACDATA Annual CD released in MapInfo format including numerous utilities, add-ins and add-ons.

Advantages

- More cost effective.
- Easier learning curve.
- Established user base in region that together with SOPAC's mailing lists IT-PACNET and GIS-PACNET allow users and developers access to significant numbers of MapInfo/ MapBasic specialists.
- MapBasic is a stable programming add-on with a longer development life than Avenue.
- Better integration with Microsoft's core productivity suite Office 2000 and the MapInfo engine integrated in the DataMap addin for Excel.
- More add-ins such as Vertical Mapper and Borehole Mapper.
- Better documentation of file formats.
- Improved handling of projections.

James Britton to Leave the Pacific

Conway Pene, USP

After four years teaching and research at the University of the South Pacific' s GIS Unit, James Britton will be returning to Canada at the end of June due to family reasons. James arrived in June 1997 to take up a lectureship in GIS at The University of the South Pacific, bringing with him a wealth of experience in GIS and cartography. He has since overseen many important and exciting developments in GIS teaching at USP, and has made valuable contributions to the wider GIS community in the Pacific region.

Shortly after his arrival, he was in contact with Wolf from SOPAC and activated the GIS and Remote Sensing newsletter, which had been inactive for some time. With his new input the newsletter went through a number of changes and is now published on a regular basis again. Many articles covered new GIS and RS developments, GIS and RS applications in different Pacific Island Countries and information about meetings and organisational developments. Besides bringing GIS and RS news to operators in the Pacific James was a contributor to GEO Asia/Pacific, writing about the activities here in the Pacific.

One of James' primary activities was to implement the new courses in GIS and Remote Sensing that had recently been introduced to facilitate the certificate and diploma programmes in GIS at USP. This involved significant amounts of course review and development, to make the courses intellectually challenging and also appropriate and relevant to the needs of the students and stakeholders in the Pacific regional GIS community. James also introduced a post-graduate course in GIS, which has provided an exciting dimension to the postgraduate diploma programme. While teaching at USP, James has also been working on his doctoral thesis, looking at the development of GIS in the Pacific.

Other developments that have taken place recently, thanks to James' efforts, include a complete upgrade of the USP GIS unit' s hardware and software as part of an agreement with Telecom Fiji and Intergraph Corp. He has also recently negotiated an agreement with the French Government for a training and funding programme in Remote Sensing in collaboration with SOPAC. A further development has been the teaching of GIS by distance mode for the first time at USP, which will begin next month with a group of students in the Marshall Islands.

In his role as director of the GIS Unit, James has played an important role in the development of the GIS community in the Pacific region. He was instrumental in starting the annual GIS User Conference, which has been a great success over the last three years. The conference brings together a broad range of GIS interests, to share progress and ideas about GIS and related activities over the year.

On the 15 th June, the GIS&RS User Forum held a farewell for James, kindly hosted by SOPAC, to thank him for his contribution and hard work over the four years he has spent in Fiji, and to wish him well as he returns to Canada. But thanks to the internet, James will always be just a click away until we will see him back.

Status of GIS in Marshall Islands

Wolf Forstreuter

Introduction

Marshall Islands had no functional GIS and Remote Sensing (RS) technology although other Pacific Island Countries such as Fiji, Samoa, Tonga, Solomon Islands and other moved towards this tool since years to enhance their management of natural resources and utilities. A new AusAID bilateral funded approach will establish GIS and RS tools to map and document the existing vegetation cover, the near shore bathymetry and the existing infrastructure and lead to Islands System Management. There has been already a project, which tried to establish GIS and there is an existing system at Marshalls Energy Company, now. The establishment of the new system will be linked to existing and future systems to assist the management of all resources.

MARIS, the last GIS Project

The MARIS GIS was established with US funding and created several layers which are transferred to the new GIS computer which is based in the Disaster Management Office, now. It was not possible to display the available GIS information at the EPA office, because the MapInfo software required a hardware key.

The different information such as roads and seawalls can be displayed with the new MapInfo software, however, there is a problem that the last project did not reference the information to a clear defined projection including spheroid and datum. As far as the difference is visible by today it seems that a non-linear transformation has to be applied to rectify the old information to a defined projection. Most probably, it will be easier to carry out the survey again.

GIS at Marshalls Energy Company, Inc.

Marshalls Energy Company (MEC) under the guidance of the General Manager, William F. Roberts, has established a GIS and a Global Positioning System (GPS) during the last months. The GIS is based on ArcView software, which is currently not supported by SOPAC. Different layers contain:

- Road network
- Power poles
- Power lines
- other

A consultant, James W. McNutt, is training the staff in GIS and GPS handling. All asset items are stored in Excel spreadsheets, which are linked to the spatial data sets. MEC has purchased IKONOS panchromatic image data (1m spatial resolution) covering Mujuro island.

MEC has established a GPS base station (Trimble Reference Station) similar to the base station established at Environment Protection Authority (EPA). Two MEC staff are trained to use the two rover units (Trimble ProXR) for mapping the asset items such as power poles, lines, etc. James W. McNutt reported a shift between the old MARIS mapping and the GPS survey referenced to WGS 84 of approximately 100m in northing and 150m in easting. This was the same noted during the surveys carried out with the EPA office, see Figure 1.

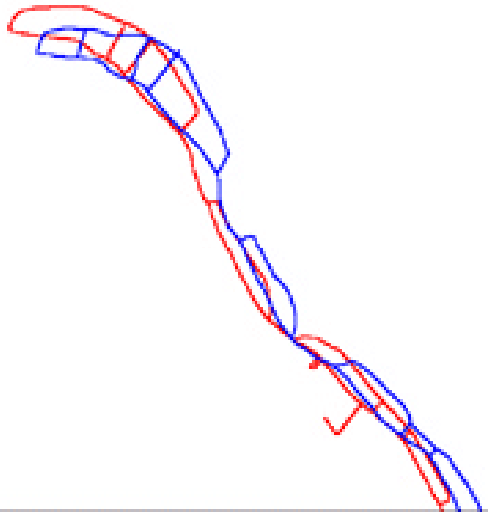


Figure 1: *Part of the road network of Majuro, Marshall Islands. Red = the new GPS survey, blue = survey without GPS carried out in the eighties.*

GIS at Marshall Islands Water Utility

The General Manager William Roberts plans to copy the GIS set up of MEC to the water utility. This seems to be a very sustainable solution, as the staff trained at MEC will be used as trainers.

GIS at Lands Department (Ministry of Internal Affairs)

During two meetings including Ellia Sablan deBrum (SOPAC's point of contact), Frederick deBrum (Secretary for Internal Affairs), Wilfredo M. Rada (Surveor Consultant) and Wolf Forstreuter (SOPAC) it was explained that there will be an own GIS based on ArcView software. ArcView is not supported by SOPAC, however, the institution wants to go to this ArcInfo family software product. The Lands and Survey department will also install a third base station in Majuro. The argument is a mapping requirement in millimeter range, because the cm accuracy of the installed systems is

insufficient. This GPS system will use different software Topcon, which cannot be assisted either by SOPAC, EPA or MEC.

GIS at the Disaster Management Office

The National Disaster Management Office (NDMO) is equipped with a computer, MapInfo GIS software, Access 2000 as database software and PathFinder Office GPS software. This computer was funded by SOPAC's disaster management project. There are no specific disaster layers established so far. The next module of the AusAID funded project will allow carrying out a survey of residential houses and public buildings. The point of contact in the NDMO is Clement Capelle.

GIS at the Environment Protection Authority

Under AusAID bilateral funding a GIS and a GPS system was established at the EPA office. There are several components:

- Trimble Reference Station (GPS base station)
- Trimble Base Station software
- One GPC Trimble GeoExplorer 3
- MapInfo GIS software
- Trimble PathFinder Office software

During the GPS survey training the following GIS layers were established:

- Road system (tar sealed road, gravel raods, tracks)
- Seawalls (concrete walls, stone walls, stones in wirebaskets)
- Water test points

The survey of seawalls is just at an initial stage and will continue during the time until the next module starts.

The first mapping results showed a shift in north direction of approximately 100m and a shift of approximately 150m in east direction, when compared with the spatial information stored in the MARIS GIS. Figure 1 shows the old mapping in blue and the current GPS based mapping in red.

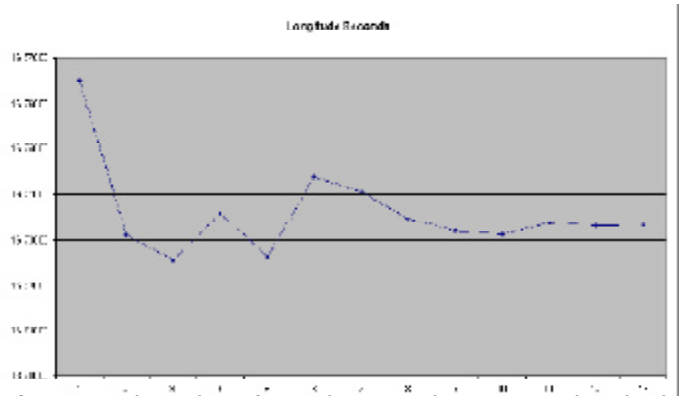


Figure 2: *Fluctation of GPS base station antenna longitude (seconds) after 13 days of averaging.*

Figure 3: *EPA building with GPS antenna*

Figure 4: *GPS survey work in Majuro*

The current road survey was based on differential GPS mapping. The base station antenna was not surveyed, however, the receiver averaged the antenna position over more than ten days. Figure 2 shows that the position recording is stable. The atmospheric and other disturbance, which can influence the position recording, have a minimal influence, now.

The point of contact at the EPA office is General Manager John Bungitak.

Linking the different GIS Activities in Marshall Islands

The Republic of Marshall Islands only has limited resources of GIS operators. It will be essential for sustainability that all GIS users have close corporation. Regular meetings and personal contacts will become important to avoid duplication of activities.

During the initial phase Ellia Sablan deBrum organised a four day workshop to:

a) introduce and discuss the activities carried out through all phases of the AusAID funded GIS project,
b) provide the necessary theoretical and practical background,
c) provide a platform for personal contacts between the different GIS user.

At the end of the first project module the DGPS survey and GIS map editing was demonstrated to other GIS users. An invitation of W.F. Roberts (MEC) was followed to visit the MEC GIS and DGPS facilities, which enhanced personal contacts and demonstrated an already fully functioning GIS in Marshall Islands.

A first GIS user meeting was held at the end of the first module of the AusAID funded GIS project. Following items were discussed:

- The mapping projection will be WGS84 latitude longitude or UTM zone 59 north.
- The original mapping file will be attached with a TXT file containing information about a) type of survey (from car, walking, etc.), b) person responsible, c) date of survey, d) scale, e) equipment used.
- All users and potential GIS users will search for historical aerial photographs, which will be scanned and geometrically rectified during the next module.
- The workshop CD containing: a) all power point presentations, b) all GIS&RS newsletters, c) instruction videos for Trimble GPS handling, is available on the GIS computer handed out to NDMO. Everybody can cut a CD with the in-built CD writer.

In a meeting between William Roberts (MEC), Ellia Sablan deBrum (MIMRA), Wolf Forstreuter (SOPAC) it was discussed that the project will purchase multispectral images from Majuro through AusAID project funding, which than can be exchanged with MEC and also used for the production of pan sharpened colour images.

For further information contact:
EPA General Manager
John Bungitak
rmiepa@ntamar.com

IT-PacNet Meeting in Suva

Jim Tora, SOPAC

The Pacific Information Technology (IT-PacNet) meeting took place in Suva from 23 April to 27 April 2001. The Regional ICT (Information and Communication Technologies) managers of (CROP): Forum Fisheries Agency (FFA), SPC (Secretariat of the Pacific Community), USP (University of the South Pacific), SPREP (South Pacific Regional Environmental Programme), Pacific Islands Forum Secretariat (ForSec), and SOPAC (South Pacific Applied Geoscience Commission) were present together with some interested parties from the region and discussed core issues that included:

- Regional software standards
- Regional hardware standards
- Regional data format standards

An important update for GIS and remote sensing (RS) users is that GIS and RS will be handled as an integral part of ICT. In Europe and North America GIS and RS may have it's own department in an organisation. Here in the Pacific it was agreed between the CROP organisations not to build a separate division for GIS and RS.

A new generation of high-resolution satellites will provide image data suitable for 1:10,000 scale mapping and GIS software will be more user friendly at the same time. Thus the application of GIS image backdrops will increase. On the other hand RS data will be delivered in new formats and in addition will require more storage space and new hardware and software solutions to handle large files. This means that the production of GIS image backdrop requires IT specialists. In Europe or North America remote sensing units have their own IT section, however, this would not be possible in CROP organisations due to the need for additional staff. Thus it was agreed to keep GIS and RS as part of ICT.

During the last week of August, an ICT workshop will be held in New Caledonia to develop a regional ICT strategy, where GIS and RS issues will be addressed such as:

- Regional data library
- GIS and RS data format standards
- GIS and RS training

SOPAC has the mandate among the CROP organisations to handle GIS and RS, however, other organisations such as SPC and SPREP will apply GIS and RS very soon. USP has now enhanced the training facilities in GIS and RS and it is necessary to avoid any duplication of activities.
For further information contact:
Jim Tora, jim@sopac.org

Realtime mapping using georeferenced image backdrops – new survey tools for coastal mapping

Robert Smith, SOPAC

Mapping in the marine sector requires a different approach compared to on land mapping, in that realtime positioning is essential. The principal reason for this is that you cannot place a reference marker "easily," post process your navigation and come back to it later. With advances in software and hardware tools, resource mapping in the marine sector using high-resolution images as a map backdrop not only ensures a quality product at the end of the day, the output is also a product easily interpreted by the laymen. A typical resource area as shown in Figure 1 reflects what is often all the data that is available to both monitor and evaluate a resource. Although some data is better than no data, limited datasets do present difficulties in really knowing your resources and developing management strategies to effectively monitor and ultilise the resource in a sustainable manner.

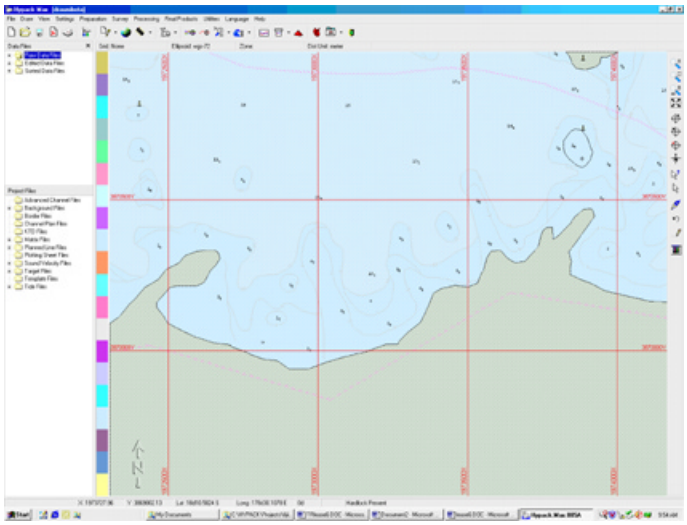


Figure 1: Back reef area detail as often depicted in an Admiralty Chart

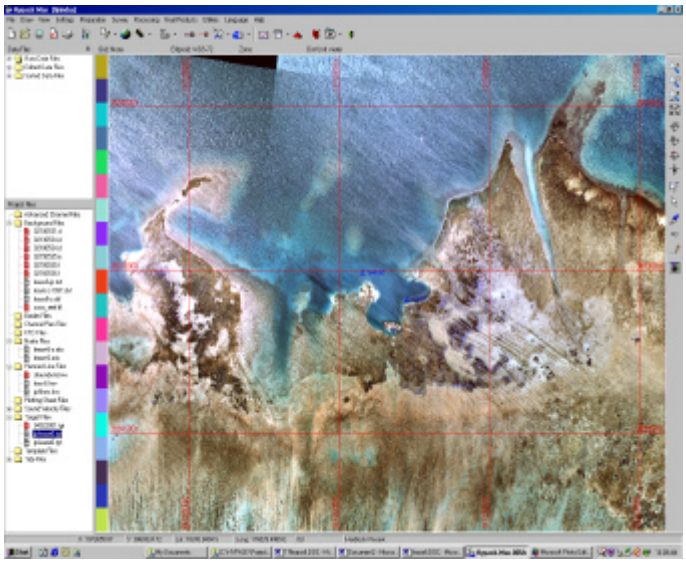


Figure 2: This image is used as mapping backdrop in reatime proved to be most beneficial.

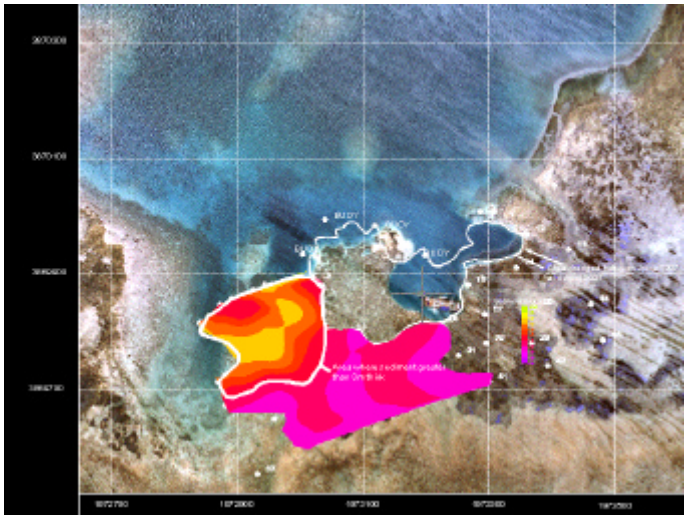


Figure 3: A typical resource map with grid lattice overlayed to enable manual plotting

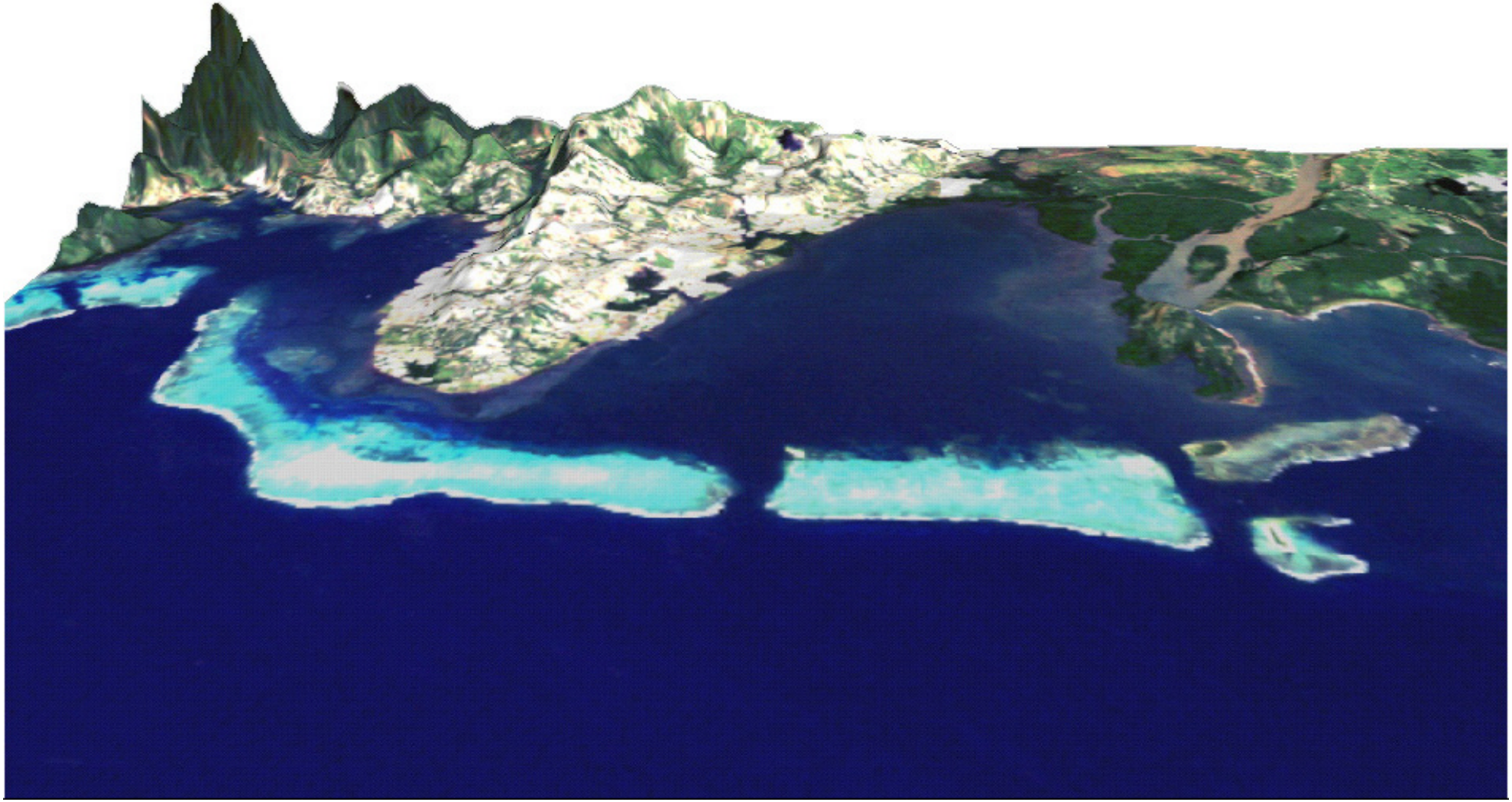
In a recent study a georeferenced image backdrop was used as a mapping tool in real time with real time differently corrected GPS data to not only guide the survey but proved to be an excellent decision making tool.

The result shown in Figure 2 shows how progressive monitoring of resource usage can be readily evaluated and new areas to be surveyed identified.

Having completed the survey the image backdrop was then used to present the data in a format that could not only be used for the resource manager to monitor progress but also for future field operations. An example of such an output is shown in Figure 3 where new resources have been identified showing where the best deposits lie in relation to surface features. Here for example the field manager of a dredging operation with only a hand held GPS unit can plot his position directly on a map to track and guide operations.

For further information contact:
Robert Smith, Robert@sopac.org

The image shows a Digital Terrain Model (DTM) of map sheet Suva with a Landsat 7 image overlay. The DTM was produced by digitising the corresponding topographic map 1:50,000 for Fiji's Natural Forest Inventory carried out during 1991/1993. The Landsat image was recorded in 1999 and purchased jointly by USP, SOPAC and others.



DTM + Landsat Image