

2021 Alaska Coastal & Ocean Mapping Summit Q&A

Day 1

Q: Christina: Jackie, did you say Mukowski's transcript will be available to us online?

A: Yes it will, along with the other summary documents of this summit.

Q: Joel: Thanks Juliana - Your agency represents the pins in our maps!

Q: Anne asks NOAA: At some point will there be integration with Canadian Datums?

A: Stephen: NOAA is definitely collaborating with the Canadian government. As you move into the definitions of water level, specifically tidal, their definitions are different and this creates some challenges for us. On another note, the Great Lakes datum we are definitely communicating and collaborating with the Canadians, to have this update.

Q: Peter asks JALBTCX: How do you choose which areas to survey?

A: Chris: We started by using the results of the 2019 Prioritization Survey and then engaged with various Federal and State stakeholders as well as looking at needs shown in SeaSketch. We combined that with a feasibility estimate based on weather and water clarity. We look forward to the results of the next prioritization survey.

Q: When would the topobathy from this past summer be publicly available?

A: End of 2022. Wrapping up field season now and will get data collections queued up for post-processing.

Q: Where can I find a copy of the Implementation Plan for providing public comment?

A: The Federal register notice provides a link to the document along with instructions for providing public comment.

Q: A list of all the websites from the chat should be put into a single document.

A: We will be compiling a list of all those hyperlinks and making it available as part of the overall summit proceedings which will be shared from the AGC website.

Q: USACE also collected 5cm imagery over all those areas they flew this summer, Chris may have talked about that but it deserves highlighting.

Q: Sorry I missed it -- can someone define CORS?

A: The NOAA Continuously Operating Reference Stations (CORS) Network managed by NGS supports 3 dimensional positioning, meteorology, space weather, and geophysical applications throughout the US.

Q: Can we get the link to the portal?

A: <https://alaska-coastal-mapping-strategy-dewberry.hub.arcgis.com/>

Q: Where can I find the AKCM Implementation Plan Draft - the links on the Federal Register

Request for Public Comment don't seem to go to the actual document.

A: Hello! <https://iocm.noaa.gov/about/strategic-plans.html> directs you to the IOCM website, and on the right side of the page you'll see a box near the top right where they are looking for feedback. You will find the document there!

Q: Peter asks Adam of NV5 Geospatial: I'm curious why someone would ever want 100+ returns per square meter for lidar, except possibly in an urban environment. Can you comment on what drives the high resolution acquisitions?

A: For a lot of applications the 100+ returns is overkill but a lot of the engineering and change detection project we're working on which require year after year data such as pipeline infrastructure along the North Slope, the engineers are really interested in getting the best picture of what's really going on with intersecting and layered pipes of varying diameters connected by support beams and stretching across the tundra with varying topography. Some data collected of those areas with lower point density really obscures what's going on underneath so we look at what is the best point density needed to achieve the raw data objective so things like 100-150 points really hits right what we need. Another example is a landslide analysis we performed where it was impacting the potential for infrastructure. During our short acquisition season up here by the time we finally get the snow to melt off we are already seeing leaf-on so sometimes that warrants taking a brute-force approach similar to a project on the Yukon River where we used a drone and increased to 300 points per square meter where we were able to get 80 of those down to bare earth through the snow pack.

Q: Ann asks Paulina of Planet: What is the positional accuracy of the product? (Referring to the "on the ground" positional accuracy of the Planet satellite imagery.)

A: For Planet Scope the 3 meter dataset has an accuracy of 3-5 meters, and for SkySat it is closer to 1 meter.

Q: Sergio asks Edward of EOmap: What is your method of harmonizing Sentinel with Planet data?

A: That is really done with post-processing but I would be curious about why you would look to use different satellite sensors. We certainly do that. WE process several satellite images in areas where we don't expect much change, we may have one image that has a bit of cloud cover, we would use multiple images to maximize spatial coverage. We also use multiple images in places where we do expect the bathymetry to change over time. We use a physics-based process so we don't rely on training data. So if the bathymetry changes you'd need training data. We can use other vendors but if you want to harmonize between vendors we would take care of that with post-processing.

Q: Open question to all presenters: what is your evaluation of using ICESat-2 LiDAR for satellite derived bathymetry?

A: From Kyle at TCarta: ICESat-2 depths themselves are SDB and quite useful for various applications like coastal and reef profiling. NGA Research presented their evaluation of the accuracy of ICESat-2 data at US Hydro conference this past year and demonstrated accuracy of these data to <0.5 m of ground truth. We've conducted similar analysis at numerous and diverse sites and found similar results. ICESat-2 points can provide a secondary method to validate other SDB surfaces particularly in areas where no other sources of ground truth data exists. Using the depths from ICESat-2 to train or inform other SDB algorithms using multispectral imagery is a focus of quite a lot of research.

A: From Edward at EOMap: The IceSat-2 Lidar bathymetric data has value in areas where water levels / tides are not complex, water (and atmosphere) is clear most of the year. We have come to realize that the derived Satellite-Lidar Bathymetric data (SLB) are often inaccurate in the first 0-2m of water depths and maximum depth reaches down to approx. 0.7-0.9m Secchi Depth. That said, for clear water conditions- we believe it serves as a valuable source of fine-tuning of our physics based Satellite-Derived Bathymetry process to reduce the vertical uncertainties and to quantify those with a validation subset of the data. In areas with complex waters and tides, we believe that Satellite-Lidar only has very limited use and - if applied - has the potential to strongly bias a SDB process. These findings are based on validations of Satellite-Lidar bathymetric data compared against MSB and ALB in different environments and latitudes. SLB are typically 10s of meters wide as well so caution should be undertaken in interpreting results where abrupt changes in bathymetry are expected or finer resolution is desired.

Note that application of pure Machine Learning procedures which use IceSat-2 bathymetry to train satellite images results in higher noise and higher uncertainties in the area between the track lines, and overall results in both less accuracy and coverage compared to fine-tuned, physics based SDB model.

EOMAP's physics based SDB is different from the empirical methodology. The physics-based approach models the light path from sun to seafloor to sensor (for the wavelengths of the satellite sensor). This also means the atmosphere, adjacency effect (land impact on nearby water), water surface, inherent optical properties and seabed properties are understood and treated on a pixel-by-pixel basis. 'Fine-tuning' physics based SDB process means that the model configuration of the SDB model is being iteratively adjusted to meet a known and trusted depth.

We're presently expanding and developing the potential interaction between SDB and SLB processes under (amongst others) the European Innovation project 4S, where we lead a

consortium of industry and research. We invite you to get in contact with us to set-up a separate call to discuss this matter.

Let me know if you have any questions. We will be publishing a StoryMap on some of our ICESat-2 evaluations completed under our NOAA SBIR grant that I can share once complete if they are interested.

Q: Kelly Carignan: At some point will there be integration with Canadian datums?

A: Stephen White: NOAA is definitely collaborating with the Canadian govt so as we move into the definitions of tidal water level they are different between the US and Canada so that will pose some challenges but we are currently collaborating for the Great Lakes area.

Q: Christopher Small: When will all the data that JALBTCX collected this summer be available?

A: Chris Macon: Data available by the end of next year 2022; will have timelines available later this month.

Q: Anke Gleitsmann: Where can I find a copy of the Implementation Plan?

A: Ashley Chappell: The Federal Register Notice contains a link to the document itself as well as some instructions for how to provide public comment.

A: NOAA IOCM: Hello! <https://iocm.noaa.gov/about/strategic-plans.html> directs you to the IOCM website, and on the right side of the page you'll see a box near the top right where they are looking for feedback. You will find the document there!

Q: Leslie Jones: USACE also collected 5cm Imagery over all those AOIs this summer. Chris may have mentioned that, but it is worth highlighting.

A: Thank you for bringing that to the attention of the group!

Q: Denise Miller: Just a comment/idea for consideration - could a list of all the websites in chat be put into a single document by summit day.

A: Yes they will! Please check our summary documents when they are released on the AGC website.

POLL: What other agencies could we coordinate with?

A: ADF&G, Fairbanks Fodar.

Q: Another question to our panelists, particularly the SDB presenters. Have you been conducting testing or QC against other bathymetry technologies such as in areas where topobathy lidar or sonar data are available? And what are the results?

A: Lauren Decker: Funny issue we ran into - there was sea ice, so we couldn't use it for SDB calibration in the area we were looking at.

A: Dave Flanagan: We have also done extensive comparisons of our SDB with lidar and multibeam. In general we find RMSE of <1m in most areas. We also assign a pixel-wise vertical uncertainty based on how closely our SDB compares to ground truth information that we have or optical closure when using the radiative transfer method.

Q: Guy Noll: Does the Navigable Area Limit Line (NALL) need to be re-evaluated and/or refined for uncrewed systems and remote sensing modalities that did not exist when the original NALL procedures and definition were created? (I have a bit of history here!)

A: Dave Maune: I fully recognize that it may be controversial of me to propose that the NALL serve as the separation between coastal mapping efforts and ocean mapping efforts, but for the purpose of developing a report on new technologies and recommending pilot projects, I decided to throw that demarcation line out there as my best guess for what would be appropriate and I invite discussion of course.

Q: Colleen Fanelli: Will presentations be posted/shared somewhere and when will they be available? Thanks!

A: Yes! They will be posted with our conference summary documents.

Q: Marta Kumle: Close water level gaps and pilot projects!

The Path Forward

Q: Jaci Overbeck: You mentioned that Alaska will be receiving 11 new CORS over the next few years and Nathan mentioned that we do have one station that acts as both a water level sensing and a CORS station. Do you think there's potential to utilize any of these new CORS and place them in a way that they can also observe water levels?

A: Will Freeman: My colleague John G. is a huge fan of reflectometry so we are starting to have discussions with the NOAA Coops folks to try to expand this as well as thinking about the other arm of NOAA, The National Weather Service, that they can use this data as well for their weather modeling. We do hope to coordinate better with tide stations. I should also clarify that we're only installing 1 new foundation CORS in Alaska, not 11. 11 will be in various locations around the nation and in remote areas.

Q: Guy Noll: Does the Navigable Area Limit Line need to be re-evaluated and/or redefined for uncrewed systems and remote sensing modalities that did not exist when the original NALL procedures and definition were created?

Q: Dave Maune: The NALL used to be the 4 meter line and now it is down to the 3.5 meter line and I'm not sure what caused that change to occur. Based on my understanding, the NALL is an area in which most vessels can safely navigate. I've talked to some hydrographic survey firms in which they said, they don't like to survey with multibeam, shallower than 3.5 meters, but they have gone as shallow as 2 meters where they knew that the bottom was soft rather than rocky. I'm not sure what goes into NOAA's designation of the NALL. I do have a URL in my whitepaper on how to read about the NALL.

Guy Noll: The original NALL line was developed to make it safer for manned vessels at the time, but uncrewed vessels now potentially change that dynamic for how NOAA could specify inshore limits and surveying. It was primarily a safety-driven requirement for the NALL. It wasn't considering the equipment's safety.

Dave Maune: I do have 3 pilot projects proposed for evaluating uncrewed surface vessels in their use of the different forms of sonar for mapping between 0 - 3.5m NALL. How close in can we get to the shore with any of these systems using uncrewed surface vessels maybe when the mothership wants to stay further out in the water.

Guy Noll: That would be very much aligned with the intent of the original NALL definition.

Dave Maune: I'll admit, I threw out the topic on NALL as a controversial topic, because I thought it was a way in which we might draw a line in the sand on the NOMEAC is on the deeper water side of this line and the Alaska Coastal mapping is on the shallower side of the line and I've heard people say what's the dividing line between these two strategies.

Hadley Owen: I think the Dave Maune's suggestion of the NALL as being the dividing line between the NOMEAC line and the Coastal mapping strategy makes sense because the NALL was intended as a safety of navigation for surface vessels operating, but those are often using the multibeam sonar so once you get shallower than the 3.5m NALL, you're not going to get much sloth width and you're definitely in territory that is much more advantageous to be using remote sensing aerial imagery and topobathy lidar because you can get more efficiency in that area. So it's a combination of the whether or not there are people in those surface vessels or just equipment in those surface vessels and the multibeam sloth width efficiency in surveying those areas.

2021 Alaska Coastal & Ocean Mapping Summit Q&A Day 2

Q: Alex Nereson: Does that map of unmapped areas in the EEZ exist as an interactive map?

A: Hillary: Hi Alex, I just added the NOAA NCEI Bathymetry Data Gap Analysis dataset to our Priorities map on the hub site here:

<https://alaska-coastal-mapping-strategy-dewberry.hub.arcgis.com/pages/priorities>

A: Meredith: You can also access the bathy gap analysis directly from NOAA's Geoplatform--

<https://noaa.maps.arcgis.com/home/item.html?id=4d7d925fc96d47d9ace970dd5040df0a>

Q: Guy Noll: Regarding the ACEP presentation, there is quite a bit of work in machine learning applications of change detection of coastline being done with Esri Deep Learning engine.

A: Jeremy Kasper: That is helpful to know! I'll have the staff look into that.

Q: Brian Midson: Mapping is important to NSF in support of basic science research objectives including, but not limited to geological, physical, biological and chemical oceanography.

Q: Ashley: how can information best be shared with the St.Paul fishermen?

A: Veronica Padula: Maps and summits like this, and reaching out to establish one-on-one relationships. CDQ Groups as an outreach component to local fishermen; Social media helps connect folks. Emails reaching out to folks is great. Any visuals are really good in terms of the way information is communicated so maps for example.

Q: Mapping is important to NSF in support of basic science research objectives including, but not limited to geological, physical, biological and chemical oceanography.

Q: Guy Cochrane: For benthic habitat please collect the backscatter intensity.

Q: Susan Merle: Water column data is also important and should be part of the data collection protocol.

Q: Hadley Owen: Aside from funding, what is the biggest barrier you see to filling your mapping needs? Examples I would think would be: personnel capacity, technical expertise, access to equipment, etc.

Q: Matt Holland: What's the minimum depth it works in and what is the sea state limit?

A: Mike Flanigan: Our standard minimum operating depth right now draws 3 feet and in our partnership with Seamap and Mapco we are working on an even shallower draft vehicle about 1 foot - 1.5 feet draft which is about minimum range on your echo sounder. In terms of survivability, we'll do roll test, drop test, drop some from a dock ring from 10 feet - 15 feet in height. We're looking to continue operations through sea state 4.

Q: Matt Holland : Is there a way to tell if your system is recording remotely? Bob says, "real-time processing is crucial". What is the real-time data access for the systems? Is it sufficient for quality assurance and quality checking to make sure all the systems are acquiring data appropriately or is there some ability to receive raw or an automated generated designated product over the satellite or closer wireless communications?

A: Mike: Use webbrowser to log-in and can view mission progress and success remotely from anywhere in the world. Richer data files with larger file sizes will only be accessible during post-processing

A: Matt : Through the satellite communications, when we're working further from shore or Earth or close to shore using a 4G cell connection using our cloud based platform, the cyber deck, the online surveyors that are working remotely have full access at all times to the survey computer, acquisition software and the sonar control so their monitoring that all in real-time for quality and coverage density and making any adjustments to the acquisition to make sure that we're getting good data similar to the way you're on a survey launcher or a boat.

Q: Brian Midson: What is the size of the Surveyor-class fleet at this time?

A: We have one and we're putting version 2 design in for production beginning hopefully in Q1 next year to produce 2-3 more of those. Voyagers are prototyping now and then we'll start mass production of those in Q1 or Q2 next year. We're likely going to be putting out 5 initially, then ramping that up to 20 - 30 throughout 2032

Q: Amy Holman: How would you take advantage of the development of the Port of Nome?

A: Brian Connon: We would all certainly appreciate having access to port facilities that help enable launch and recovery and to perform maintenance certainly helps with data collection efforts.

Q: Alissa Johnson: For Saildrone - did I see correctly that you have a towed sound velocity profile on some of the larger saildrones?

A: Brian Connon: They're not towed, but they are on a winch. So we stop and drop. We have the ability to stop and lower a sound velocity profiler down toward the voyager and it'll be about a 200m cable on there. The surveyor currently has the 200m and for the next versions, were going to try to ramp that up to the 500m cable.

Q: From Bob McConnaughey: Question for Fugro re their "multi-sensor integration: Do they have ideas or experience integrating (actually normalizing) seabed intensity information from LIDAR in coastal areas with sonar data from offshore sonar systems?

A: Michael Warnow: Yes Fugro has vast experience with merging topobathy, sonar datasets. Recently we did the entire coastlines of California. Vessel-based sonar merged with topographic elevation data collected from the RAMMS sensor.

Q: Saildrones - these sound great for MBES mapping, but how well are they able to sail tracklines? And how much does heeling of the saildrone effect collection of MBES data?

A: Brian Connon: We actually don't heel over like you would think a sail does. It's a wing that we control and it autonomously sails so we give waypoints, a line, and a corridor for it to sail and the saildrone will sail within a meter or 2 of that line. We don't see any issues with that. We have done line spacing as tight as 15m-20m with no issues of losing track.

Q: Sean Rooney: What if any hydrographic capabilities does the UAF Nanook vessel have? Has it been used for mapping?

A: Doug Baird: No multibeam, it has a single beam echo sounder on board.

Q: Sean Rooney: One additional mapping not represented here is the Alaska Longline Fishermen's Association (ALFA) <https://www.alfafish.org/bathymetry>

Q: From Peter: Are XOcean USVs self driving?

A: Matt Holland: Yes. They are tested to remain upright in sea state 6 even broadside to waves. Communications and safety protocols in place to notify when weather is becoming adverse enough to risk capsizing.

Q: From Matt: For a vendor day, I think an RFI requesting proposals from vendors would be a great way to move forward, to put a realworld cost to things. Not meeting any specs, just let vendors propose various projects they'd like to do at whatever specs they can, targeting perhaps the strategy document. This way the cost/performance optimization can be assessed and then the committee would have a sense of how much money would chase.

Q: From Peter: Question for Bob McConnaughy: Is there any chance of switching from collecting single beam bathymetry to multibeam? Seems this would be a cost effective way to cover a lot of ground on the shelves.

A: We are operating under the current existing contract, so it's certainly possible but we haven't pursued this option as of yet.

Q: Stephen Escarzaga: Contact info for Dave Maune?

A: DMAune@dewberry.com

Q: Aaron Poe: Have you ever thought about targeting incentives to obtain crowd-sourced bathymetry?

A: Georgianna Zelenak: Right now we are looking at different sectors and industries that we can target and perform outreach in order to get that data shared. We are interested in considering the incentive approach for data.

A: Aaron Poe suggests Tipalti - send micropayments per a service agreement to compensate data owners. This is the same system used by companies like Uber.

Q: One additional mapping not represented here is the Alaska Longline Fishermen's Association (ALFA)<https://www.alfafish.org/bathymetry>

Q: Practically none of Cascadia Margin has been mapped in water depths less than 200 meters, but the map did not indicate that. Do we not care about shallow water mapping on the Cascadia Margin?

Q: From Bob: Thank you for an outstanding conference! We were richly rewarded by your hard work strategizing & preparing the agenda, the official and technical contributions you selected, and your skillful management of time and interactions. BRAVO

Q: Hillary Palmer: I loved the BOEM Critical Minerals talk! Exciting to know about the potential for natural resource development. Also loved the NOAA Office of Exploration & Research website... check it out! They have a monthly photo calendar you can use for your desktop background and I found an adorable video of an octopus!

Q: Peter Haeussler: What I really like is the attitude that everyone wants to do things better. Its clear that if we do what we have always been doing, we will get a slow rate of progress. I think we will do better in the future!

Q: I appreciated the up to date summaries of capabilities of AUVs. It would be great to turn that into comprehensive coverage of the sea bottom.