STAR 2026

The Pacific Islands Science, Technology and Resources Conference Week

16 – 21 November 2026

PRE-CONFERENCE PROGRAM
&
ABSTRACT VOLUME



The island motifs used here is a collage of island designs that are representative of the Pacific Region. Individual motifs are based on various popular island designs. Images have been downloaded from the "Tapa Cloths from the Pacific and Artwork" website: www.tapapacifica.com, accessed 10 November 2016. The use of the images are gratefully acknowledged.]

[STAR 2025 Abstracts Volume]

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The Abstracts Volume is available online at the STAR Website via the following link:
http://star.org.fj/

Cover photograph: Idyllic view of part of the Yasawa Group, Republic of Fiji.

PREFACE

The Science, Technology and Resources (STAR) Network was founded in 1984 as a joint initiative between SOPAC[1] and the IOC/UNESCO[2]. STAR met annually for nearly three decades in conjunction with the SOPAC Governing Council Meeting. SOPAC provided secretariat support to STAR until its suspension in 2010. SOPAC became a new division of the Pacific Community (SPC) and internal policy does not require divisions to hold annual meetings, therefore STAR had not met since 2013. However, in April 2015 at a Regional Geoscience Steering Group Meeting an agenda item considered the future of STAR. The inaugural meeting of the revitalised STAR was held in Nadi 6-8 June 2016. Further meetings were held June 2017, July 2018, November 2019, November 2021 (virtually due to COVID), November 2023, November 2024 and November 2025. It has been generally agreed:

- to strongly support the continuation of STAR because of its value in refreshing and animating scientific alliances and showcasing useful work, techniques and instrumentation that may be adapted to address development issues of the Pacific;
- to further explore how STAR could become more independent, in particular with respect to administration and financial matters; and
- that for the future of STAR to be sustained, STAR needed to secure ownership by the Pacific islands, with the Permanent Secretary of the Ministry of Lands and Mineral Resources being the STAR Chair to take forward the independence and reinvigoration causes.

The STAR 2026 Conference Week is being held from 16 to 21 November 2026, and sponsored by the Government of Fiji. STAR 2026 is again being held as a hybrid conference under the overall theme of **"*The Role of the Pacific Island Nations in the Development of their Energy, Minerals, and Geo-resources Security Through Urban Sea Systems*".** The Conference week will also include a CPC sponsored workshop **"*Urban Sea Systems and Deep-Sea Minerals*"** and a University of OLD, SPC, UNDP and TARA sponsored workshop "***Mineral Security in the Pacific: Resilient Supplies of Sustainable Construction Materials Through the Blue Concrete Initiative".*** The newly established **"*STAR Hydrospatial Working Group*"** will also be meeting.

This booklet is the program and abstracts of papers to be presented during the 5 days of STAR 2026 at the Grand Pacific Hotel, Suva. The field trip to the Suva Area will be held on 21 November.

The STAR Steering Committee has worked over the past several years to plan the STAR 2026 Conference Week program and field trip. We hope the 6 days are professionally fulfilling for each participant. We also thank you all for affirming that the model for the STAR can work just as well in the Pacific as it does in other regions.

STAR Steering Committee Members:
Permanent Secretary, for Lands and Mineral Resources, **Paula Cirikiyasawa** (Chair)
Principal Investigator, Australian Volcanological Investigations, **Paul Taylor**
Technical Adviser (Fiji) & former Director of SOPAC, **Russell Howorth**
Director, MRD, Ministry of Lands and Mineral Resources, **Apete Soro**
Geotechnical Advisor, GEM Division (SPC), **Gary Lee**
Geophysicist, Smith Geoscience Consultancy, Fiji, **Robert Smith**
Geoscience Lecturer at Fiji National University, **Malakai Finau**
Representative for Pacific GIS and Remote Sensing Council, Fiji, **Wolf Forstreuter**
Divisional Administrator, Geoscience Division (SPC), **Litia Waradi**
Project Coordinator, United Nations Development Minerals Programme, **Rigieta Ravuiwasa**
Representatives of the Circum-Pacific Council, **H. Gary Greene & Edward Saade**
Representative of University of Queensland, **Gary Flomenhoft**
MRD, Ministry of Lands and Mineral Resources, **Menuka Anandani**
Administration Manager, MRD, Ministry of Lands and Mineral Resources, **Litia Takalaiyale**

[1] SOPAC: Pacific Islands Applied Geoscience Commission, now the Geoscience Division of the Pacific Community.
[2] IOC/UNESCO: Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization

TABLE OF CONTENTS

Preface 2

Table of Contents 3

Conference Week Program 4

- Official Opening and Workshop on Urban Seas and Deep-Sea Minerals 4
- Workshop on Mineral Security in the Pacific: Supporting Resilient Supplies and Use of Sustainable Construction Materials through the Blue Concrete Initiative and A Day of Commemoration of the life and work of Dr Paul Rogers (UQ) and Mr Raymond Mohammed (MRD) 7
- STAR Hydrospatial Working Group Workshop 9
- STAR Conference Sessions 10
- STAR Business Meeting Agenda 12
- STAR Field Trip Details 12

Abstracts for all Papers Presented 13

ABSTRACTS

Bernstein 13
Bernstein & Others 14
Betasolo & Others 15
Bosselmann-Borosos 16
Brooks 17
Butler & Others 18
Carey & Others 19
Delai 20
Dioko & Others 21
Fepuleai 22
Flomenhoft 23
Greene 24
Greene & Others 25
Greene & Van Graafeiland 26
Johnstone 27
Kaumi 28
Kumar & Others 29
Kumar 30
Leong & Others 32
MacKay & Others 33
Maschke 34
Maschke 35
McMurtry 36
McMurtry & Smith 37
Metherall & Others 39
Metherall & Others 40
Mishra & Others 41
Mule 42
Nemeth 43
Parianos & Morris 44
Parianos 45
Roland & Others 46
Saade 47
Saade & van de Poll 48
Saili & Benson 49
Seaton 50
Seniroqa 51
Taylor & Others 52
Tomojiri & Others 53
Twiggs 54
Van Graafeiland & Greene 55
Vuetaki-Starzynski 56
Williams 57
Woytak 58

STAR CONFERENCE WEEK 2026

PROGRAM

Saturday 14 November 2026

09:00 – 12:00	Tour of Chinese Research Vessel in Suva Harbour	Contact Gary Greene Email: herbert.greene@sjsu.edu

Monday 16 November 2026

Official Opening of STAR Conference Week		
08:00 – 08:30	Registration	
08:30 – 08:35	Opening Prayer	
08:35 – 08:45	Chair of STAR Dr Paula Cirikiyasawa	Welcome to Participants and Introduction of the Guest of Honour
08:45 – 09:00	Minister for Lands and Mineral Resources Hon.Filimoni Vosarogo	Official Opening

09:00 – 10:00 *Morning Tea*

Workshop on Urban Seas and Deep-Sea Minerals

Sponsored by the Circum-Pacific Council and STAR

Session 1: Workshop Introduction – Critical Minerals		
10:00 – 10:15	Paula Cirikiyasawa STAR Chair Ed Saade CPC Chair	CPC Welcome
10:15 – 10:30	Gary Greene; CPC President and Executive Director	Introduction and Workshop Agenda and Brief History of Urban Sea Systems and Deep-Sea Minerals (DSM)
10:30 – 10:40	Paul Taylor; STAR	Role of STAR
Session 2: Nodules – Critical Minerals and Rare Earths of The Pacific Basin		
10:40 – 11:00	Gary McMurtry; University of Hawaii	Overview of deep-sea ferromanganese deposits in the Pacific Region
11:00 – 11:20	John Parianos; Cook Islands (virtual)	Mineral Resources Reconciliation for Part of the Cook Islands Nodule Field
Session 3: Present-Day Deep Sea Mineral Activities		
11:20 – 11:40	Graham Talbot; Wetstone	**Keynote:** Deep-Sea Mining: Industry Perspectives
11:40 – 12:00	Ed Saade; CPC	U.S. Government Sponsored Activity throughout the Pacific

12:00 – 13:00 *Lunch Break*

Session 4: Advancement of Deep-Sea Exploration Tools		
13:00 – 13:20	David Caress; MBARI (video)	Multi-Modal Seafloor Habitat Mapping at Centimeter Scale Using the MBARI Low-Altitude Survey System
13:20 – 13:40	Daniel Doolittle/Jake Russell; Integral/Orpheus	Autonomous Environmental Monitoring Tools Deployed from a Bottom-Tending Robotic Platform
13:40 – 14:00	Jens Steenstrupt; CEO, R3Vox	Applying Multi-Aspect and Multi-Spectral Sonars to Monitoring Subsea Mining Operations

14:00 - 14:20	Daniel Doolittle; Integral	Optimizing Environmental Baseline and Monitoring Surveys in the Deep Ocean Using Multiple Survey Platforms

14:20 – 15:00 *Afternoon Tea*

Session 5: Governance		
15:00 – 15:20	Leticia Reis de Carvalho; Secretary-General of ISA (video)	Role of the ISA
15:20 – 15:40	Ed Saade CPC/Fugro	Introduction of DSM in SIDS Region (2026)
15:40 – 16:30	Gary Greene; Daniel Doolittle; CPC	Recap, and Next Day's Agenda and Close of the Meeting

18:00 - Cocktails - Pool Bar Area, Grand Pacific Hotel
Sponsored by Nexus Marine

Tuesday 17 November 2026

Session 6: Deep-Sea Environment		
09:00 – 09:20	Gary Greene/Daniel Dolittle/Ed Saade; CPC	Day 2 Objectives
09:20 – 09:40	Bruce Robinson; MBARI (virtual)	How Will Seafloor Mining Affect Midwater Communities
09:40 – 10:00	John Parianos; Cook Islands (video)	Geoform Classification in the Cook Islands – From Sunlit Seamounts to Hadal Troughs

10:00 – 10:30 *Morning Tea*

Session 7: Case Study – American Samoa		
10:30 – 10:50	Amy Gartman; USGS (Virtual)	The American Samoa Investigative Studies
10:50 – 11:10	Keith Van Graafeiland; ESRI	Spatial Intelligence for Critical Minerals: American Samoa Seabed
11:10 – 11:30	David Bernstein; NV5	Integrating Complex Offshore Survey Operations in American Samoa: Innovation, Collaboration, and Data Delivery at Scale
11:30 – 11:50	Gary Greene; CPC	Burping Sediment and Concentrated Nodules, American Samoa
11:50 – 12:10	Keith Van Graafeiland; ESRI	Lava Puddles and Flat-Topped Volcanic Cones of the American Samoa Abyssal Plain
Session 8: Global Probabilities of Seabed Nodules		
12:10 – 12:30	Keven Butler; ESRI	Mapping Global Polymetallic Nodule Occurrence: Environmental Controls and Regional Differences

12:30 – 13:30 *Lunch*

Session 9: Training, Communications, and Outreach		
13:30 – 13:50	Emily Roland; Western Washington Uni	Seafloor Mapping Training for South Pacific Regions
13:50 – 14:10	Kevin Butler; ESRI	From Depth to Discovery – Understanding the Seafloor with ArcGIS Pro

14:10 – 15:20	All participants	Panel Discussion – What is Known and Where to From Here

15:20 – 15:50 *Afternoon Tea*

Session 10: MAPS AND TOOLS FOR MAP CONSTRUCTION		
15:50 – 17:00	ESRI/CPC All Participants	Maps and Tools for Map Construction Mapping Exercise for SIDS
17:00 – 17:30	CPC	Recap and Next Steps
17:30	Workshop Close and Group Photograph	

Cocktails and Fellowship during the afternoon/evening

Wednesday 18 November 2026

Workshop on Mineral Security in the Pacific: Supporting Resilient Supplies and Use of Sustainable Construction Materials through the Blue Concrete Initiative

A Day of Commemoration of the life and work of Dr Paul Rogers (UQ) and Mr Raymond Mohammed (MRD)

Sponsored by University of Queensland, TARA, Pacific Community, Smith Geoscience, ACP, European Union, UNDP and Fiji Government

08:00 – 09:00	Registration and Tea/Coffee	
Session 1: Inauguration		
09:00 – 09:10	Robert Smith, Smith Geoscience	Welcome Adress
09:10 – 09:25	Resident Representative, UNDP Pacific Office	Special Address
09:25 – 09:35	Mr Paula Cirikiyasawa, Permanent Secretary, Ministry of Land and Mineral Resources	Keynote Address
09:35 – 09:45	Dr Raijeili Taga	Commemoration for Dr. Paul Rogers, Mr. Raymond Mohammed

Session 2: Findings to Date Toward Blue Concrete		
09:45 – 10:05	Robert Smith, Smith Geoscience	Assessing the Resource
10:05 – 10:25	Soumen Maiti, TARA	Technical Transfer/Prepare Industry
10:25 – 10:45	Bora Aska and Gary Flomenhoft	Education and Outreach

10:45 – 11:15 *Morning Tea and Networking*

Session 3: Findings to Date Toward Blue Concrete (cont.)		
11:15 – 11:30	Soumen Maiti, TARA	Standards, Cost and Pricing Aspects
11:30 – 11:45	Akash Mishra	Life-Cycle Assessment, LC3 Performance, Circular Economies
11:40 – 12:00	Ms. Rigieta Ravuiwasa and MRD Staff	Key conclusions and Recommendations from the Pre-COP conference
12:00 – 12:30	Moderated by UQ or MRD?	**PANEL DISCUSSION:** Cement Co, Concrete Co, Quarry Co. Landowners, Roadbuilders, etc

12:30 – 13:30 *Lunch Break*

Session 4: Mineral Security Through Sustainable Sourcing of Aggregates			
13:30 – 13:45	Gary Flomenhoft and Bora Aska	Session Introduction	Facilitators
13:45 – 14:00	Presentation Guidelines Checking Understanding	Suggest involving stakeholders to present their sections. Check understanding with True False questions to discuss at tables	**Training Deliverables** – Set of Training Materials: ● Powerpoint deck (adapted from Guidelines) ● Quiz

14:00 – 14:30	Applying Understanding	Case study work Three groups apply Guidelines to case study. Critique an Aggregate Extraction Plan or Write an Aggregate Extraction Plan	**Training Deliverables** ● 3 Case studies (to be developed how and by who?) and activity - – Set of Training Materials 1) Rivers 2) Quarries 3) Beaches/lagoons ● Aggregate Extraction Plan activity
14:30 – 14:45	Checking Understanding	Present Feedback	
14:45 – 15:15	Breakout Session on Implementing Guidelines	Quarry companies, Concrete Companies, MRD, govt agencies, Road Building Companies/agencies	How will this session be run? How can we make it a training deliverable?

15:15 – 15:45 *Afternoon Tea*

15:45 – 16:15	Presentation of Working Groups on how to move forward	Quarry companies, Concrete Companies, MRD, govt agencies, Road Building Companies/agencies	Next steps for follow up online session
16:15 – 16:30	Blue Concrete Team	Next Steps to Mineral Security in the Pacific	
16:30 – 16:40	Rigieta Leba Babitu Ravuiwasa, UNDP	Closing comments and Vote of thanks	
16:40 – 17:00	Workshop Photograph		

Open Discussion and Fellowship during the evening

Thursday 19 November 2026
STAR Conference 2026
Hydrospatial Working Group

08:00 – 08:30	Registration	
Session 1: Welcome and Hydrospatial Perspectives		
08:30 – 08:45	Mr Paula Cirikiyasawa, STAR Chair	General Introduction and Welcome
08:45 – 09:00	John Maschke, STAR HWG Chair	Welcome, General Announcements Housekeeping
09:00 – 09:20	John Maschke Chair, STAR HWG	The Blue Economy & What is 'Hydrospatial'?
09:20 – 09:40	Sally Watson (Kevin Mackay) Marine Geologist, Marine Data Manager, Earth Sciences NZ & Head, Seabed2030 South and West Pacific Centre	Seabed 2030 and the challenge to map the World's Oceans. Pacific perspective
09:40 – 10:00	Christopher Saili Managing Director Kahuto Pacific	From Ridge to Reef: Connecting Land and Marine Data for Pacific Hydrospatial Decisions

10:00 – 10:30 *Morning Tea*

Session 2: Costal Aspects from Hydrospatial Issues		
10:30 – 10:50	Paul Seaton Director – Climate & Nature (APAC), Fugro	Integrating Net Ecosystem Values into Coastal Hazard and Climate Adaptation Planning
10:50 – 11:10	Dave Bernstein, Vice President NV5 Hydrospatial	Caribbean Coastal Resilience Partnerships: Lessons for Pacific Island Nations
11:10 – 11:30	Cory Brooks Director, NoHumes Pty Ltd	Autonomous Monitoring Systems: Live Monitoring of Port Infrastructure.
11:30 – 11:50	Dr Robert Williams (Cartography)	An Odyssey: Captain Cook to Doctor Bob

11:50 – 13:00 *Lunch*

Session 3: Hydrospatial the Wider Perspectives		
13:00 – 13:20	Dr. Elizabeth Johnstone Director & Principal Geophysicist, Revelare Hydrospatial	From Seabed to Space: Building a Maritime ISR Capability for the South Pacific
13:20 – 13:40	Verena Bosselmann-Borsos SWPHC S-100 Co-ordinator Land Information NZ (virtual)	Findings from the S-100 Implementation, Maintenance and Benefits Realisation Plan (SIMBRP) workshop June 2026
13:40 – 14:00	Emily Twiggs Director, Business Development, Projects & Operations (EOMAP APAC) Fugro	Layered Seabed Intelligence from Space, Air and Sea for Pacific Urban Sea Systems.
14:00 – 14:30	John Maschke, STAR HWG Chair	Promotion And Support For Hydrospatial Science Groups
14:30 – 15:00	John Maschke, STAR HWG Chair	Closing Remarks

15:00 – 15:30 *Afternoon Tea*

Thursday 19 November 2026

STAR Conference Sessions

Session 1: Welcome and Environmental Issues		
15:30 – 15:40	Mr Paula Cirikiyasawa, STAR Chair	Welcome
15:40 – 16:00	Daiki Kadotani Tomojiri	Environmental DNA Reveals Habitat-scale Structure of Coastal Fish Communities in Rakiraki, Fiji
16:00 – 16:20	Nicholas Metherall and Others	Spatial Analysis for Marine Litter Prevention in Fiji
16:20 – 16:40	Chris Leong	Bridging Science and Community Knowledge: A Transdisciplinary Ridge-to-Reef Approach to Coral Reef Protection in Fiji
16:40 – 17:00	Henal Kumar	Installation and Commissioning of the Iron and Manganese Water Treatment System at Lekutu Primary and Secondary Schools, Bua, Fiji
17:00 – 17:20	Anawaite Vuetaki-Starzynski	Using Airborne Electromagnetics to guide groundwater drilling in Fiji

Friday 20 November 2026

STAR Conference Sessions

Session 2: Tsunami and Volcanoes		
09:00 – 09:20	Saula Mule	Numerical Hydrodynamic Simulation and a Decision-Support Framework for Volcanic Tsunami Early Warning in the Southwest Pacific
09:20 – 09:40	Koroi Seniroqa	Fiji Earthquake Information Dissemination System (FEIDS): Accelerating Earthquake and Tsunami Information Dissemination in Fiji
09:40 – 10:00	Aleni Fepuleai	Sites may have Geothermal Potential Along the Samoa Volcanic Field
10:00 – 10:20	Paul Taylor	A Pictorial Chronology of Home Reef: Tonga's Currently Most Active Volcano
10:20 – 10:40	Rebecca Carey and Others	Understanding Tsunami Risk to Australia from Volcanic Sources.

10:40 – 11:10 *Morning Tea*

Session 3: Geochemical and Other Aspects		
11:00 – 11:20	Gary McMurtry and Robert Smith	Introducing a Complete, Autonomous Geochemical Monitoring Station for Nabukalevu (Mt. Washington), Kadavu, Fiji
11:20 – 11:40	Vilikesa Delai	Isotope Hydrology of the Yaqara Catchment, Fiji: A Tool for Integrated Water Resource Management
11:40 – 12:00	Mirzi Betasolo and Others (Virtual)	Preliminary Coastal Change and Multi-Hazard Exposure Screening at Busamang and Salamaua, Papua New Guinea

12:00 – 12:20	Faga H. Varea	Energy Security – Fiji's Potential Hydrocarbon Opportunity (Oil & Gas)

12:20 – 13:30 *Lunch*

Session 4: Urban Sea Systems and Other Issues		
13:30 – 13:50	Gary Greene	Aggregate Mining in the San Francisco Bay Urban Sea System
13:50 – 14:10	Karoly Nemeth	Geoheritage Research Trends in the SW Pacific for Sustainable Conservation and Natural Hazard Resilience
14:10 – 14:30	Gary Greene	The Suva Harbor Urban Sea System as a Commercial Hub for Deep Ocean Mining Support, Observation, and Monitoring
14:30 – 14:50	Kaludia Kaumi	Assessing the Relationship Between Customary Land-Use Practices and Sedimentation in Coastal Ecosystems of the Gazelle Peninsula, East New Britain, and Identifying Nature-Based Management Strategies
14:50 – 15:10	Holly Woytak	Connected Urban Sea Systems: Transforming Science and Engineering Data into Decisions for Pacific Resource Security

15:10 – 15:40 *Afternoon Tea*

STAR Posters (will be displayed throughout the STAR week)

Richie Dioko and Others	Basalt as a Soil Amendment for Acidic Soils in Fiji: A Case Study of Navuso Agricultural Technical Institute, Naitasiri, Fiji
Anurag Kumar and Others	Drought, Groundwater Stress and Household Water Insecurity in South Tarawa, Kiribati
Nicholas Metherall and Others	Coral Bleaching Extent Detection (C-BED) Copernicus Marine Data and Sentinel-2 spectral Analyses to Monitor the Impacts of the 2026 Marine Heatwave in Tonga and Fiji.

15:40 – 17:30	**STAR ANNUAL BUSINESS MEETING**

Agenda

Call to Order **15:40**

- Adoption of Agenda
- STAR Chair's Report
- Financial Report
- Working Group Reports
- STAR – The Future
- Election of the STAR Chair 2026-27
- STAR Website
- Other Matters
- Date, Venue and Theme of Next STAR 2027

Closing Remarks

Cocktails and Fellowship during the evening

Saturday 21 November 2026

STAR Field Trip: Hydrospatial and the Suva Urban Sea System

Field Trip Details:

Meet at Grand Pacific Hotel at 09:00, depart 09:30

- Visit to the Royal Fiji Navy Hydrographic Office, Maritime Essential Services Centre, Naimawi Street, Lami

Return to Royal Suva Yacht Club, arriving by approx. 13:00

Afternoon – Pig on spit and fellowship at the Royal Suva Yacht Club

Abstracts of Papers

NV5; Processes for Climate Resilience and Resource Mapping

David Bernstein

NV5 Geospatial

Email: *dave.bernstein@nv5.com*

NV5 Geospatial has a history of working with regional groups in support of common challenges including climate resilience and resource mapping. This talk will detail ongoing geospatial survey work being done in the Caribbean region, in partnership with local communities, to protect coastal resources and strengthen nearshore resilience. Parallels will be drawn from this experience to provide examples for how such partnerships could support Pacific Island Nations.

Climate change is increasing the Caribbean's exposure to severe storms, flooding, coastal erosion, and sea-level rise, creating significant economic and environmental risks. To improve climate resilience, the Caribbean Community Climate Change Centre (CCCCC) and NV5 Geospatial have established a regional lidar mapping program that provides participating nations with high-resolution topographic, bathymetric, and coastal elevation data.

By coordinating surveys across multiple countries, the initiative lowers costs, standardizes data quality, and creates a consistent baseline for climate adaptation planning. The resulting high-resolution datasets support storm surge modeling, disaster preparedness, infrastructure design, environmental management, and coastal monitoring.

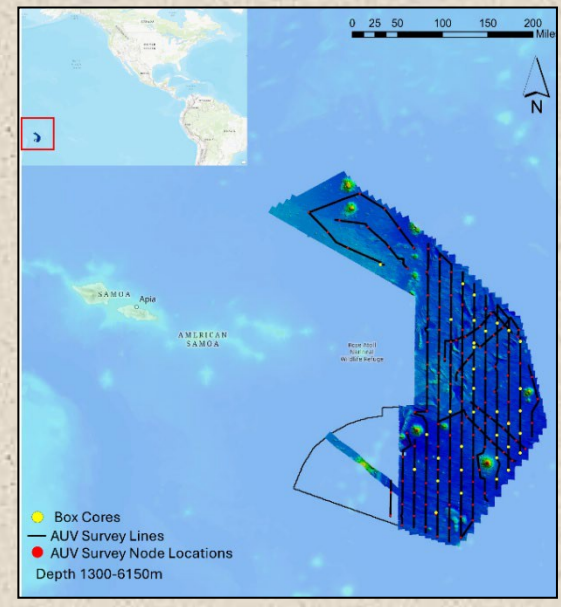
The program also strengthens regional expertise through training, data-sharing platforms, and accessible analytical tools. Applications in Antigua and Barbuda and Barbados demonstrate how lidar data is improving coastal management, environmental monitoring, and infrastructure planning. Overall, the initiative provides a scalable model for helping climate-vulnerable nations make more informed decisions and better prepare for future climate impacts.

Integrating Complex Offshore Survey Operations in American Samoa: Innovation, Collaboration, and Data Delivery at Scale

Dave Bernstein[1], Nick Damm[2], Erin Cziraki[3]

[1,2,3]NV5 Geospatial, 100 Kimeplex Park, Unit 5, Morehead City, North Carolina, United States

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The American Samoa Deep Sea Critical Minerals Project represents an innovative, collaborative approach to seafloor investigation in support of NOAA's Office of Coast Survey and multiple federal stakeholders. Designed to maximize data acquisition while addressing diverse scientific and operational objectives within a compressed timeline, the project required an integrated strategy for planning, execution, data production, and management.

NV5 served as the systems integrator, coordinating multidisciplinary teams, technologies, and workflows within a unified operational framework. Advanced geospatial tools, including NV5's OASIS enterprise platform, cloud-based processing, edge computing, and collaborative multi-sensor workflows, enhanced visibility into project performance, streamlined quality assurance, and supported timely decision-making.

Embracing a "build it as we fly it" philosophy, the team continuously adapted workflows, developed innovative solutions, and responded to operational challenges as they emerged. This presentation highlights the mapping campaign strategies, enabling technologies, collaborative practices, and lessons learned that supported successful execution of this complex deep-sea investigation and their application to future large-scale ocean mapping and seafloor characterization programs.

Preliminary Coastal Change and Multi-Hazard Exposure Screening at Busamang and Salamaua, Papua New Guinea

Mirzi Betasolo[1], Elena Carcano[2], Meseret Dawit[1] Teweldebrihan[1]

[1]School of Civil Engineering, Papua New Guinea University of Technology
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Resilience can happen if you know what is going on such as the coastal communities along the Huon Gulf require reliable evidence to guide infrastructure adaptation under interacting coastal and catchment hazards. The preliminary assessment shows shoreline variability and potential hazard exposure at Busamang and Salamaua in Morobe Province, Papua New Guinea. The assessment was done by twelve annual Digital Earth Pacific shoreline layers for 2012–2023, six exploratory shoreline transects, community photographs, geographic screening maps, and documentary evidence on flooding, seismicity, and mining-related sediment pathways. Shoreline differences range from approximately 7 m landward to 26 m seaward at the sampled Busamang transects. There are five unstable data flags out of the six sampled 2023 positions. Resolving uncertainties will require site-specific positional data. The research aims to identify locations for investigation rather than establish erosion rates or persistent shoreline trends. Photographs support the research, showing coastal scarping, affected water sources beside a coastal bank. The mapping of Busamang and Salamaua shoreline intends to support survey prioritization rather than quantified inundation prediction. Although, the regional hazard records show a broader multi-hazard context without demonstrating local damage or attributing shoreline movement to sea-level rise, earthquakes, or mining. Therefore, the preliminary assessment is able to propose an integrated monitoring programme combining repeat shoreline surveys, terrain and asset elevations, georeferenced photographs, community impact records, and water and sediment sampling. This approach provides a practical foundation for assessing exposure and informing future decisions on infrastructure protection, service continuity, setbacks and relocation.

Keywords: Busamang; Salamaua; shoreline change; coastal hazards; infrastructure resilience, Huon Coast

Beyond S-101: A Regional Methodology for Prioritising S-102, S-104 and S-111 Products

Verena Bosselmann-Borsos

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As readiness assessment for S-100 implementation progressed in the South West Pacific, it became clear that no regional approach existed for prioritising the development of S-102, S-104 and S-111 services. The S-100 Implementation Maintenance Benefits Realisation Plan (SIMBRP) was commissioned to address this gap and identify priorities across the region.

A workshop-based methodology was developed to assess the potential benefits of S-102 Bathymetric Surface, S-104 Water Level Information for Surface Navigation, and S-111 Surface Currents. The assessment considered three dimensions: Safety of Navigation, Efficiency, and the Blue Economy, using jurisdiction-specific information provided by regional representatives.

The results showed that priorities vary significantly depending on local factors such as port operations, tidal constraints, and exposure to currents. At the same time, common themes emerged across jurisdictions, supporting a shared regional case for water-level and surface-current services.

The project provides a transparent and repeatable approach for prioritising S-100 products, identifying gaps, and exploring opportunities for regional collaboration. The methodology can be adapted by other regions seeking to plan their transition beyond S-101.

CERNOS: AI and Smart-logic Enabled Integrations for Autonomous Monitoring, Categorisation and Alerting.

Cory Brooks

No Humes

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Its core system, Cernos, comprises the computing, telemetry and power supply components required to acquire data across a range of operating environments. The subsystems connected to Cernos define each deployment's function.

To date, three proven configurations are available:

1. Autonomous vessel traffic monitoring, categorisation, behaviour analysis and identification.
2. Real-time monitoring of underwater infrastructure and autonomous alerting in case of a shift or subsidence event.
3. Monitoring of seabed scour around infrastructure and alerting of scour volume or profile changes.

The first configuration provides autonomous vessel traffic monitoring, categorisation, behaviour analysis and identification by fusing track data with machine vision applied to high-resolution imagery is more relevant to maritime security and is not discussed in this presentation.

The second configuration provides real-time monitoring of underwater infrastructure, and autonomous alerting in case of a shift or subsidence event. Using subsurface tilt sensors that measure and resolve the planet's gravity into a vector, the system outputs highly accurate and precise inclination values. These values are monitored against thresholds set by the client's asset management team. Threshold breaches trigger email and text notifications to relevant stakeholders. The system uses opensource data protocols, enabling integration with existing asset monitoring software and maintaining a sole source of information for end users. This system is called CERNOS IHMS, or Infrastructure Health Monitoring System.

The third configuration autonomously monitors seabed scour around infrastructure and sends alerts when the scour volume or profile changes. By applying edge processing to a sonar capable of scanning up to 100 metres in a 360-degree space, the system generates periodic seabed models and detects changes by comparing each scan with a baseline model. If change thresholds are breached, the system sends email and text alerts to stakeholders, including a link to download the latest model for office-based assessment. This system is called CERNOS SMS or Scour Monitoring System.

From Depth to Discovery – Understanding the Seafloor with ArcGIS Pro

Kevin Butler[1], Keith Van Graafeiland[1], H. Gary Greene[2]

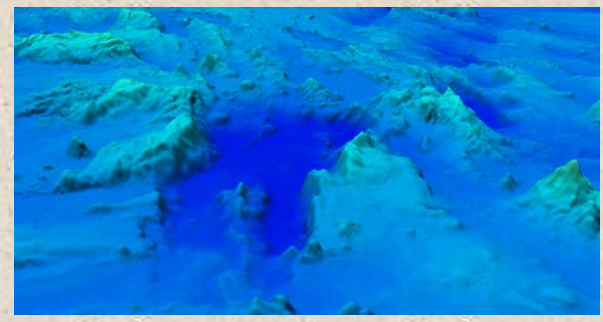
[1]Esri, Redlands, CA
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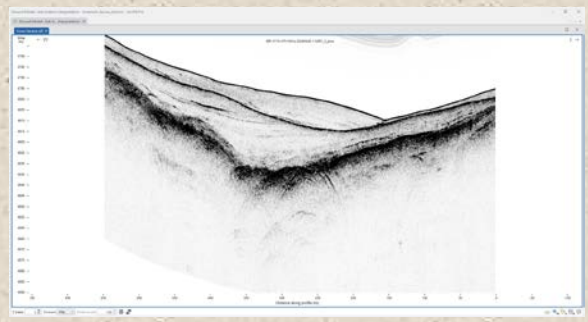
Bathymetry tells us how deep the ocean is, but understanding the shape, structure, and character of the seafloor requires looking at those data in new ways. Using exploration data collected around American Samoa as an example, this presentation highlights a range of ArcGIS Pro techniques for revealing submarine terrain, geomorphic patterns, and features that may not be immediately apparent from bathymetry alone. Multiscale percentile, deviation, and difference analyses can help reveal features expressed at different spatial scales, while Geomorphic classification, Benthic Terrain Modeler, and related terrain-analysis approaches provide additional ways to characterize the form and complexity of the seabed.

The exploration can also extend below the seafloor. GeoCap Ground Model provides an additional component of the workflow for working with and interpreting sub-bottom data, enabling exploration of structures and features hidden beneath the seabed. Bringing these surface and subsurface perspectives together provides a more complete view of the marine environment.

Finally, interactive 3D Scenes in ArcGIS Pro, combined with techniques such as vertical exaggeration, perspective viewing, and complementary terrain visualization, can make subtle features and spatial relationships easier to recognize and communicate. Together, these approaches demonstrate how GIS can help transform marine exploration data into a richer and more intuitive understanding of the seafloor, supporting scientific interpretation, exploration, and informed marine decision-making.



3D Perspective view of American Samoa Bathymetry



Sub-bottom profile data viewable in ArcGIS Pro

Understanding Tsunami Risk to Australia from Volcanic Sources.

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Tsunamis generated by volcanic eruptions represent a poorly understood but potentially significant natural hazard for Australia. While Australia's tsunami hazard assessments and warning capability have traditionally focused on earthquake-generated tsunamis, recent events have demonstrated that volcanic eruptions can generate destructive tsunamis through multiple mechanisms, including explosive eruptions, volcanic summit caldera collapse, pyroclastic density currents entering the ocean, submarine mass failures, and combinations of these processes. These mechanisms differ fundamentally from earthquake sources and require specialised approaches to source characterisation and numerical modelling.

The 15 January 2022 eruption of Hunga volcano highlighted this knowledge gap. The eruption generated tsunami waves that propagated throughout the Pacific Ocean and were recorded around the Australian coastline. Although impacts in Australia were relatively minor, the event demonstrated that volcanic tsunamis could affect Australian coastal communities, ports and maritime operations, while also highlighting limitations in existing volcanic source information available for tsunami hazard assessment.

At present, Australia does not have a nationally consistent database of volcanic tsunami source scenarios equivalent to those available for earthquake-generated tsunamis. This limits the ability of emergency management agencies to assess volcanic tsunami hazards consistently, prioritise potentially hazardous volcanic sources, and evaluate the relative contribution of different volcanic processes to tsunami risk.

A project (NHRA T9-A2) funded through the Natural Hazards Research Australia over the next 2 years will look at developing a database of potential source volcanoes around Australia that are likely to produce volcanogenic tsunamis. This database will then be used to develop a series of scenarios for tsunamigenic events at specific volcanoes. Modelling of these events will be used to elucidate the probable inundation effects on the Australian coastline. This project will involve technical liaison with our neighbours particularly those in the SW Pacific.

Isotope Hydrology of the Yaqara Catchment, Fiji: A Tool for Integrated Water Resource Management

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Groundwater resources in volcanic, structurally compartmentalized catchments are increasingly subjected to competing commercial, agricultural, and domestic demands. This study investigates the Yaqara catchment in Fiji, host to intensive long-term commercial artesian extraction alongside local shallow water use, to establish a robust hydrogeological baseline using environmental isotopes (δ18O, δ2H, and 3H). The research examines stable isotope compositions to understand flow paths and transitions from upper basaltic ridgelines to coastal alluvial deposits, while utilizing tritium activity analyses to evaluate groundwater age and residence times.

Furthermore, the study explores complex multi-source dynamics, including the relationship between local alluvial dilution and upward leakage from regional storage. By assessing catchment-wide water balances in the context of secondary porosity, dyke compartmentalization, and localized extraction zones, the findings underscore the necessity of source-specific, age-informed monitoring frameworks. Ultimately, this approach aims to balance commercial extraction with long-term domestic water security under an Integrated Water Resources Management (IWRM) framework.

Basalt as a Soil Amendment for Acidic Soils in Fiji: A Case Study of Navuso Agricultural Technical Institute, Naitasiri, Fiji (Poster)

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Soil acidity is a significant and growing agricultural concern on high volcanic islands such as Fiji where many cropping soils show strongly acidic conditions. Although agricultural lime can be used to correct soil acidity, its cost and availability can limit its use by smallholder farmers. This study investigates the potential of locally available basalt as an alternative soil amendment, focusing on basalts from the Nasinu quarry and acidic soils from the Navuso Agricultural Technical Institute in Naitasiri, Fiji. The study characterized the mineral composition and weathering behaviour of the two basalt types from Nasinu Quarry and assessed their ability to increase soil pH. Hand specimens and petrographic thin sections were examined to identify major minerals and alteration products. Laboratory experiments investigated three basalt particle-size fractions (<0.15 mm, 0.15–0.50 mm and 0.50–1.0 mm) and different application rates during controlled incubation experiments. Soil pH was monitored over the experimental period of 20 days to assess changes associated with basalt addition. Results indicate that Nasinu Quarry basalts have potential to improve acidic soil conditions. Finer basalt particles showed greater weathering and produced higher pH responses, reflecting their greater surface area and increased water-rock interaction. Both basalt types increased the pH of the Navuso soil, which initially ranged from approximately 4.5 to 5.2. However, olivine-rich basalt produced a greater increase in soil pH compared to plagioclase-rich basalt, with the highest application rate raising soil pH above 6.0. The findings suggest that finely ground basalt quarry material could provide a locally available and potentially sustainable approach for managing acidic soils in Fiji and other similar Pacific Islands. However, further field-based studies are recommended to assess long-term effectiveness, potential environmental impacts, appropriate application rates, crop responses and potential trace-element risks.

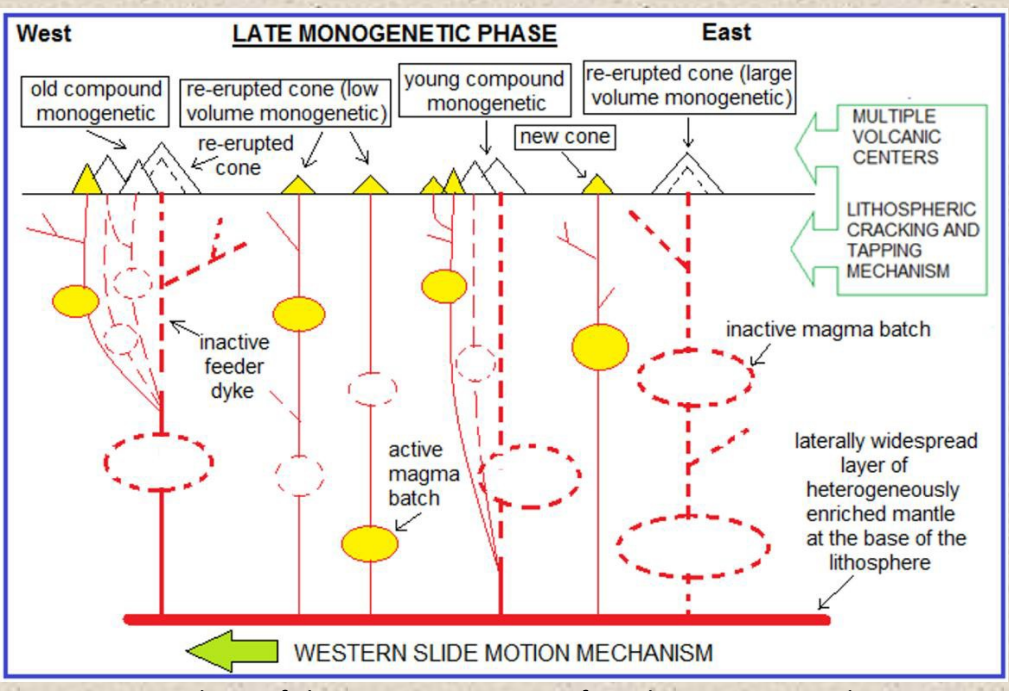
Sites May Have Geothermal Potential Along the Samoa Volcanic Field

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Samoan volcanism is tectonically controlled and driven by tension-stress activity associated with the sharp bend in the Pacific Plate (Northern Terminus) at the Tonga Trench. A mix of shield and post-erosional volcanic activity dominates the Samoan island chain. The easternmost end of the chain is an active submarine volcano known as Vailuluu (Samoan Hotspot). The westward movement trail is referred to as a "western-slide motion mechanism" (WSMM) that is also known as the tapping mechanism and corresponds with the western movement of the Pacific Plate. It triggers simultaneous activities along the central ridge of the main islands (Upolu & Savaii), which could influence the westward progression in volcanic age of the Samoan hotspot. Picritic and basanitic /basaltic sources derive from different magma batch levels (deep and shallow, respectively). This shows that there is a "transition process" amongst the magma batches, i.e. a shift from a lower to the upper level source or vice versa, during the same eruption episode. Based on radiometric dating, geochemical analysis and seismic interpretation data, hydrothermal potential along a subaerial volcanic field could refer to those associated with a fault network, an interconnected fissure system and dominated by younger cones.



Late monogenetic phase of the easternmost part of Upolu associates with an increase in tectonic activities. Feeder and arrested dyke network is increased at this late stage of monogenetic phase. Dashed straight lines refer to inactive feeder dyke and dashed ovals represent inactive magma batches. The model is not to scale.

Mineral Security in the Pacific: Supporting Resilient Supplies and Use of Sustainable Construction Materials through the Blue Concrete Initiative

A Day of Commemoration of the life and work of Dr Paul Rogers (UQ) and Mr Raymond Mohammed (MRD)

Gary Flomenhoft

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This special session is presented by staff and faculty of the Global Centre for Mineral Security (GCMS) at the University of Queensland (UQ) along with our partners, Pacific Community (SPC), Fiji Mineral Resources Department (MRD), United Nations Development Programme (UNDP), Robert Smith Consulting (RS Consulting), and the European Union-Africa/Caribbean/Pacific Development Minerals Programme (EU-ACP Development Minerals Programme).

The session will begin with an inauguration and commemoration for our highly valued but recently departed colleagues Mr. Raymond Mohammedp of the Mineral Rresources Department (MRD) and Dr. Paul Rogers of the University of Queensland (UQ).

The morning session will focus on progress made under the Blue Concrete Initiative, which aims to promote and transfer of limestone-calcined clay cement (LC3) technology and the sustainable sourcing of aggregates in Fiji and across the Pacific. LC3 is an innovative cement formulation that uses local materials such as kaolin clay and limestone to reduce production costs and greenhouse gas emissions, while improving durability.

The session will also feature an interactive panel discussion with industry representatives to share recent developments, discuss opportunities and challenges, and explore the next steps for advancing sustainable construction materials in the Pacific.

The afternoon session will focus on another essential component of the Blue Concrete Initiative: the sustainable sourcing of aggregate materials for use in concrete. The University of Queensland will present guidelines developed from the Pacific Region Infrastructure Facility (PRIF) report on *Responsible Sourcing of Aggregates in the Pacific* in collaboration with UQ and Pacific partners. These guidelines have been further developed and refined through consultations with industry and government representatives across the Pacific. The guidelines cover general principles for responsible aggregate sourcing, recommendations for governments, and specific guidance for river sand and gravel extraction, hard and soft rock quarrying, and beach and lagoon dredging.

The session will conclude with reflections on the day's discussions and an overview of the next steps towards advancing the Blue Concrete Initiative and promoting sustainable construction materials across the Pacific.

The Suva Harbor Urban Sea System as a Commercial Hub for Deep Ocean Mining Support, Observation, and Monitoring

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The Suva Harbor Urban Sea System consists of urban, industrial, and port facilities that are encompassed within the watershed drained by the major Tamavua River and other rivers. It is a major regional port city that facilitates shipping, transportation, and communications for itself and other Pacific island nations. This Urban Sea System acts as a maritime oasis for regional and international fisheries and a transshipment hub for export and import goods. With the advent of marine critical minerals extraction its position within the vast expanse of the Pacific lends itself to facilitating onshore-offshore support, observation, and monitoring of deep-sea minerals exploitation.

While Fiji's base tourism economy can be supplemented by deep-sea minerals and monitoring activity support, caution can be exercised in planning for this support that conserves its environmental resources. Modern technologies and tools are available to use in planning, monitoring, and forecasting activities for efficiency and economy while integrating potential natural and anthropogenic hazards. To begin with assessment of these hazards and toxic inputs into the system can be used to set a base line for monitoring and mitigation. Present and future natural and anthropogenic impacts (as shown in the figure below) will be discussed along with tools including digital twins and AI that can be used to comprehensively assess change and provide information for any mitigation that may be necessary.



Aggregate Mining in the San Francisco Bay Urban Sea System

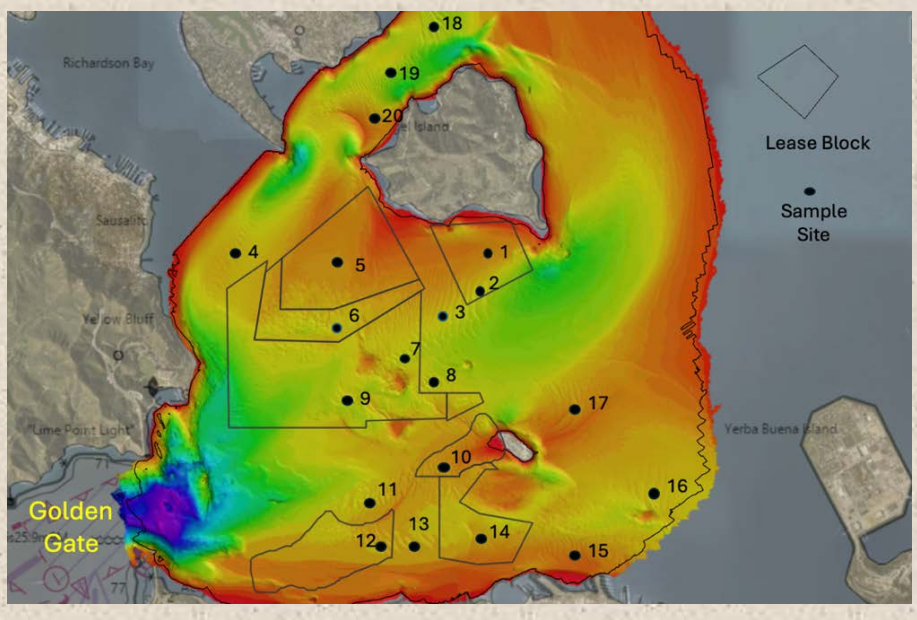
H. Gary Greene[1], Brenda Goeden[2], Jaime Lopez[2], John Douglas[1]

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The San Francisco Bay Urban Sea System entails a large water shed basin of the entire Great Valley of California drained by the Sacramento and San Juaquin rivers. It includes the major port cities of San Francisco and Oakland with a significant industrial base. Since the industrial scale of hydraulic extraction gold mining in the foothills of the Sierra-Nevada in 1852-1853, San Francisco Bay has been the recipient of much of the river swept tailings and other effluents from the mining. While this gold rush activity was environmentally adverse, a beneficial by-product of aggregate accumulated within the Bay, trapped behind the Golden Gate. This close source of tidal current and river well-sorted sands and gravel led to the cement construction of San Francisco. However, today no further sediment contribution from the mining tailings is occurring although aggregate mining continues.

Much of the relic sediment in the Bay are in the form of dynamic bedforms such as sand and gravel wave fields that harbor the forage fish Pacific sand lance (*Ammodytes personatus*), which are preyed upon by humpback whales and other fish and mammal species. Based on the industries and the San Francisco Bay Area Conservation Commission (BCDC) concerns in conserving this habitat type we undertook an extensive sediment sampling exercise to determine the presence of the sand lance marine benthic habitats. Results of that exercise is ongoing at the time of this printing but will be discussed during the STAR sessions.



Multibeam echosounder bathymetry of San Francisco Bay with aggregate lease blocks shown as black outlines and proposed sample sites as numbered black dots. Source: BCDC

Burping Sediment and Concentrated Nodules, American Samoa

H. Gary Greene[1], Keith Van Graafeiland[2]

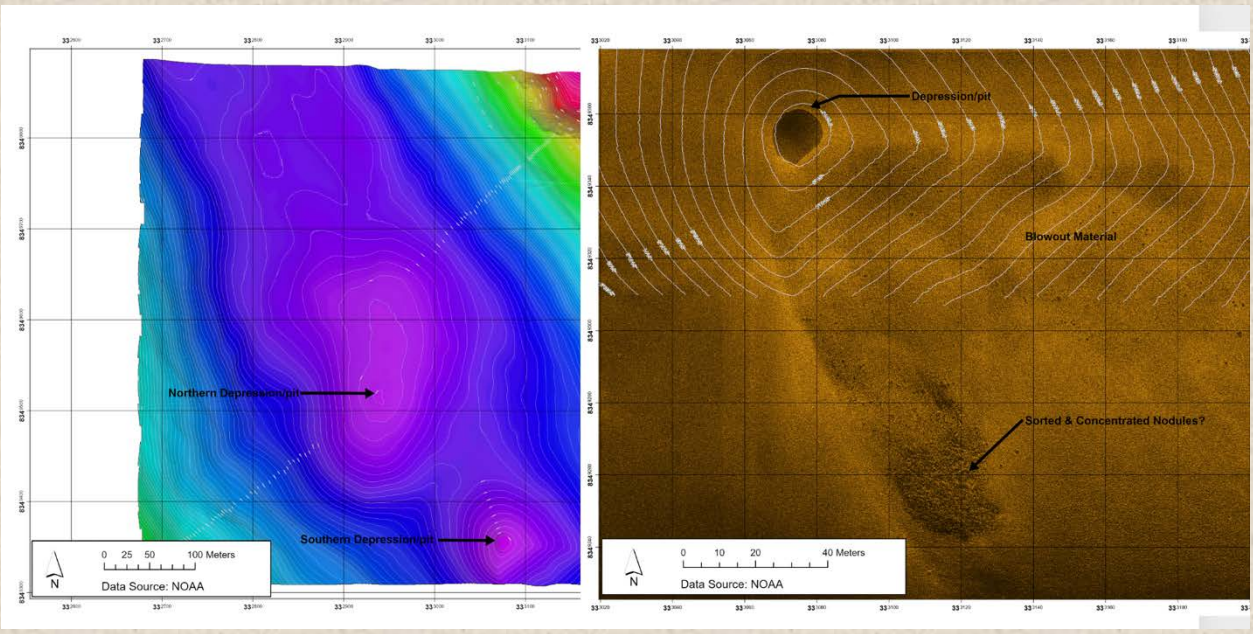
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Exploration by the U.S. National Oceanic and Atmospheric Administration (NOAA) within the American Samoa EEZ was recently undertaken to assess the deep-sea mineral resources of that country. From the large open-source data sets resulting from this exploration we examined and undertook some initial interpretations of the sub-bottom profiles (SBPs), High-resolution Synthetic Aperture Side-scan Sonar (HiSASS) mosaics, and seafloor photos.

The objective of the exploration was to map seafloor areas that contain manganese nodules and determine their concentrations. Within an area of nodule concentrations, we found an expulsion pit (pockmark) and a gentle mound devoid of nodules. The blowout that created the pockmark caused a sediment slide that fans out away from the pit with the leading part of one lobe of the sediment slide appearing to have densely concentrated nodules (see image below). In contrast, the mound devoid of nodules was surrounded with concentrated nodules. High amplitude reflections in the SBPs suggest gas may be present in the subsurface and gas bubbling to the surface may be a mechanism to rotate seabed nodules allowing them to grow.

We suspect that other parts of the regions may also have expulsion pits and mounds. Further examination of these features could enlighten our understanding of natural ecological disturbances and provide a long-term history of recolonization. In addition, sediment disturbed natural concentrated sites may be a preferable target for the collection of nodules with minimum disturbance to marine benthic habitats.



From Seabed to Space: Building a Maritime ISR Capability for the South Pacific

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Pacific Island nations govern some of the largest and most strategically significant maritime areas in the world. Yet the scale, remoteness and environmental complexity of these ocean territories make persistent maritime awareness difficult to achieve using conventional vessel- and aircraft-based surveillance alone.

This presentation explores the concept of an integrated Intelligence, Surveillance and Reconnaissance (ISR) framework for the South Pacific, combining hydrographic and seabed mapping, autonomous marine systems, satellite Earth observation, passive acoustics, vessel tracking, environmental sensors and cloud-based geospatial intelligence to create a more persistent and comprehensive understanding of the maritime domain.

A key premise is that the seabed should be considered part of the ISR environment. High-resolution bathymetry, seabed characterisation and knowledge of subsea infrastructure provide the enduring geospatial foundation against which dynamic observations can be interpreted. When combined with surface and above-surface surveillance, these datasets can support applications ranging from maritime safety, fisheries protection and environmental monitoring to critical infrastructure security, disaster response and national security.

The presentation will consider how existing Pacific hydrographic programs, regional partnerships and emerging autonomous technologies could contribute to a scalable, distributed ISR architecture suited to the geography of the Pacific.

Rather than proposing a single surveillance system, the paper presents a layered “seabed-to-space” approach to maritime domain awareness, where data collected for scientific, hydrographic, environmental and security purposes can contribute to a shared geospatial intelligence picture.

The opportunity is to develop a model that is not simply deployed *in* the Pacific but developed collaboratively *for and with Pacific Island nations*—strengthening sovereign capability while improving collective understanding and stewardship of the Pacific Ocean.

Installation and Commissioning of the Iron and Manganese Water Treatment System at Lekutu Primary and Secondary Schools, Bua, Fiji

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Access to safe and reliable drinking water remains a significant challenge for rural communities and educational institutions in Fiji, particularly where groundwater sources contain naturally occurring minerals that affect water quality. The Lekutu Primary and Secondary School Water Treatment System Project was implemented by the Mineral Resources Department (MRD) to address elevated iron and manganese concentrations identified following the development of the schools' groundwater supply and reticulation system.

In 2023, MRD undertook groundwater investigations and borehole development, identifying borehole TDH23/02 as a suitable production source with a tested discharge of 5 L/s. The subsequent reticulation system was funded through the Fiji Program Support Platform (FPSP) and implemented by MRD. However, water quality monitoring identified iron and manganese concentrations of 1.61 mg/L and 0.20 mg/L, respectively, exceeding the Fiji National Drinking Water Quality Standards. These elevated concentrations resulted in water discolouration, metallic taste, staining of plumbing fixtures and mineral deposits within the distribution network.

To address these challenges, an automated containerised iron and manganese removal treatment system was procured and installed in collaboration with Moerk Water Solutions. The treatment system incorporates oxidation, filtration and disinfection processes and was integrated with the existing borehole, storage tanks and gravity-fed distribution network. Project implementation involved engineering design, procurement, civil works, mechanical and electrical installation, system testing, water quality verification and operator training.

Post-treatment water quality analysis demonstrated significant improvements, with iron concentrations reduced from 1.61 mg/L to 0.008 mg/L and manganese from 0.20 mg/L to 0.00 mg/L, achieving compliance with the applicable national drinking water quality standards.

The successful completion of the project has improved the quality and reliability of the water supply serving Lekutu Primary and Secondary Schools while maximising the use of existing infrastructure. The project highlights the effectiveness of containerised treatment technology as a practical and sustainable solution for addressing groundwater quality challenges in rural Fiji.

Drought, Groundwater Stress and Household Water Insecurity in South Tarawa, Kiribati (Poster)

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Atoll islands have no rivers, natural lakes, or deep underground aquifers hence people there rely almost entirely on rain and the freshwater lenses as their source of water. Rainfall is essential to recharge the thin freshwater in Atoll Islands which makes them susceptible to drought. There have been few studies on the relationship between rainfall variability, ENSO (La Niña and El Niño) and household water insecurity, although this situation is prevalent in South Tarawa, Kiribati. South Tarawa is a highly populated area of Tarawa atoll, and the people of South Tarawa are highly dependent on groundwater for livelihood. This study used a combination of long-term rainfall, ENSO data and an online questionnaire of 31 respondents on the topics of groundwater quality, water problems and coping strategies for drought. The rainfall variability data showed continuous years of less rainfall which indicated less recharge to the lenses recently from 2020 to 2022. The survey unveiled that households rely mostly on groundwater, rainwater and PUB (Public Utilization Board) for their primary source of drinking water. Many households reported that their water was slight salty or brackish, and that PUB water is provided just 2-4 times per week for only 2-3 hours. During drought periods the households reported problems such as gardens being affected and well water dropping down. To mitigate the effects of drought on atoll communities, enhancements are required in rainwater storage, well protection and in monitoring the rainfall and groundwater quality. Desalination plants could provide cleaner water but are expensive.



Figure 1: '**A**' is an image of rainwater tank in South Tarawa Kiribati; '**B**' image of well water levels in South Tarawa Kiribati; '**C**' is an image of PUB pipe water in South Tarawa, Kiribati. (Picture credit: Bureimoa Teekia, 2026).

Assessing the Relationship Between Customary Land-Use Practices and Sedimentation in Coastal Ecosystems of the Gazelle Peninsula, East New Britain, and Identifying Nature-Based Management Strategies

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Coastal communities of the Gazelle Peninsula, East New Britain, Papua New Guinea, rely on marine ecosystems for food security, livelihoods, and cultural wellbeing. Climate-related pressures and land-derived sedimentation increasingly threaten coastal habitats (Department of Environment and Conservation, 2010; Lipsett-Moore et al., 2017). Deforestation, agricultural



expansion, and infrastructure development may intensify soil erosion and sediment runoff, particularly without integrated catchment management (Bleeker, 1983; Lipsett-Moore et al., 2017). As customary tenure governs much of the peninsula's land, sustainable responses must engage customary landholders and local decision-making systems (Allen & Bourke, 2009).

This study examines relationships between customary land-use practices and coastal sedimentation in the Gazelle District and identifies nature-based management strategies compatible with customary governance. It explores community-led approaches, including agroforestry, riparian restoration, and revegetation, to reduce erosion while supporting Indigenous knowledge and environmental stewardship. The research aims to inform equitable, culturally appropriate land–sea management policies that strengthen coastal ecosystem resilience, food security, and livelihoods. Its broader contribution concerns Indigenous sovereignty, blue justice, climate resilience, and sustainable seascape governance across East New Britain and Melanesia.

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Bridging Science and Community Knowledge: A Transdisciplinary Ridge-to-Reef Approach to Coral Reef Protection in Fiji

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Submarine Groundwater Discharge (SGD) is an often-overlooked pathway linking land-based activities to coastal water quality and coral reef decline in Pacific Island Countries. In rural coastal communities with limited sanitation and intensive agricultural land use, groundwater, rivers, and surface runoff can transport nutrients and contaminants from land to the marine environment, yet these interconnected ridge-to-reef pathways are rarely considered together in environmental management and adaptation planning.

Using Navolau District in Ra Province, Fiji, this study applied a transdisciplinary ridge-to-reef approach integrating hydrological and social science methods. Hydrogeological investigations examined groundwater flow, SGD, river and coastal water quality, and nutrient transport pathways, while social science activities explored community knowledge, environmental perceptions, resource use, and local management priorities. Participatory workshops and community engagement were used to connect scientific findings with local ecological knowledge and lived experience.

Results highlight the importance of considering groundwater, rivers, land use, communities, and coral reefs as an interconnected social-ecological system. The study also demonstrates that local stewardship, ecological knowledge, and willingness to participate in environmental monitoring provide strong foundations for co-designed socio-hydrological management, community-based monitoring, and future ridge-to-reef conservation strategies in Pacific Island communities.

Seabed 2030 and the Challenge to Map the World's Oceans: Pacific Perspective

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After concerted international collaboration, 27% of the seabed has now been mapped. While we can celebrate the success to map so much, there is still more that can be done.

We know the surface of Mars and the Moon better than our own planet. This is why Seabed 2030 has taken the challenge to compile a map of the entire oceans by year 2030.

The ocean being at least 70% of the earth does not just provide resources to sustain human life but also drives earth's processes geologically and climate-wise. With climate change, sea-level rise, tsunami threats and marine pollution; seamless land and underwater elevation is essential for risk mitigation which are based on scientific models and analyses. Even though most marine science studies use seafloor topographic data as base information needed for creating ocean process models, analysis and interpretation, ~72% of the world's ocean is still unmapped. Hence, increasing the uncertainty of the accuracy of local and global models. This is what drives The Nippon Foundation – GEBCO Seabed 2030 Project to pursue gathering and compiling existing data and promote ocean mapping so that humanity will have free data access of a fully-mapped ocean floor by year 2030.

Endorsed by UN Decade for Ocean Science, Seabed 2030 operates in (4) regional centres. The Pacific Ocean Regional Centre is based in Earth Sciences New Zealand (ESNZ).

This talk will focus on the work of Seabed 2030 Pacific Ocean Regional progress, Pacific engagement and collaboration opportunities.

The Blue Economy & What is ‘Hydrospatial’?

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This presentation introduces the term ‘hydrospatial’ and highlights the importance of hydrography and other associated hydrospatial sciences to countries’ economic wellbeing. It is based on an International Hydrographic Organization (IHO) presentation provided to the presenter. The definition of ‘hydrospatial’ derived by the founding members of the Hydrospatial Movement Club and Community (HMCC) is currently awaiting endorsement by the IHO Hydrographic Dictionary Working Group and approval by the IHO Plenary. The term ’hydrospatial’ is increasing in general usage.

Promotion and Support for Hydrospatial Science Groups

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For maritime nations, hydrospatial science plays an important role in both economic development and community well-being. Over the past few years, the terms *hydrospatial* and *hydrospatial science* have become much more widely used, especially across the South-West Pacific. This growing interest is also reflected in the creation of two groups dedicated to promoting the field.

One of these groups began to take shape in 2020, bringing together people with an interest in the maritime environment, conservation, and governance. It launched on LinkedIn in August 2021 as the **Hydrospatial Movement Club and Community (HMCC)** and has since grown into a global network of more than 7,000 members. The group is supported by a core club of 12 members, including two co-leads and two representatives from each of the African, American, Asian, Oceania, and European nodes.

At the 2025 STAR Conference, many of the presentations were connected in some way to hydrospatial science. This highlighted the value of creating a dedicated working group to promote the discipline and keep members of the Science, Technology and Resources (STAR) Network informed across the South-West Pacific region. As a result, the **STAR Network Hydrospatial Working Group (STAR HWG)** was established.

This presentation provides an overview of the work being done to promote and support hydrospatial science.

Overview of Deep-sea Ferromanganese Deposits in the Pacific region

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Many international, national and private venture research cruises, mostly conducted in the 1960-1980 timeframe defined the broad patterns of nodule distribution on the abyssal seafloor plus their relation to sediment type and the deposit morphology. From 1980 research focused upon the Co-rich FeMn crusts found on the shallow, (>800-2000m water depth) slopes of Pacific islands and seamounts. A current resurgence of research is focusing upon deep-ocean nodules found in the Exclusive Economic Zones (EEZ) of SW Pacific island countries.

FeMn deposits grow at very low rates, and are most abundant where conditions such as depression of primary productivity, increased bottom current activity, a lack of significant terrestrial or volcanic deposition and steep slopes can act alone or in combination to protect their growth. Most abyssal nodules can be up to Miocene in age, whereas crusts can be much older, reaching the Mesozoic age of the seafloor on which they grow. The ultimate source for the metals in these deposits is the continents, by very long-term chemical and mechanical rock weathering (e.g., wind uptake and transport of fine oxide-coated particles). Pelagic biological activity concentrates and makes rapid vertical transport of metals to the seafloor where they accumulate in sediments that are reservoirs for metals to be ultimately diagenetically accumulated in FeMn nodules containing Birnessite and Todorokite. Nodules and crusts directly exposed to the ocean grow more slowly and adsorb metals into more oxidized Mn phases (Vernadite) that can be enriched by oxidative scavenging.

Seafloor hydrothermal activity provides relatively pure Fe and Mn oxides to vast Pacific regions that acts as a diluent to other metals such as Co^{3+}, which are limiting in their concentrations in FeMn deposits (Manheim and Lane-Bostwick, 1988). In some regions, such as the Cook Islands basins, nodules grow slowly far away from hydrothermal source regions, and are enriched in Co, Ti and the REE, as well as containing large amounts of Cu and Ni from the pelagic sediments there (e.g., Hein et al., 2015).

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Hein, J.R., Spinardi, F., Okamoto, N., Mizell, K., Thorburn, D., Tawake, A. 2015, Critical metals in manganese nodules from the Cook Islands EEZ, abundances and distributions. *Ore Geol. Rev.* **68**, 97–116.

Introducing a Complete, Autonomous Geochemical Monitoring Station for Nabukalevu (Mt. Washington), Kadavu, Fiji

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Nabukelevu volcano (805 m, a.k.a. Mt. Washington) is a small (ca. 3.4 km^3) hornblende/biotite-andesite dome-breccia complex. It is the youngest in a Plio-Pleistocene series of volcanoes related to a presently inactive subduction zone in southern Fiji. Like many composite edifices in moist climates, Nabukelevu is prone to failure, the propensity in this case exacerbated by up to three edifice-cutting fault zones (Cronin et al., 2004).

The present "hazardscape" of the Nabukelevu area includes common landslides induced by frequent earthquake swarms and cyclones. Larger edifice failures, possibly related to volcanism or fault movement, have the potential to create local tsunami, which under favorable conditions could reach areas near Fiji's capital, Suva, 110 km to the north (Cronin et al., 2004). An additional hazard source not foreseen by the Cronin et al. (2004) study is strong undersea earthquakes in the vicinity of Nabukalevu that are likely not directly related to volcanic activity there but can nevertheless trigger landslides.

We propose to fabricate and install a physical and chemical monitoring station in a selected hot spring suspected to lie within a major cross-cutting fault zone on Nabukalevu volcano. The station will run and record autonomously on internal batteries and can be communicated with via a solar-charged satellite modem located in a nearby clearing. We chose an initial set of temperature, conductivity, pressure (water level) and total dissolved carbon dioxide gas sensors. Justification for their choice will be presented. We propose to report the temporal, relatively high-frequency findings on these parameters on a monthly basis to MRD for one year. Afterwards, the equipment will be transferred to MRD.





Figure: TOP: Landslide scars on the north face of Nabukalevu volcano, Kadavu island, Fiji after the October 2019 M5.7 earthquake offshore. **BOTTOM:** Northern slopes of Mt Washington showing historic large-scale landslide scarps (yellow) and a remnant zone of the edifice (red line) which could potentially collapse and lead to a local tsunami during a future seismic or volcanic event. (photo and caption from Lee and Degei, 2019).

Cronin, S. J., M. A. Ferland and J. P. Terry, 2004. Nabukelevu volcano (Mt. Washington), Kadavu -- a source of hitherto unknown volcanic hazard in Fiji, *J. Volcanol. Geotherm. Res.* **131**, 371-396.

Lee, G. and P. Degei, 2019. Kadavu Earthquake Technical Memo, Nov. 4, 2019. Pacific Community, 20 p.

Coral Bleaching Extent Detection (C-BED) Copernicus Marine Data and Sentinel-2 spectral Analyses to Monitor the Impacts of the 2026 Marine Heatwave in Tonga and Fiji.

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Coral reef biogenic georesources have a foundational role in sustaining the livelihoods of coastal communities in Pacific Island Countries and Territories (PICTs) by providing food security, income, coastal protection, minerals and cultural benefits through fisheries and other ecosystem services. Yet, these ecosystems are becoming increasingly exposed to a warming ocean, which subsequently leads to marine heatwave events that trigger coral bleaching. Therefore, developing an Early-Warning System (EWS) to closely monitor coral bleaching in these communities is more important than ever before. Because the Pacific Ocean covers around one-third of the Earth, blending in-situ and remote sensing data is critical for early detection, monitoring, and timely action. This study presents the Coral Bleaching Extent Detection (C-BED) framework, which integrates Copernicus Marine Data Services, Pacific Ocean Portal, and NOAA Coral Reef Watch datasets with satellite data, including Sentinel-2 imagery, as well as observations of local field monitoring networks. The framework was implemented at six reef sites, three in Tonga and three in Fiji, to examine the correlation between SST anomalies, marine heatwave conditions, and spectral changes in coral reef ecosystems both before and after the 2026 marine heatwave event. The results provide a preliminary estimate of coral bleaching for these sites.

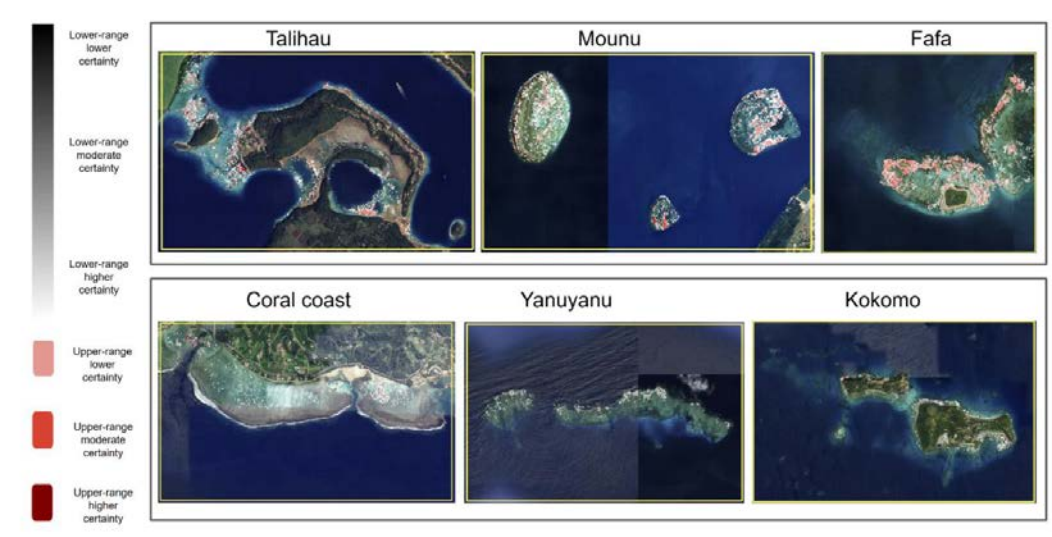


Figure: Estimated extents of areas affected by coral bleaching for each of the 6 case studies.

Spatial Analysis for Marine Litter Prevention in Fiji

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Pacific Island nations are strongly dependent on marine environments, which support critical ecological functions, livelihoods, economic activities, and natural resources. Rapid urbanisation, increasing waste generation, and changing environmental conditions are intensifying pressures across the land–sea interface. Within an **Urban Sea System,** materials generated on land can move through drainage networks, waterways, and river systems before reaching coastal and marine environments, creating cumulative pressures on the natural systems and resources upon which Pacific communities depend.



This project (Clean Seas) seeks to address this cumulative pressure by developing a national-scale spatial assessment of priority marine litter hotspots across Fiji, providing an evidence base to support targeted management interventions (and informed decision-making). This project integrates both opensource tools such as Q-GIS and Q-field that involves both environmental and anthropogenic spatial datasets to perform spatial analysis techniques that identify, map, and prioritize areas with a high likelihood of plastic litter accumulation.

The expected outputs include a priority marine litter hotspots analysis, and maps that identify areas requiring immediate monitoring and interventions. This project provides a national assessment of marine litter hotspots in Fiji, supporting evidence-based environmental management, plastic pollution reduction, and sustainable ocean stewardship.

Building a More Resilient Fiji: Low- Carbon Cement Solutions Using Local Resources

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The cement sector accounts for approximately 7% of global CO_2 emissions, with clinker production representing the most carbon-intensive phase due to its high energy demand and chemical decarbonation of limestone. This study presents a detailed life cycle analysis (LCA) of Limestone Calcined Clay Cement (LC^3) as a low-carbon alternative that utilises locally available materials, specifically kaolinitic clay and limestone, to partially substitute clinker in cement production. The LCA employed covers raw material extraction, calcination, grinding, transportation, application, and end-of-life phases. Inventory data were compiled for both conventional Portland cement and LC^3, incorporating site-specific energy mixes, transport distances, and material availability. Impact assessment was conducted using midpoint indicators such as Global Warming Potential (GWP) and cumulative energy demand (CED).

The results demonstrate that LC^3 cement achieves a significant reduction in GWP and in CED compared to clinker-based Portland cement, primarily due to lower clinker content. Furthermore, utilization of existing clay deposits and carbonate-rich resources within a country presents a viable pathway for domestically producing LC^3. The study concludes that LC^3 offers a technically robust and environmentally superior alternative for the construction sector. By reducing dependency on clinker, LC^3 not only aligns with a low-carbon development strategy but also enhances the resilience of its infrastructure supply chain. Strategic deployment of LC^3 in public infrastructure projects, coupled with supportive regulatory frameworks, could catalyse a paradigm shift toward climate-smart cement technology.

Numerical Hydrodynamic Simulation and a Decision-Support Framework for Volcanic Tsunami Early Warning in the Southwest Pacific

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Volcanic tsunamis present significant early warning challenges in the Southwest Pacific due to diverse generation mechanisms, limited real-time observations, and the geographical complexity of island communities. Unlike tectonic events, volcanic tsunamis involve submarine explosions, caldera collapses, and pyroclastic density currents, producing hazardous transboundary impacts.

This study presents a numerical hydrodynamic simulation and decision-support framework developed using EasyWave to support early warning in the Southwest Pacific. Implemented in a Linux environment, the framework was applied to 34 hypothetical volcanic scenarios across Fiji, Tonga, and Vanuatu, assessing wave amplitudes and exposure at 54 points of interest. A historical benchmark of the 15 January 2022 Hunga Tonga–Hunga Ha'apai eruption was incorporated to test applicability.

The study establishes a structured workflow for processing simulations, conducting quality assurance, and translating wave amplitudes into operational alert categories. This approach strengthens the link between numerical modelling and warning procedures in Fiji's National Tsunami Warning Centre. Future work will refine source characterisation, incorporate high-resolution bathymetry, and validate models against observational records.

Keywords: Volcanic tsunami; EasyWave; tsunami modelling; early warning; decision support; Southwest Pacific; Fiji; Hunga Tonga–Hunga Ha'apai.

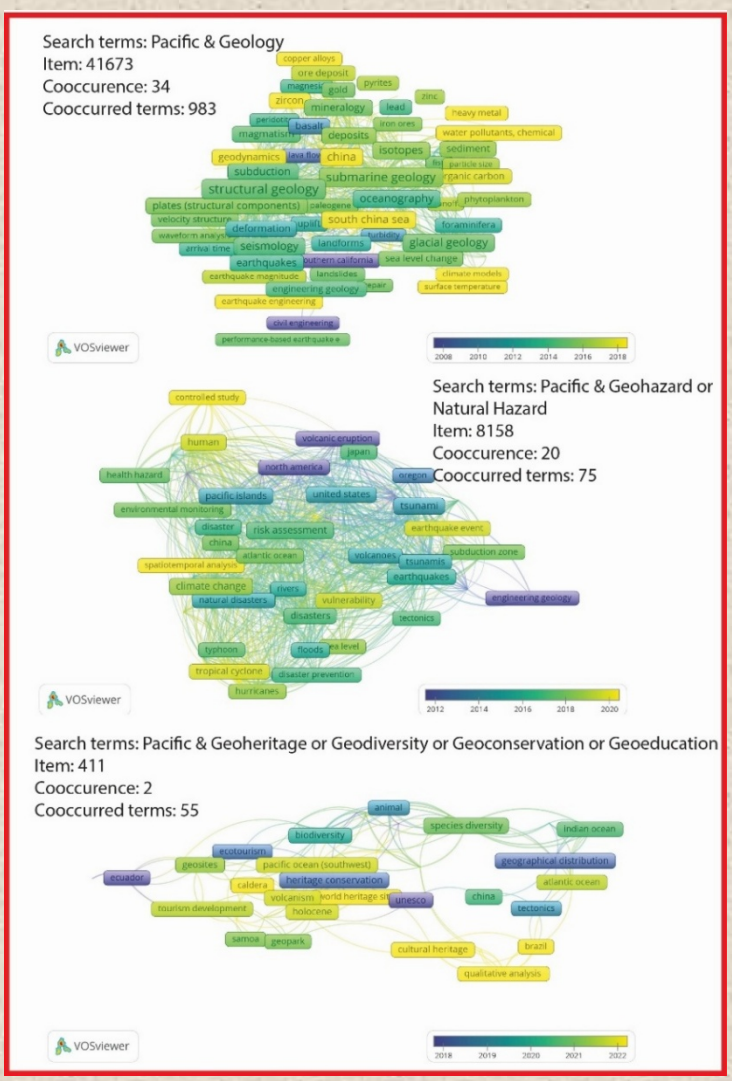
Geoheritage Research Trends in the SW Pacific for Sustainable Conservation and Natural Hazard Resilience

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Geoheritage research in the Southwest Pacific centers on inventory-based geoconservation: identifying, mapping, scoring, and visualizing geosites and geodiversity, often using GIS. Studies



focus mainly on volcanic and tectonic islands, connecting them with hazard education, tourism, and geocultural narratives. Increasingly, research explores management, planning, protected areas, UNESCO-style governance, conservation priorities, climate risks, and community governance, especially in coastal and reef areas and under customary land tenure. However, research remains uneven and often conceptual. New Zealand and Samoa have the strongest methodological evidence. Comparative, region-wide management research is still developing. The International Union of Geosciences (IUGS) Commission on Geoheritage and its Geosites, Heritage Stones and Geo-collections subcommissions have advanced geoheritage research. Their work can raise awareness of Pacific geoheritage, build resilience to natural hazards, and support geotourism and geoconservation. IUGS recognition of geosites in Micronesia (1), New Zealand (9), Niue (1), Samoa (1), Tonga (1), Tuvalu (1) and Vanuatu (2) among its First, Second and Third 100 Geological Heritage Sites underscores the region's rich geoheritage. Yet stones central to Polynesian geocultural heritage remain unexplored. We show that locally grounded, often community-led geoscience can advance sustainable development, preserve heritage and inform environmentally conscious policy—strengthening connections to Pacific lands and oceans.

Geoform Classification in the Cook Islands - From Sunlit Seamounts to Hadal Troughs

John Parianos and Tanga Morris Jr

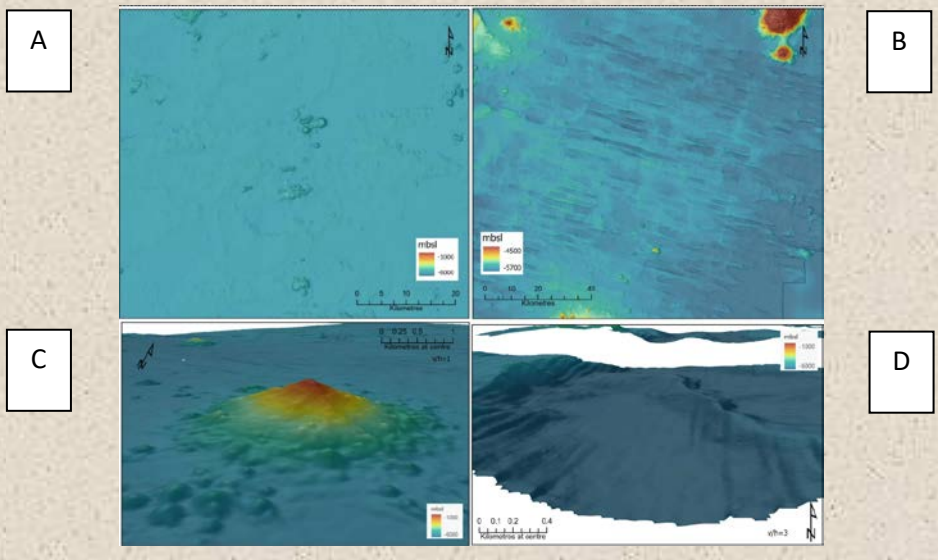
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Ecosystem based management for the Cook Islands seabed relies in part on a scalable definition of habitat-types that involve seabed geoforms and substrates. Along with other related and independent surrogates, geoforms support a marine spatial framework that characterize the seabed and assist, for example, in assessing potential seabed minerals extraction impacts. While focus to date has been on abyssal plains that host polymetallic nodules, more recent research has expanded to knolls and seamounts, and in the future hopefully a major plateau, and troughs that extend to hadal depths in places.

At a regional to subregional scales, habitat management zones (interpreted groups of habitats) are derived from surrogates of broad brush geoforms/geomorphology and modeled net export. These suffice for regional scale assessments such as a recently completed Strategic Environmental Assessment for the Cook Islands seabed.

At project to local scales, multibeam bathymetry helps define geoforms, and in combination with backscatter and other data, potentially substrate. Geoform and substrate classifications derived from CMECS[1] have been synthesized and partially tested using limited long duration ROV[1] traverses. A key gap is that the hadal troughs in the Cook Islands have not yet been visited and have only partial transit-type MBES[1] coverage. Hadal troughs are important to understand from a regional Cook Islands perspective as mapping and characterizing them will help bracket the range of seabed geoforms in the country.



Example bathymetry of some geoforms A) flatter seabed, B) narrow abyssal hills, C) seamount, D) hadal trough

[1] CMECS is Coastal and Marine Ecological Classification Standard; ROV is Remotely Operated Vehicle

Mineral Resource Reconciliation for Part of the Cook Islands Nodule Field

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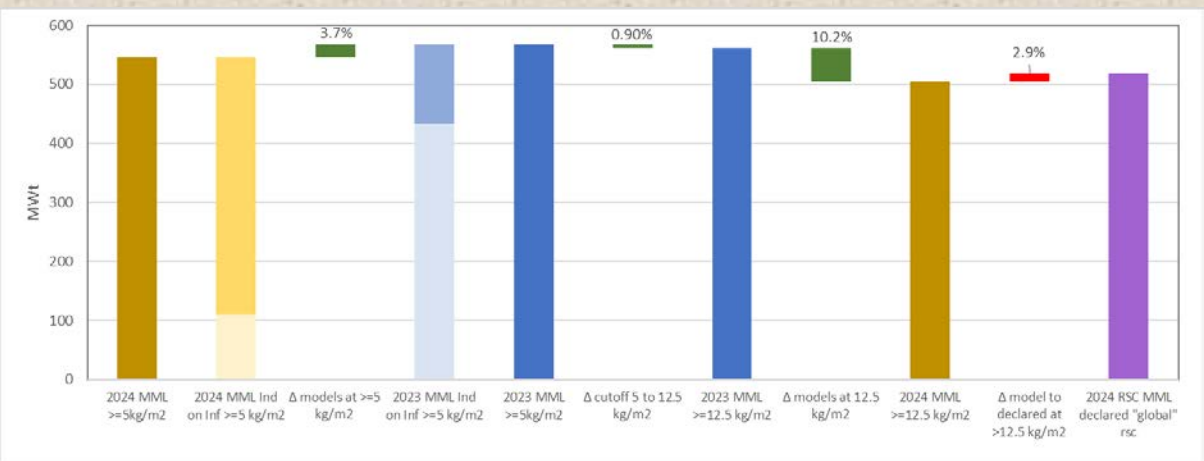
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Polymetallic nodules have been explored in the Cook Islands since the 1960s, with mineral inventory estimates dating back to the 1990's. More recently, these data have supported formal Mineral Resource Estimates (MREs) prepared under internationally recognised reporting frameworks. The first publicly issued JORC-compliant MRE covering the known Cook Islands polymetallic nodule deposit was completed in 2023, followed by a more detailed MRE within the EL3 exploration licence area in 2024.

This study reconciles the overlapping portions of the 2023 and 2024 resource models to examine how the estimated resource changed as exploration information and geological understanding improved. The two models were developed using broadly similar geostatistical approaches, but differ in sampling density, block size (~1/10th the size in 2024), geological domaining and treatment of seabed slope. The 2024 model also incorporated substantially more detailed bathymetric, geological and exploration information and consequently classified a much greater proportion of the resource at an Indicated rather than Inferred level of confidence.

Reconciliation on a common basis shows that the overall estimate is remarkably consistent between the two generations of modelling. At an abundance cut-off of 5 kg/m², estimated tonnage differs by only about 4%, although differences increase at higher cut-offs as the finer resolution and sharper geological domaining (change of support) of the 2024 model become more significant. The 2024 model also reports slightly higher metal grades which may reflect improved laboratory practices regarding minimization of hygroscopic effects in pulps.

The comparison demonstrates an important feature of progressive mineral-resource evaluation: additional exploration does not necessarily substantially change the overall estimated quantity of mineralisation, but can significantly improve where it is understood to occur and the confidence with which it can be estimated.



Reconciliation of estimated polymetallic-nodule tonnage between the 2023 and 2024 resource models, illustrating the effects of model refinement and abundance cut-off on the resulting estimates.

Seafloor Mapping Training for South Pacific Regions

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Small Island Developing States across the South Pacific increasingly need in-house skills to map, monitor and manage their coastal and offshore resources. In November 2026, the Circum Pacific Council and Integral Corp. partnered with Fiji's Mineral Resources Department (MRD) and the Fiji Hydrographic Service to host a two-day multibeam echosounder (MBES) training workshop in Suva. The goals of this training were to provide easy-access to first order theory, skills, data interpretation and application strategies that South Pacific communities can use to engage with seabed mapping efforts, and assessment of critical mineral resource areas. Day 1 of this training was coordinated in the classroom, focused on the full mapping workflow: acoustic principles, acoustic mapping systems, positioning and calibration, survey planning, acquisition, processing, and interpretation for hazards, resources and benthic habitats. On Day 2, participants collected data aboard a MRD vessel in Suva Harbour, an urban sea system. Participants left with training materials and practical experience they can build on. We will present the workshop design, outcomes and lessons learned. We also describe how this pilot can become a model for capacity-building workshops across the region.

US Government Activity for DOM Development in the Pacific

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U.S. government survey operations throughout 2026 and 2027 are systematically targeting primary critical mineral deposits, deep-water environments, and marine infrastructure baselines across the Central and Western Pacific Islands. Facilitated by agencies like the National Oceanic and Atmospheric Administration (NOAA), active deep-water mapping tracks and seafloor acoustic characterization are focused heavily on the U.S. Exclusive Economic Zone surrounding American Samoa. Additional targeted sonar mapping, environmental DNA (eDNA) sampling, and sub-seafloor profiling span the remote ecosystems of Jarvis Island, Palmyra Atoll, Kingman Reef, Johnston Atoll, and the Hawaiian Islands to evaluate benthic health and map potential critical mineral reserves.

Further west, airborne and maritime hydrographic tracking is establishing foundational engineering and ecological data to map infrastructure feasibility and coastal vulnerabilities. Multi-instrument survey platforms—including uncrewed vehicles, saildrone, and mapping aircraft—are operational over the Mariana Islands, the main islands of Yap State in the Federated States of Micronesia, and key choke points near the Solomon Islands and Kiribati. These operations establish localized geographic and seafloor baselines used to determine grid stability, design deep-sea telecom cable pathways, and assess port facilities, fuel pipelines, and coastal storage vulnerabilities in nations such as Tonga, Vanuatu, and the Marshall Islands.

Specific Minerals of Interest include:

- Polymetallic Nodules: These potato-shaped rocks rest loosely on the abyssal plain at extreme depths of 4,000 to 7,000 meters.
- Cobalt-Rich Ferromanganese Crusts: These form metallic encrustations on the hard rock surfaces of underwater seamounts at depths ranging from 600 to 7,000 meters.
- Seafloor Massive Sulfides: These mineral deposits accumulate around volcanically active hydrothermal vents, precipitating out of superheated fluids bursting from the ocean crust.
- Marine Phosphorites: These sedimentary layers typically form in shallower shelf and slope environments at depths under 1,000 meters

This presentation will briefly describe the planned activity including maps, timelines and some of the current planned technologies to be applied.

Introduction of DSM in SIDS Region (2026)

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Today, United Nations "Law of the Sea Applications" manages 162 Coastal States' (Coastal and/or International Lakes) Exclusive Economic Zone (EEZ) Waters (approx. 169,529,000 km2 (Geodetic), and up to 88 Coastal States' Extended Continental Shelf (ECS) claimed Waters (approx. 37,000,000 km2 (Geodetic). This represents 207,029,000 km2 (Geodetic) or 57.1% of the Worlds Maritime Waters. Among other seabed natural resources (i.e. Hydrocarbons), these Global Marine Waters' have also recently become a serious consideration for future seabed critical minerals. Regional Asia Pacific has some 25 individual Countries (Coastal States) all following the Rules of Procedure outlined in the Law of the Sea (LoS) Technical Guidelines. This presentation will focus on the following specific nations and territory: Fiji, Cook Islands, Tonga, Vanuatu, and American Samoa.

This presentation will offer the latest updated status for Asia Pacific States' Law of the Sea (LOS) applications, for (i) Territorial Sea Baselines (ii) Legal Maritime Limits (iii) Maritime Boundaries (resolved and/or unresolved) and (iv) ECS Submissions (United Nations (CLCS)) with specific emphasis on current Seabed Resources (i.e. Seabed Mining and Gas Hydrates and/or new (future) potential areas of Interest), including summarizing current status, and what is still to be completed. Specifically, when considering Seabed Mining, High Seas Seabed Mining Activities were solely managed by the International Seabed Authority (ISA). Recently, the USA started to look themselves, offering their own program ((thru Deep Seabed Hard Mineral Resources Act (DSHMRA)). Of particular interest and potential urgency will be the recognition of any recent or near-term impacts related to Global Climate change and sea-level rise, and the urgency Coastal States' need to finalize work on planned Territorial Sea baseline creation. Globally, this specific subject and concern has become a primary driver in accelerating the process to get the work done to complete all LOS applications.

From Ridge to Reef: Connecting Land and Marine Data for Pacific Hydrospatial Decisions

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Pacific communities face risks that connect catchments, rivers and coastal waters, yet the information used to understand these environments often remains fragmented. Separate survey programmes, inconsistent reference systems and limited data access constrain flood modelling, coastal infrastructure planning and climate resilience.

Drawing on Kahuto Pacific's survey experience in Fiji and the wider Pacific, this presentation examines how airborne LiDAR and hydrographic surveys can support a connected hydrospatial framework. It focuses on survey control, verified relationships between terrestrial heights and marine tidal datums, and documented uncertainty. Individually accurate datasets can remain incompatible without these foundations.

The presentation also explores the Moana Data Service approach to making survey information discoverable and reusable beyond its original project. Common standards, clear custodianship and practical access arrangements enable agencies to use shared evidence across catchment and coastal management.

Lessons from remote survey delivery highlight the contribution of local operators, community knowledge and specialist partnerships to developing Pacific technical capability.

The presentation proposes coordinated investment in reference frameworks, data stewardship and local expertise to turn separate surveys into trusted information for decisions across the land and ocean.

Integrating Net Ecosystem Values into Coastal Hazard and Climate Adaptation Planning

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Coastal planning and adaptation increasingly requires approaches that account for the ecological, cultural, and economic functions of coastal systems, rather than relying solely on asset-based assessments. This presentation outlines the **Net Ecosystem Value (NEV)** framework, a spatially explicit method for quantifying ecosystem condition, service provision, and system vulnerability across coastal environments. NEV integrates biophysical indicators, geomorphic processes, and socio-economic dependencies to identify where changes in ecosystem function may influence community exposure, resilience, or long-term management outcomes.

The framework incorporates measures of ecosystem connectivity, functional performance, and climate-related pressures to provide a more complete representation of coastal system behaviour. NEV has been applied in multiple settings to examine how ecosystem decline or modification affects coastal processes and the distribution of benefits and risks.

The analysis is supported by a digital environment that brings together monitoring data, remote sensing, model outputs, and local knowledge to enable consistent assessment and scenario exploration. This environment allows users to examine how alternative management actions or future climate conditions influence ecosystem value and system performance.

Case studies from the Torres Straits can be applied in a Pacific island context and illustrates how NEV can highlight dependencies not captured in traditional assessments, identify areas of declining resilience, and support transparent evaluation of management options. The presentation focuses on the NEV methodology, data integration approach, and insights gained from recent applications, demonstrating how ecosystem-centred valuation can inform coastal planning, adaptation, and investment decisions.

Better GeoData in marine and coastal environments leads to better decision making when the value of the environment is better understood.

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Fiji Earthquake Information Dissemination System (FEIDS): Accelerating Earthquake and Tsunami Information Dissemination in Fiji

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Timely dissemination of earthquake and tsunami information is essential for effective emergency communication in Fiji. Manual preparation of information products can delay communication when rapid updates are needed. The Fiji Earthquake Information Dissemination System (FEIDS) was developed to streamline this process and support operational staff.

FEIDS is a Python-based application that uses operator-entered earthquake parameters to generate standardised earthquake and tsunami information bulletins. It automatically generates earthquake location maps using PyGMT and incorporates results from Tsunami Travel Time (TTT) software to present estimated tsunami arrival times for coastal locations throughout Fiji. By combining bulletin preparation, automated mapping and TTT outputs, FEIDS reduces repetitive tasks and improves consistency across information products.

The developer reports a reduction in information preparation and dissemination time from approximately 15 minutes to less than one minute once the required earthquake parameters and TTT results are available. These times refer to the dissemination workflow rather than the time elapsed since earthquake occurrence.

This presentation describes FEIDS development, operational workflow, automated mapping and integration of TTT results. It demonstrates how locally developed software can strengthen national capacity for timely earthquake and tsunami communication.

A Pictorial Chronology of Home Reef: Tonga's Currently Most Active Volcano

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The Home Reef volcano is an isolated submarine stratovolcano located on the Tofua Volcanic Arc between Tofua and Late and is currently Tonga's most active volcano. It is considered a submarine volcano; however, it has often produced submergent activity that has resulted in ephemeral islands being formed. It has experienced six documented periods of activity since the early 1800s and is currently experiencing a period of emergent activity that has resulted in an island being formed. Due to its isolated location further periods of activity may have occurred but have not been observed and hence were unreported. One such period of activity was occurring in mid-1990 when aerial photographs were being taken.

The current period of activity was first observed in early- September 2022, with more or less continuous activity occurring to date. This eruption has produced substantial island that is composed primarily of lava. This period of activity has been monitored primarily by satellite, with an expedition being conducted in November 2025.

This presentation will, following a general introduction to historic activity of Home Reef, provide a pictorial summary of the current eruption with images and other date being drawn from a number of sources.

Environmental DNA Reveals Habitat-scale Structure of Coastal Fish Communities in Rakiraki, Fiji

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Environmental DNA (eDNA) metabarcoding offers non-invasive surveys of coastal fishes. In March 2026, we filtered 18 one-litre seawater samples off Rakiraki from three habitats (a coral-rich reef, a reef passage and a river mouth; two sites each, three transects per site) and recorded benthic cover on each transect. MiFish metabarcoding detected 190 fish taxa from 45 families, including three candidate new records for Fiji. Total richness estimated from detection frequencies (Chao2) was 284, so about two-thirds of detectable taxa were found. Richness per sample was highest in the passage and lowest at the river mouth, and was unrelated to hard-coral cover. Communities were more dissimilar between habitats than within them, mainly through species replacement, and gobies characterised the sandy river mouth. Fish composition tracked differences in benthic cover among sites but not among transects tens of metres apart, and nearby sites with different substrates were more similar than distant sites with similar substrates. eDNA appears to reflect fish assemblages beyond the transect scale. This study shows eDNA's potential for resource monitoring in Fiji and the need for several samples per site and more sites per habitat, as single samples missed many taxa and sites within a habitat differed in composition.

Layered Seabed Intelligence from Space, Air and Sea for Pacific Urban Sea Systems

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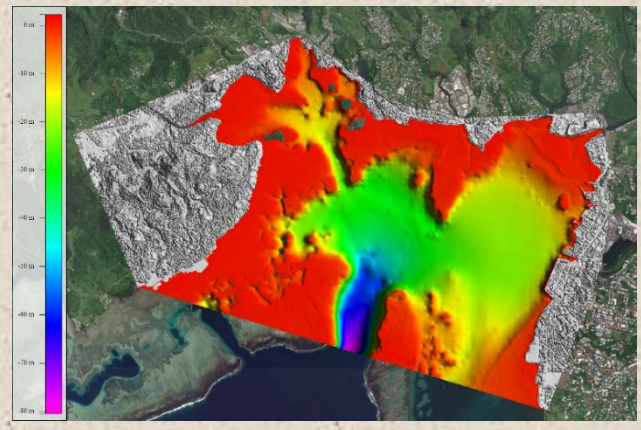
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Pacific Island nations steward some of the world's largest ocean territories, yet much of their coastline, reefs and seafloor remain unmapped to modern standards. Sustainable management of energy, mineral and marine resources depends on an understanding of the seabed; however, no single technology can provide the coverage, efficiency and resolution required across these vast maritime domains.



This presentation demonstrates a layered seabed intelligence approach integrating Satellite-Derived Bathymetry (SDB), Airborne LiDAR Bathymetry (ALB) and hydroacoustic surveys from the coastline to the deep ocean. SDB provides cost-effective coverage across extensive shallow waters and remote atolls, ALB bridges nearshore, reef and intertidal environments, and hydroacoustic surveys deliver high-accuracy mapping in deeper and more complex settings.

Together, these complementary datasets support evidence-based management of Pacific urban sea systems. Applications include maritime safety and navigation, renewable energy planning, submarine cable routing, port development, marine spatial planning, maritime boundary definition, resource assessment, climate resilience and risk management, and marine conservation.



Regional case studies highlight how integrated seabed mapping enables Pacific nations to prioritise survey investment, address critical knowledge gaps and strengthen decision-making. The value of these data is further amplified through open data initiatives, including industry contributions coordinated through the Ocean Decade Corporate Data Group, the Seabed 2030 Project, and collaborative programmes such as AusSeabed. These initiatives improve data accessibility, reduce duplication of effort, and maximise the value of hydrospatial intelligence for sustainable ocean management.

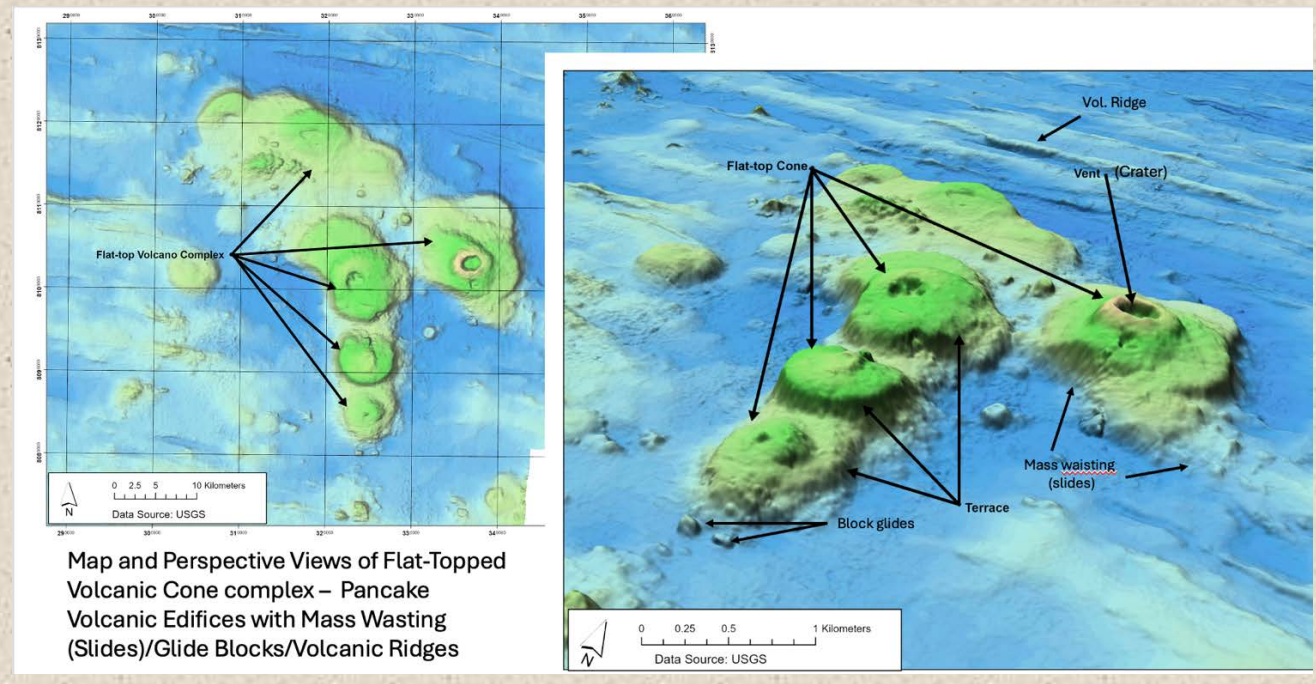
Lava Puddles and Flat-Topped Volcanic Cones of the American Samoa Abyssal Plain

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Pancake-like volcanic edifies scattered around the abyss of the Western Samoa EEZ attest to the type of volcanism that has occurred in the region during the past 100 or so million years. Initial interpretation of recently publicly released Multibeam Echosounder (MBES) bathymetric and backscatter data by the U.S. National Oceanic and Atmospheric Administration (NOAA) collected within the EEZ reveals a region of past intense rifting and volcanism. Some flat-topped cones appear to be aligned along rifts while others are isolated within the wide expanse of the abyssal plain. These edifices represent a shield stage volcanic development most likely constructed by continuous extrusion of viscous tholeiitic basaltic lava as described by Clague and others (2000) of similar features along the Hawaiian chain of volcanic islands. The crest and flanks of these cones vary from circular flat with a central mound, to circular flat with one or more pit-like craters, to simi-circular flat terraced stepped features. We describe an advance GIS methodology in identifying and mapping these and other edifices, geologic structure, and sedimented cover lava ridges.



Map and Perspective Views of Flat-Topped Volcanic Cone complex – Pancake Volcanic Edifices with Mass Wasting (Slides)/Glide Blocks/Volcanic Ridges

Using Airborne Electromagnetics to Guide Groundwater Drilling in Fiji

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Finding reliable water sources remains a challenge for many rural and maritime communities in Fiji, especially during prolonged dry periods. At the Mineral Resources Department (MRD), we are using airborne electromagnetic (AEM) survey data to help identify groundwater drilling targets under Fiji's Groundwater Assistance Programme. This presentation shares our experience of using these data to guide drilling decisions and support communities needing a dependable water supply.

Completed in 2025 through collaboration between MRD, Geoscience Australia, the Pacific Community and Australia's Department of Foreign Affairs and Trade, the survey provides information on subsurface electrical conductivity across selected areas of Viti Levu, Vanua Levu and Taveuni. Our Hydrogeology team uses this information together with geological maps, existing borehole records, ground geophysical surveys and observations made in the field. We also consider local knowledge, community needs, land access, terrain and how water could be supplied from the borehole to the community.

We have used AEM data to guide the selection and drilling of multiple groundwater targets. Through examples from our drilling programme, this presentation shows how we interpret the data, select sites and compare our interpretations with what we encounter during drilling. These experiences are helping us better understand where AEM can support groundwater investigations and where further field assessment is needed. Pumping tests and water-quality assessments remain essential to confirm how much water each borehole can reliably provide and whether it is suitable for the intended supply.

AN ODYSSEY: Captain Cook to Doctor Bob

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Cartographer

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"The farther backward you can look, the farther forward you can see"

The odyssey begins with Captain Cook and his voyages of discovery. Cook's first voyage was in 1769 with the aim of establishing an observatory at Tahiti in order to record the transit of Venus. The second aim was to record natural history, led by 25-year-old Joseph Banks. The final secret goal was to continue the search for the Great South Land.

The odyssey continues highlighting significant events and the technology of the day. For example, Geranium was a major technology change in the 1920s; a survey ship fitted with a seaplane.

Then, the Benson and Bigot story is amazing; preparation of a momentous day. At this point we witness arguably the most transformational changes in technology and outcomes here in the South-West Pacific.

More recently, the past two decades have highlighted the Blue Economy, contemporary threats to security, and challenges in embracing a Geographic Information Infrastructure.

This presentation takes us on an odyssey; reviewing past initiatives, discussing a capability development strategy and predicting future capabilities in our profession.

The odyssey reveals the enduring nature of the engineering characteristics of surveying and charting and the sciences of geodesy and cartography.

So, now it's time to review visionary systems with autonomous assets, replay past events and model future events, and introduce avatars (Dr Bob).

Finally, we need to consider the knowledge and skills of the hydrographer of the future.

Connected Urban Sea Systems: Transforming Science and Engineering Data into Decisions for Pacific Resource Security

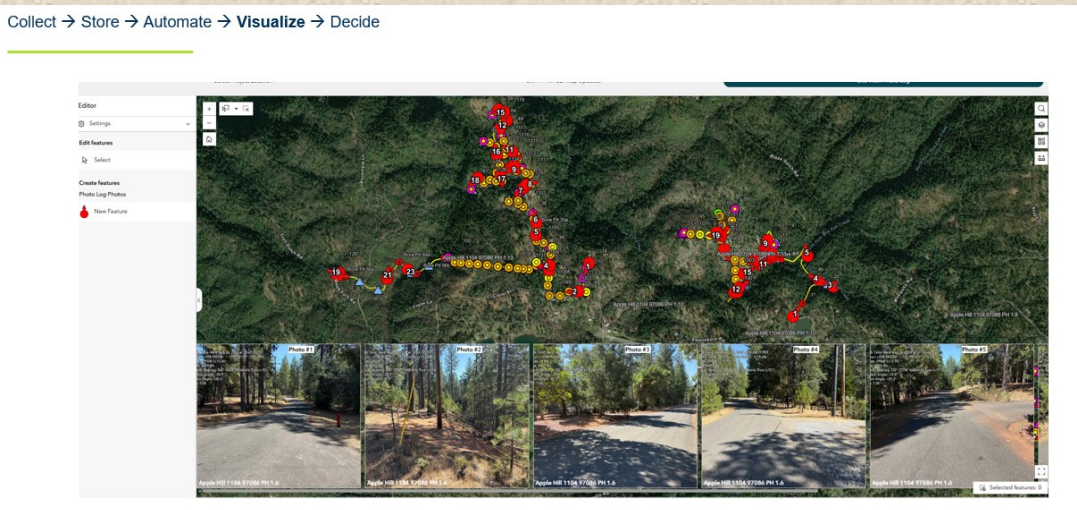
Holly Woytak[1], Brian Frantz[1], Luke Swanson[1]

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Pacific Island nations face a uniquely interconnected challenge in securing energy, minerals, geo-resources, infrastructure, and coastal environments within rapidly changing urban sea systems. Verdantas brings together environmental and biological science, engineering, geospatial and hydrospatial technologies, surveying, remote sensing, resilience planning, and digital solutions to assist communities in understanding these interconnected systems and translate information into defensible, locally driven decisions.

A key component of this approach is Wingspan, Verdantas' configurable georeferenced digital operations platform, which connects field observations, GIS workflows, automation, environmental and infrastructure data, reporting, images and decision-support tools into one combined environment. Wingspan integrates technologies such as Survey123, Field Maps, ArcGIS Dashboards, Power Automate, SharePoint, and other enterprise systems into a connected digital workflow that can be configured around an organization's specific operational and decision-making needs. This flexibility allows Wingspan to support a wide range of programs, including stormwater, utilities, inspections, asset management, and other field-based operations. When applied to Pacific urban sea systems, this unified approach can support coastal and port infrastructure, marine and mineral resource characterization, environmental monitoring and climate resilience. Verdantas seeks to collaborate with Pacific Island nations and regional partners to strengthen sovereign access to information and create resilient, sustainable pathways for managing energy, mineral, and geo-resources critical to Pacific communities.



Example of mapped features and associated images of targeted areas in the field aiding in visualization and informed decisions. Source: Verdantas