WORLD HYDROGRAPHY DAY SEMINAR

Jonathan Chuhairy, Sophie Clayton, Robbie Greene, Emily Tidey

Before the S+SNZ conference in Dunedin this year, a day of workshops including a hydrography seminar were hosted at Te Kura Kairūri, the School of Surveying. The annual World Hydrography Day Seminar is supported by the New Zealand Region (NZR) of the Australasian Hydrographic Society (AHS) in conjunction with the S+SNZ Hydrography Professional Stream (HPS). This year we hosted more than 40 attendees including eight students, who were sponsored to attend, and present or to report back here with a summary of the day.

Four Years in Five Minutes – Jett Ganaway, Otago student

Jett, a BSurv (Hons) finalist, shared his experience and perspective of the Bachelor of Surveying degree over the past four years. He described the characteristics that one would typically expect of a School of Surveying graduate. He painted the picture of someone who is hardworking and motivated, with solid theoretical knowledge and appropriate practical experience, and most importantly, someone who has had valuable life experience. These attributes set graduates up to succeed in their profession. Jett explained the constraints faced by aspiring hydrographic surveyors in the School of Surveying, with only two hydrographic papers available every second year. He suggested this lack of exposure could be a reason why the final hydrographic paper, SURV452, has a reasonably small class of 10. He also identified that one could be sure that the students who take up SURV452 are passionate and committed towards the subject.


Jett's presentation. Photo: S. Clayton

The Role of Multibeam Sonar in Reconstructing Lake Tsunamis Across Te Waipounamu – Katie Hughes, Victoria University/Otago University student

Katie presented her PhD research on lake tsunamis. These events can be particularly devastating due to the concentration and amplification of waves compared with ocean tsunamis. Notably, many of Te Waipounamu, the South Island's lakes are close to the Alpine Fault, potentially placing communities and infrastructure at high risk of tsunamis. Katie identifies past tsunamis using a combination of LiDAR and MBES (multibeam echosounder) to find steep areas within or near water bodies that show evidence of past landslips and deposits. Core samples are taken from these areas to date them, and models created to identify high-risk areas. There are very complex physics involved in modelling lake tsunamis, requiring high-resolution bathymetric data. To achieve this resolution, the project

has been using MBES with compressed high-intensity radar pulse (CHIRP). Te Waipounamu's lakes are currently under-surveyed, making it more difficult to create models that correctly identify high-risk areas.
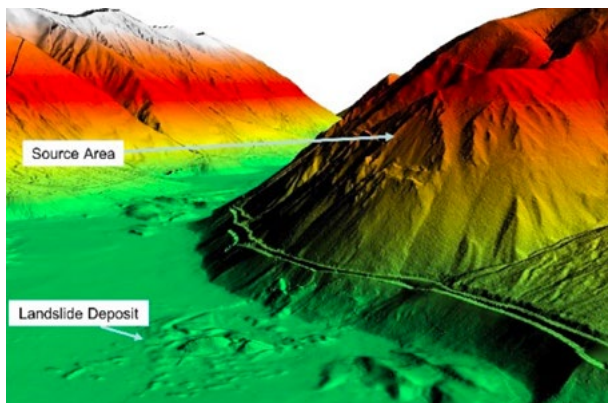
Katie showed some incredible data from her surveys of lake beds. Photo: S. Clayton, Image: K. Hughes

MBES Bathymetry and Derivatives in Species Distribution Modelling – Ella Westenberg, Otago student

Ella is a fourth-year marine science honours student who has been using MBES bathymetry data to research the distribution of blue cod around the south-eastern parts of Banks Peninsula. Ella has been using LINZ MBES data gathered for the Iongairo project, which is a partnership between the Department of Conservation, ECan and the University of Otago to undertake backscatter analysis and habitat classification. Classifications were dictated based on things like depth, rugosity and slope, as well as the basic flora and fauna in the area. Fish density data was gathered by deploying baited video cameras for 30 minutes and counting the species observed. Poor visibility often made it challenging to identify fish species. Blue cod are an important species to New Zealanders in a customary, recreational and commercial context. Ella's research is providing important insights into what drives the abundance and distribution of the species in the area.
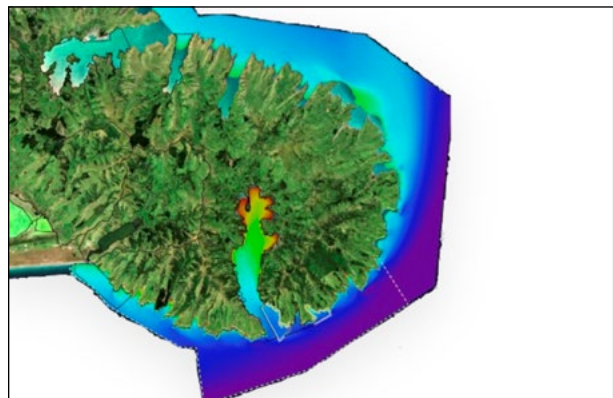
Banks Peninsula dataset that Ella is working with for the Iongairo project. Photo: S. Clayton, Image: LINZ/ECan

Line Planning for the DriX USV – Duncan McRae, Sulmara

Duncan joined the session remotely to provide a live demonstration of his workflow for line planning for the DriX USV (uncrewed survey vessel). Once the client provides the necessary information about the survey area or targets, different software tools are used to determine the run lines before sending them out remotely to be executed by the DriX. Since USVs predominantly operate on latitude and longitude, it is often necessary to apply the appropriate coordinate conversion if it hasn't been done earlier in the workflow. The DriX software provides the final stage where line spacings and directions can be precisely specified for the DriX to follow during the survey. This spacing will be determined by factors such as water depth, required resolution and instrument frequency. During his presentation, Duncan demonstrated the remote capabilities of a DriX located in Taiwan, including showcasing live radar, camera and MBES data feeds.
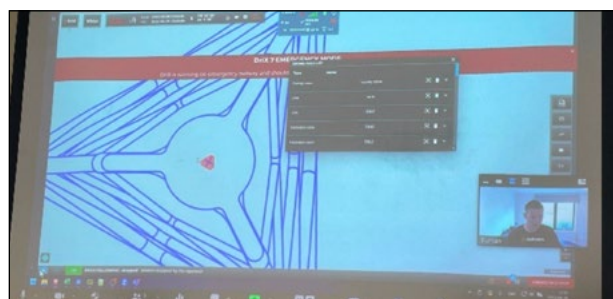
Duncan demonstrates issues with line planning around wind turbine generators using the DriX USV. Photo: S. Clayton

Focus on the Vessels that Matter – Dr Dave Kelbe, Starboard Maritime Intelligence

Dave is a senior data scientist at Starboard Maritime Intelligence, a company dedicated to assisting nations in addressing complex maritime challenges through state-of-the-art surveillance solutions. The existing surveillance tools that have been in place are ineffective due to the scattered nature of the relevant information making it difficult to consolidate and analyse. Starboard aggregates data from many different sources, including satellite synthetic aperture radar (SAR) and photography, sea surface temperature (SST) data, bathymetric data, government regulations, and vessel lists and registries. This data is integrated with automatic identification system (AIS) data through intricate algorithms and machine learning, enabling a comprehensive analysis that paints a clear and intuitive picture of maritime activities within a given area. Starboard's product is allowing national authorities to filter through vast volumes of data and identify those exhibiting behavioural patterns indicative of harmful activities such as illegal fishing, drug trafficking or posing biosecurity concerns.

Dave Kelbe presents on Starboard Maritime Intelligence. Photo: S. Clayton

After the AHS AGM, there was an awards presentation to recognise a multitude of achievements. This year there were two recipients of the Australasian Hydrographic Society Annual Education Award, of A$3500: Katie Hughes from Victoria University/University of Otago for her research on lake tsunamis and the use of hydrographic techniques for analysing these. The other recipient was Emily Harrex from the University of Otago for her research project, which addresses diversity within the hydrography field. There were two AHS Order of Merit awards received by Gary Chisholm (more than 20 years of work for the AHS) and Kevin Smith (previous past NZR Chair and AHS Awards Chair) for their service to the industry. Bevan Waller from DML was presented with his AHSCP Certified Professional Hydrographic Surveyor Level 1 certificate. DML also introduced its

inaugural Hydrographic Surveying Scholarship and awarded this to Ryan Slattery from the University of Otago. Ryan plans to undertake an honours project focusing on research around low-cost GNSS tide-buoys in 2024. It was great to see the range of award presentations – from career-long recognition to students starting out. Mīharo!

Award recipients: Kevin Smith (AHS Service Award), Emily Harrex (AHS Education Award), Bevan Waller (AHSCP Level 1 certification), Gary Chisholm (AHS Service Award), Ryan Slattery (Inaugural DML Student Scholarship), Katie Hughes (AHS Education Award). Photo: S. Clayton

Benthic Terrain Modelling of the South-Western Hauraki Gulf: Habitat Identification and Human Impacts – Sam Davidson, NIWA

Sam 'Zoomed in' to discuss the drivers behind habitat mapping and how MBES allows us to quickly and affordably map benthic habitats. He walked us through the process of data collection, the survey outputs and geospatial derivatives focusing on DTM classification. An example area from Survey HS52 in the Hauraki Gulf was presented, highlighting features such as tilted parallel rock units, depressions and pockmarks, seafloor rugosity and substrate variability and how these present in data. The human impacts were also evident through linear scours and feathering marks from anchors as well as some exposed pipeline. Sam also spoke to us about how this geospatial data is presented through the use of public story maps which allow users to investigate various features.


A cluster of rounded depressions which may be indicative of relict or active fluid seepage and may act as sites of sensitive ecosystems. A pipeline can also be seen immediately to the northwest of the pockmarks. Image: NIWA

Vertical Control Case Study (GNSS Tides): Port Underwood Survey – LTCDR Paul Trudgian, RNZN

Paul presented vertical control work carried out by the RNZN (Royal NZ Navy) for the Te Whanganui/Port Underwood Survey. The RNZN usually works on rapid data turnover projects but has the capability of completing surveys to support LINZ and national objectives too. This survey came with some challenges due to the area having complex geography, and as such, GNSS tide buoys and pressure sensors were used to collect water level measurements. The GNSS data was post-processed using a GeoNet CORS station and a Tidal Analysis Software Kit (TASK) was used to derive 26 harmonic constituents. The tidal model was used to determine the lowest astronomical tide referenced to the ellipsoid. Paul also discussed the need for a separation model to be developed as this area has a complex terrain and would likely require a third tide gauge to confirm.
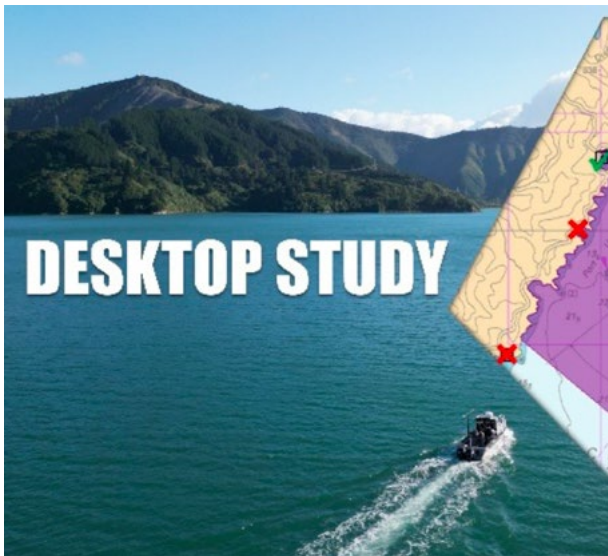
Paul's slide indicating potential sites for tide gauges for the project. Image: P. Trudgian

Unmanned Surface Vehicle: Interferometric SSS – LTCDR Robin Kuhn, RNZN

Robin's presentation focused on two pieces of equipment used by the RNZN: the unmanned surface vehicle MANTAS T12 and the side scan sonar PING DSP 3DSS-iDX-450 which is mounted on the MANTAS T12. The MANTAS T12 is a small USV (uncrewed surface vehicle) which has a maximum speed of 35 knots and a 30cm draught, giving it a very sleek appearance. It is predominantly used for experimentation work at this stage and one of the benefits is its ability to manoeuvre easily in shallow waters due to its shallow draught. The PING DSP 3DSS-iDX-450 side scan sonar mounted on the MANTAS T12 produces high-quality swath bathymetry and 3D side scan imagery. It allows for real-time corrections and outputs very clean data, making it a valuable piece of equipment for the RNZN's hydrographic survey operations.

A photo of the Maritime Tactical System MANTAS T12 in the water (foreground) and Robin presenting. Photos: R. Kuhn, S. Clayton.

HMNZS Manawanui Capabilities – LTCDR Matt Gajzago, RNZN

Matt presented on the new naval vessel, HMNZS Manawanui. The 85-metre, 5741-tonne vessel has two RIBs for boarding operations and custom patrols, a dive team with compression chamber and a helicopter pad. It is able to provide support to advance force operations and has salvage capabilities of up to 1000m depth and 100t, with up to 450t cargo on board, which is new to the RNZN. It also has a remotely operated vehicle which operates to a depth of approximately 1000m and works alongside the onboard crane for salvage missions. The vessel uses dynamic positioning system and has hydrographic surveying capabilities. The HMNZS Manawanui provides fast turnaround on survey data to enable ports to reopen after disasters and operates predominantly around New Zealand, but also around the Southwest Pacific up to Hawaii.


Matt presents the capabilities of the HMNZS Manawanui. Photo: S. Clayton, Image: RNZN)

Seabed 2030 and the Challenge to Map the World's Oceans. How Can You Make a Difference? – Belen Jimenez Baron, NIWA

Initiated in 1903 by Prince Albert I of Monaco, the General Bathymetric Chart of the Ocean (GEBCO) has had several versions, released many decades apart. Fully mapping the sea floor is vital to understanding and sustainably managing our oceans. The mapping was initially run by volunteers, but in 2017 the Nippon Foundation partnered with GEBCO to launch the Seabed 2030 Project. Despite appearing to be fully mapped in many places, most of the sea floor uses modelled depth information. Seabed 2030 is now at 25% coverage. Collecting data for the remaining 75% requires the contribution of hydrographic authorities, corporations and

recreational mariners. Surveying companies such as Fugro have been involved in data collection while in transit. But anyone can take part: Belen showcased a device that allows any vessel with an echosounder – even recreational vessels – to gather depth soundings and the associated metadata to contribute to Seabed 2030.
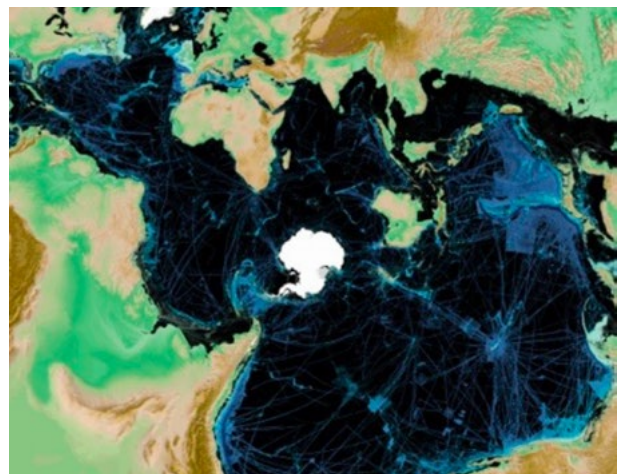

Belen shows the audience the small sensor that can be installed on vessels to collect depth data for Seabed 2030 and an image showing how it's all just 'one ocean'. Photo: S. Clayton, Image: Seabed 2030

Technician to Undergraduate: A Professional Development Journey Within the Hydrographic Industry – Ryan Slattery, Otago student

Ryan formerly served in the Royal New Zealand Navy as a hydro technician for seven years. Starting in 2013, he gained nautical charting experience and was involved in UXO (unexploded ordinance) searches as well as work with NZ Police. More recently, Ryan joined the School of Surveying | Te Kura Kairūri to complete a Bachelor of Surveying (BSurv) and is now in his third year of studies. The BSurv has supplemented Ryan's field experience with background theoretical knowledge giving him a more complete view of hydrographic surveying. Ryan is the inaugural winner of the DML Hydrographic Surveying Scholarship for 2024.
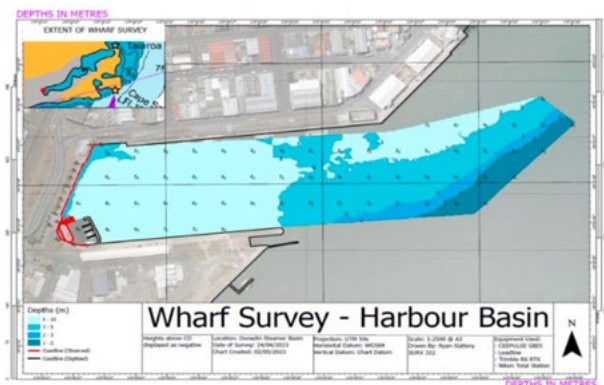
Ryan showed some of the work he has undertaken at university, including this chart of Harbour Basin. Image: R. Slattery

Breaking Waves: Understanding the Barriers that Prevent Women from Pursuing a Career in Hydrography – Emily Harrex, Otago student

Emily, a final-year student in the BSurv programme, conducted research inspired by the IHO's Empowering Women in Hydrography project. Her study focused on investigating and understanding barriers preventing women from pursuing a career in hydrography in the Southwest Pacific region. Data collection methods included literature research and questionnaires. Findings from the questionnaire interestingly contradicted barriers cited in her background research, revealing that a lack of information regarding the profession in educational institutions as well as little to no public examples of women working on the job as the biggest barriers. Respondents suggested that increasing knowledge of the profession is vital to attract more women to a career in hydrography.
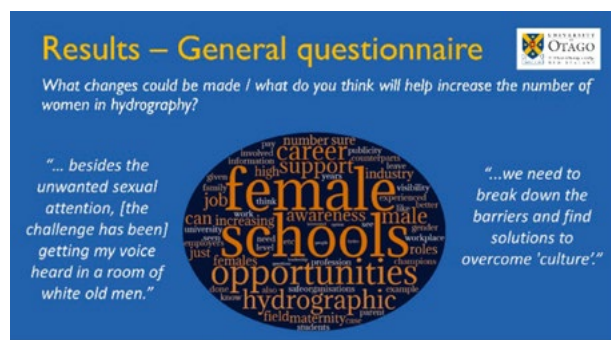
Emily in a 'standard-sized' immersion suit, and some of her findings. Photo: E. Tidey, Slide: E. Harrex

Navigating New Horizons: Pushing Integrated Technology's Boundary – Alex Waugh, Fugro

Alex Waugh, Fugro New Zealand's country manager, talked about some of the jobs and technologies that Fugro has been involved with in New Zealand and Australia. The New Zealand team recently conducted positioning services to complete the decommissioning of an old offshore floating production storage and offloading (FPSO) station in the South Taranaki Bight. Multibeam surveys were conducted before and after the recovery of the 13mm anchor wires. He then described some multibeam systems being used in unconventional situations. Other technologies showcased included Fugro Adelaide's airborne LiDAR bathymetry system and Perth's Remote Operations Centre (PROC), as well as continual development of USVs in other Fugro offices.
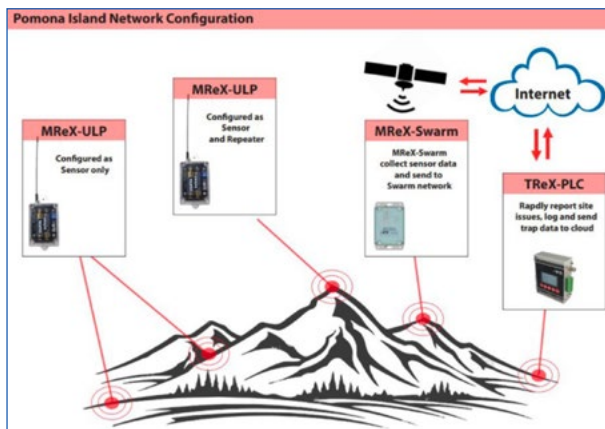

Alex's presentation. Photo: S. Clayton

An Easier Way to Get MetOcean Tidal Data Back from Field Sensors Using IoT – Gary Chisholm

Gary Chisholm, a former university graduate who managed Trimble Marine for 35 years spoke about using the internet of things (IoT) in surveying applications. Recent technological developments have allowed the deployment and use of low-Earth orbit satellites manufactured by Swarm. A significant portion of the technology used is New Zealand-sourced, including Rocket Lab launches and the satellite tracking station in Bluff. The satellites allow

data streams to even the most remote places, however, the current network still results in two to three-hour data gaps due to their polar orbits resulting in fluctuating satellite availability. Gary presented a case study where the technology is used to monitor rat traps placed in Pomona Island, in the middle of Lake Manapouri. The technology has also been used in Australia to place river flow gauges in remote areas.

After a busy and informative day, the hydrography team retired to Ombrellos restaurant and bar to continue discussions into the night. Thanks to the NZR AHS for its continuing generous sponsorship of student participation, the School of Surveying for hosting (congratulations on the 60th anniversary), sponsors DML, Fugro, NIWA, and Ocean Infinity, and the organisers of this excellent event. We look forward to meeting again next year.

The Pomona Island Network Configuration set up by Gary.
Slide: G. Chisholm, Photo: S. Clayton

Participants at the Hydrography Day Seminar. Photo: S. Clayton