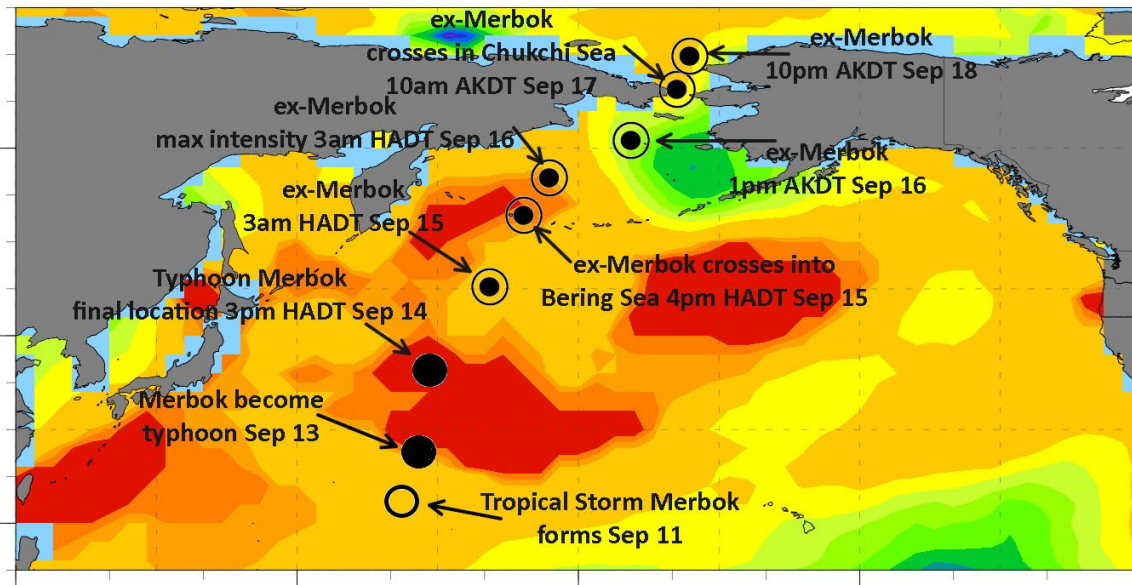


All Hands-On Deck Data Collection Response to 2022 Bering Sea Storm from Typhoon Merbok

November 15, 2022
GIS Day Celebration

Track of Merbok, September 11-18, 2022 August 2022 Sea Surface Temperature Ranks Relative to 1900-2021



B. Brettschneider 2022 (Data Source: NOAA).ERSSTv5
Ranks are from 1 (High) to 123 (Low). [Since 1900]
Compared to all August periods.

Warmest

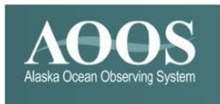
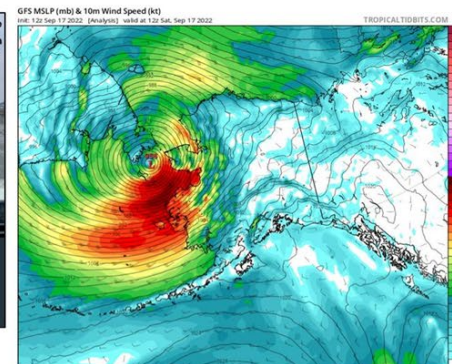
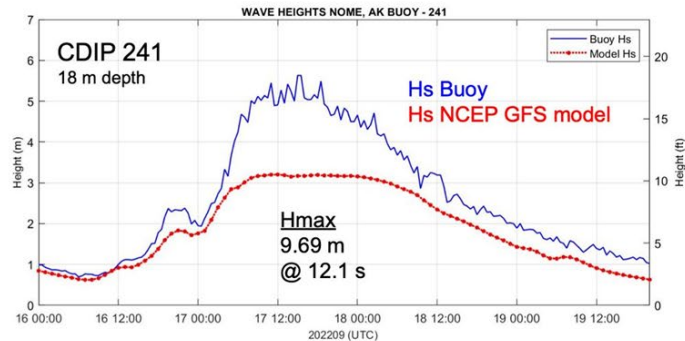
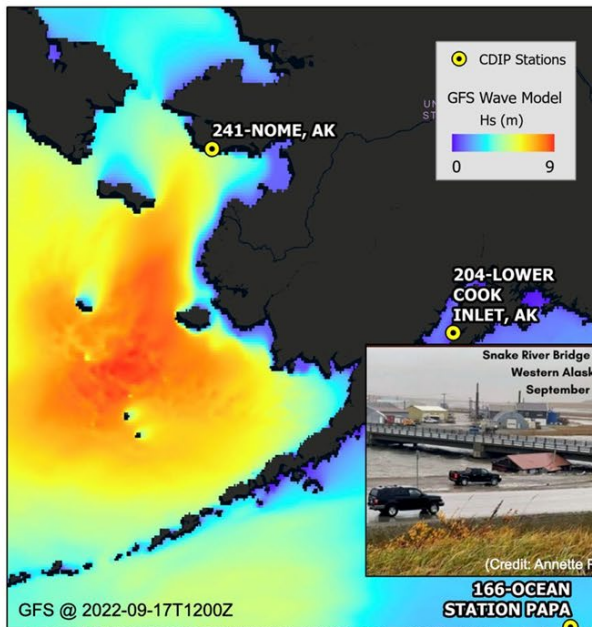


1 2 3 4 15 26 38 50 62 74 86 98 109 120 121 122 123

Coldest

- Sept. 15 formation
- Warmest temperature on record in region of formation
- Sept 17 landfall in western Alaska

Figure created by Rick Thoman -
ACCAP and Brian Brettschneider -
NWS.



- Remnants of Typhoon Merbok generated powerful waves and storm surge in the Bering Sea, causing historic severe widespread coastal flooding.
- Waves at CDIP 241 Nome reached a maximum Hs of 5.63 m, with a maximum individual wave of 9.69 m, while the tide exceeded 3 m MLLW, its highest level since 1974.
- Station was established in 2018 and is operated in cooperation with AOOS and the Port of Nome.

CDIP storm bulletins:
cdip.ucsd.edu/themes/cdip?d2=p12

Immediate and Coordinated Post-storm Data Collection Response

- Documentation for disaster response and recovery
- Interagency, public, private involvement - all hands
- Single POC, lower comms impacts
- Common data infrastructures for communication



AGO Ex-Typhoon Merbok Post-Storm Data Response



Ex-Typhoon Merbok Post-Storm Data Response

<https://arcg.is/1umjSH0>

September 17, 2022

Governor Mike Dunleavy issued a disaster declaration for the storm

September 23, 2022

President Joseph R. Biden, Jr. approved a major disaster declaration

September 29, 2022

President Joseph R. Biden, Jr. made additional disaster assistance available to the State of Alaska

Major flooding: At what height...

1. Have several buildings been flooded with over 1 foot of water?
2. Have the fuel storage or power generation facilities flooded?
3. Has the airstrip been completely inundated?
4. Has flood water reached the drinking water source?
5. Has flood water reached wastewater facilities?

Moderate flooding: At what height...

1. Have several buildings been flooded with up to 1 foot of water?
2. Have people in the lowest area(s) been evacuated to higher ground due to flooding?
3. Has flood water cut off access to larger parts of town?
4. Has flooding closed the airstrip?

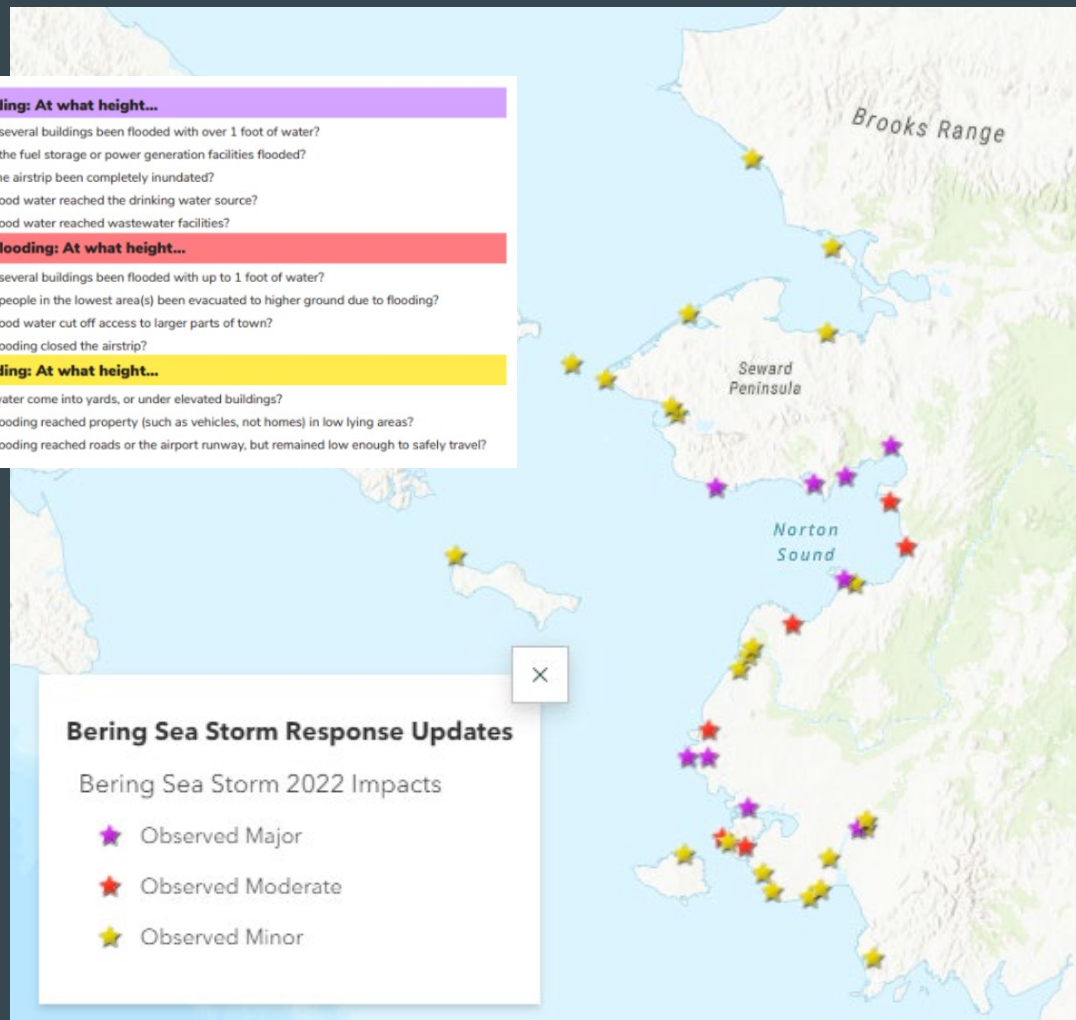
Minor flooding: At what height...

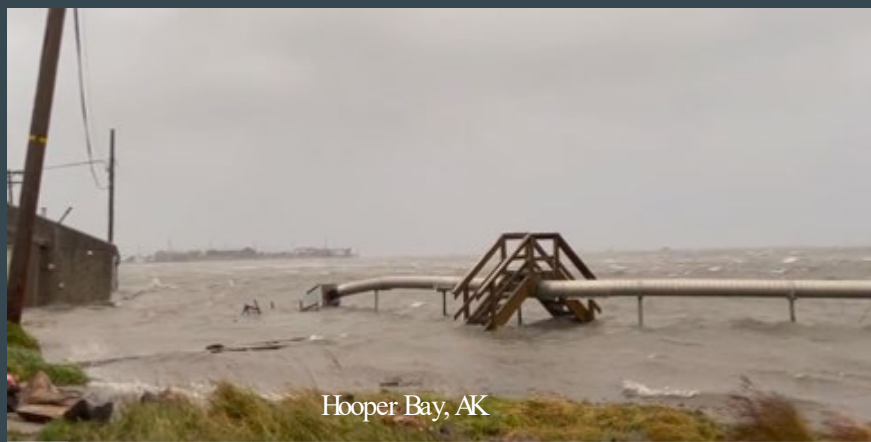
1. Has water come into yards, or under elevated buildings?
2. Has flooding reached property (such as vehicles, not homes) in low lying areas?
3. Has flooding reached roads or the airport runway, but remained low enough to safely travel?

Bering Sea Storm Response Updates

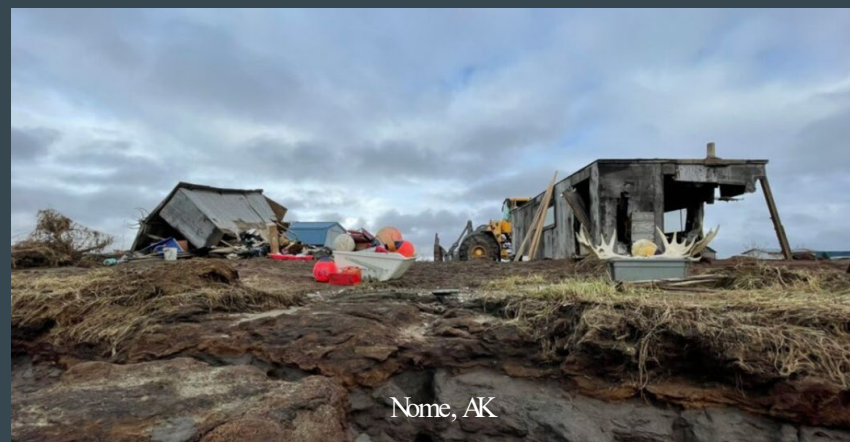
Bering Sea Storm 2022 Impacts

- ★ Observed Major
- ★ Observed Moderate
- ★ Observed Minor





Hooper Bay, AK



Nome, AK

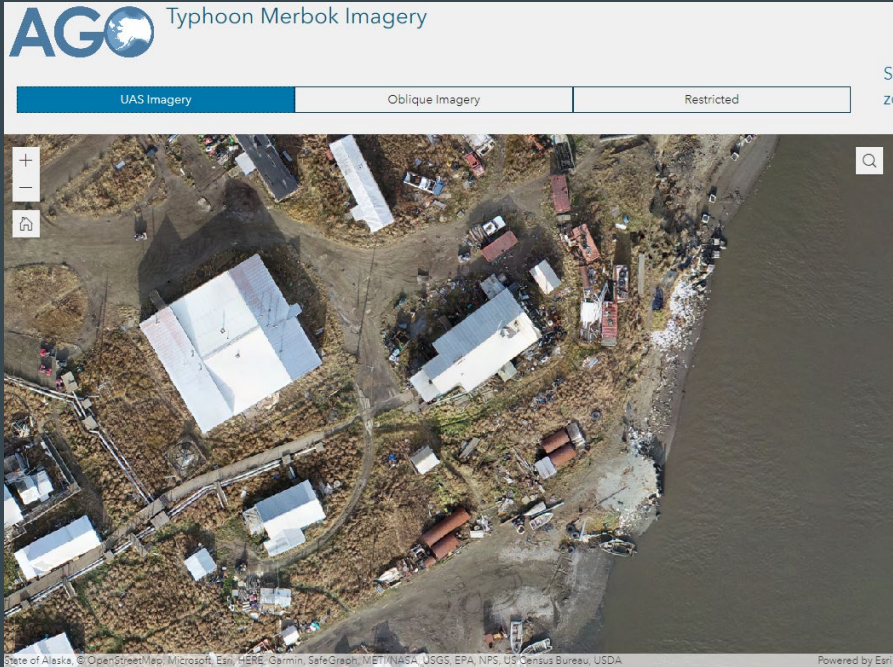


Newtok, AK



High Water Marks and Imagery

Flood heights above ground and building first floors, erosion extents and volumes, debris tracking, building damages, and situational awareness.



UAS survey UAF, Chevak, AK served up on SOA geoportal.

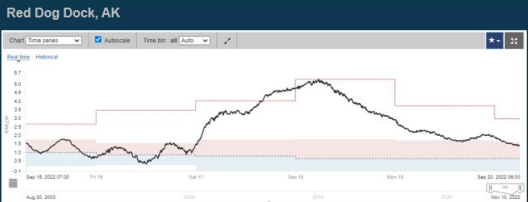
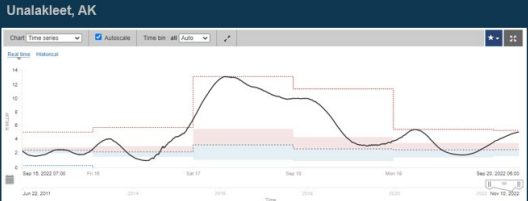
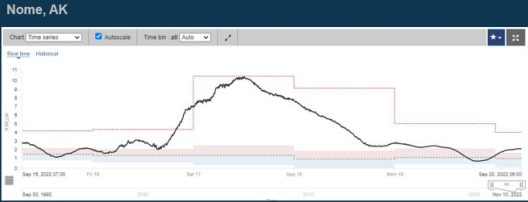
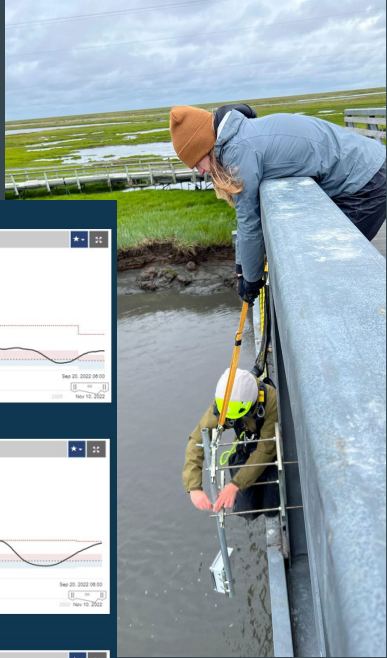


High water mark surveying, DCGS/USGS, Stebbins, AK

HWMs

Observed Water Height Through High Water Marks, Water Level Sensors, Photographic Evidence, and Flood Stuffs.

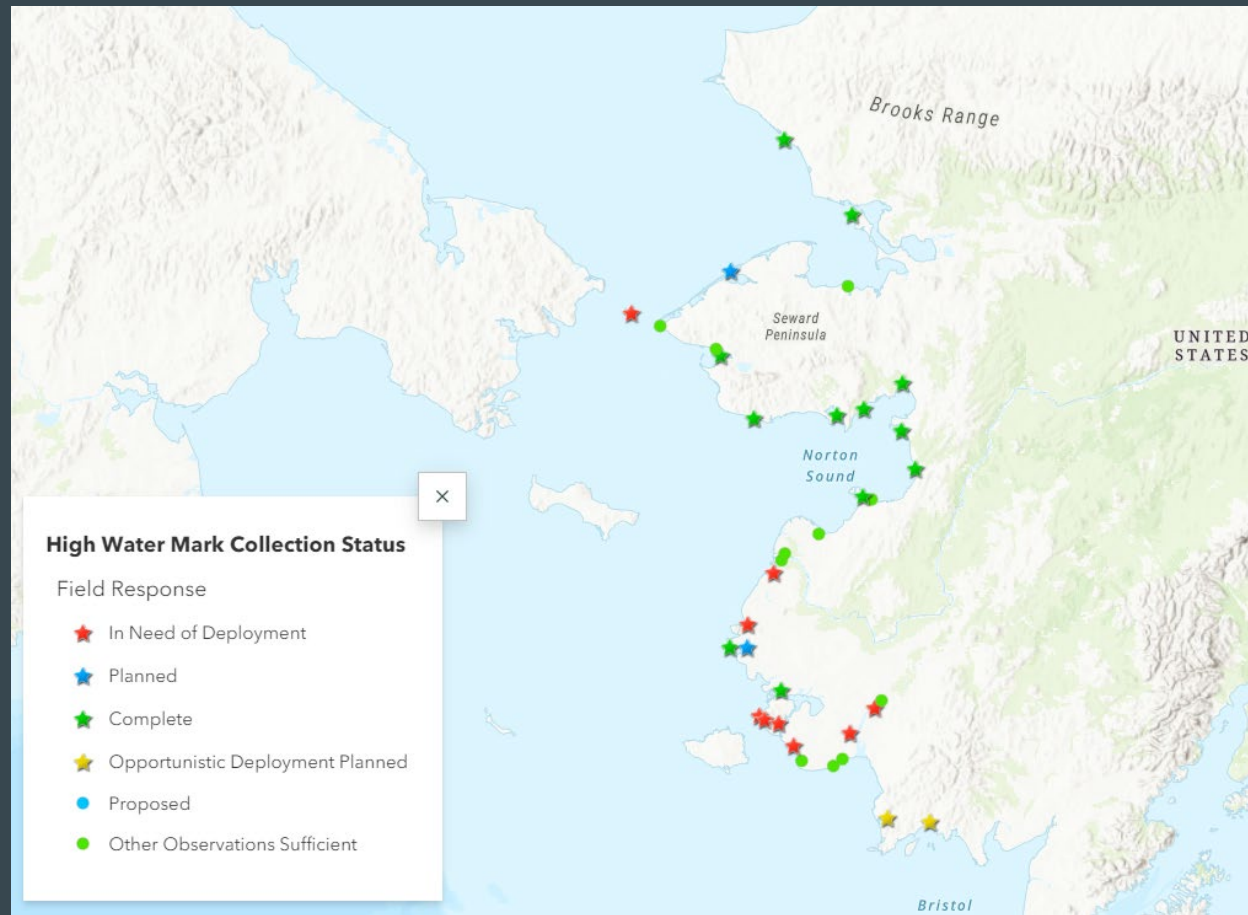
Above: Water level sensor installation, DGGs, Kwigillingok, AK



Flood staff photo, Alakanuk Tribe IGAP, Alakanuk, AK DMLW survey of HWM in Nome, AK


HWMs

- Rapid deployment of 3 field teams of 2 people, DGGs, DMLW, USGS
- Rapid contract deployment, JOA Surveys
- Opportunistic collections UAF, JOA Surveys, CRW Engineering.
- 430 points and 19 communities



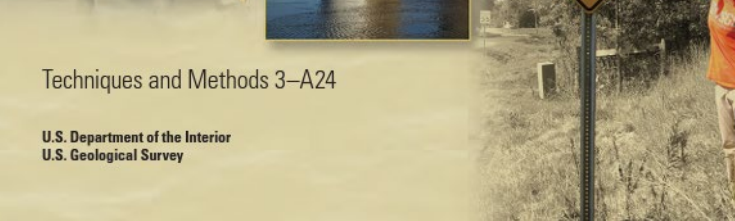


High water marks are critical datasets for document the height that water reached in and around communities to understand and map flood extent. More information at: <https://pubs.er.usgs.gov/publication/tm3A24>

- Common data collection procedure
- Simple and pre-existing form
- Data submission to USGS for entry to HWM data portal



Identifying and Preserving High-Water Mark Data

Chapter 24 of
Section A, Surface-Water Techniques
Book 3, Applications of Hydraulics



RECREATION DEPT.
424-7176
Holidays

HANCOCK RD 223

CAUTION
HIGH
WATER
HERE

Techniques and Methods 3–A24

U.S. Department of the Interior
U.S. Geological Survey



Immediate access to rapid collect.



Flood Event Viewer

EVENT:

**2022 September AK
Extratropical Cyclone**

16 Sep 2022 thru 23 Sep 2022

BASEMAPS >

FILTERS >

CHANGE FILTERS

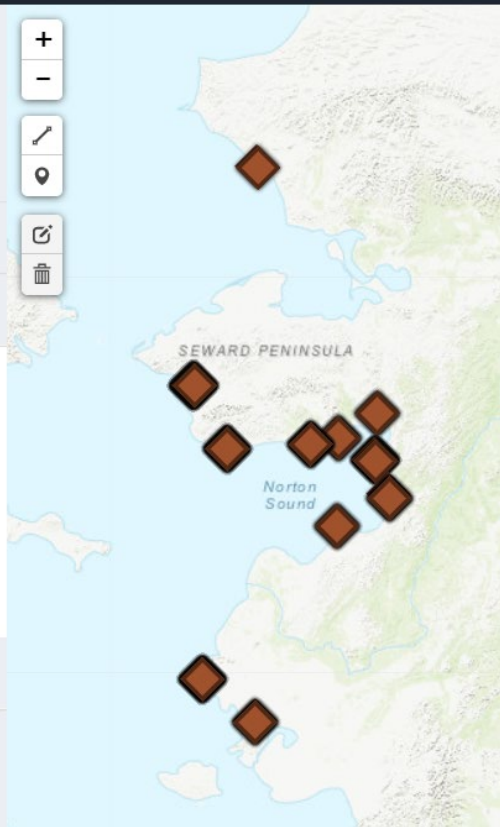
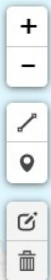
Current Filters

EVENT

**2022 September AK
Extratropical Cyclone**

GET DATA >

POWERED BY **WIM**



Site and High-Water Mark Detail

Site Information

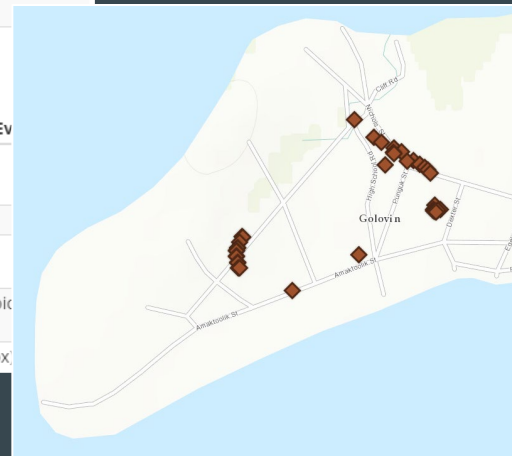
| | |
|------------------------------|--------------------------|
| Site Number | AKNOM32452 |
| Site Description | Golovin HWM Site 2014 |
| Latitude | 64.54402427 |
| Longitude | -163.0331382 |
| Horizontal Datum | NAD 83 (2011) epoch 2010 |
| Horizontal Collection Method | RT-GNSS |
| Address | |
| City | |
| State | AK |
| ZIP Code | |
| County | Nome Census Area County |
| Waterbody | Norton Sound |
| Drainage Area (sq mi) | --- |
| Station ID for USGS gage | |
| Station ID for NOAA gage | |
| Other Station ID | |

Peak Summaries

| Elevation (ft) | Date/Time | Ev |
|----------------|-----------|----|
|----------------|-----------|----|

HWM Information

| | |
|-------------------------|---|
| HWM Label | 2014 |
| Provisional or Approved | Approved |
| Event | 2022 September AK Extratropical Cyclone |
| HWM Type | Other (Note in Description box) |



Alaska Water Level Watch

Home Catalog Map


70.4073, 152.5781

Flood Events


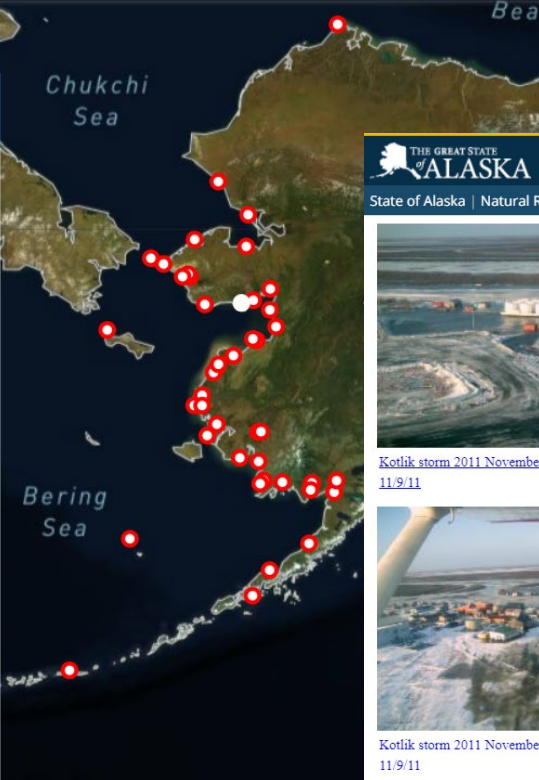
Flood Events
Flood Events
Feature selection

Golovin
Storm Surge: November 9, 2020


Event type Storm Surge
Flood impact pending assessment
Click to enlarge image




Downloads Detail




Kotlik storm 2011 November 10 p07
11/9/11




Kotlik storm 2011 November 10 p02
11/9/11




Kotlik storm 2011 November 10 p01
11/9/11



Kotlik storm 2011 November 10 p04
11/9/11




Kotlik storm 2011 November 10 p06
11/9/11



Kotlik storm 2011 November 10 p03
11/9/11

Login Help

storm Search



500 km
500 mi
72.899 -166.8516

Reset Previous Displaying 1 - 96 of 374 Next
Showing 96 Sort by Score

- Didn't make it to all of the impacted communities
- High water marks can be marked now and surveyed later



Imagery

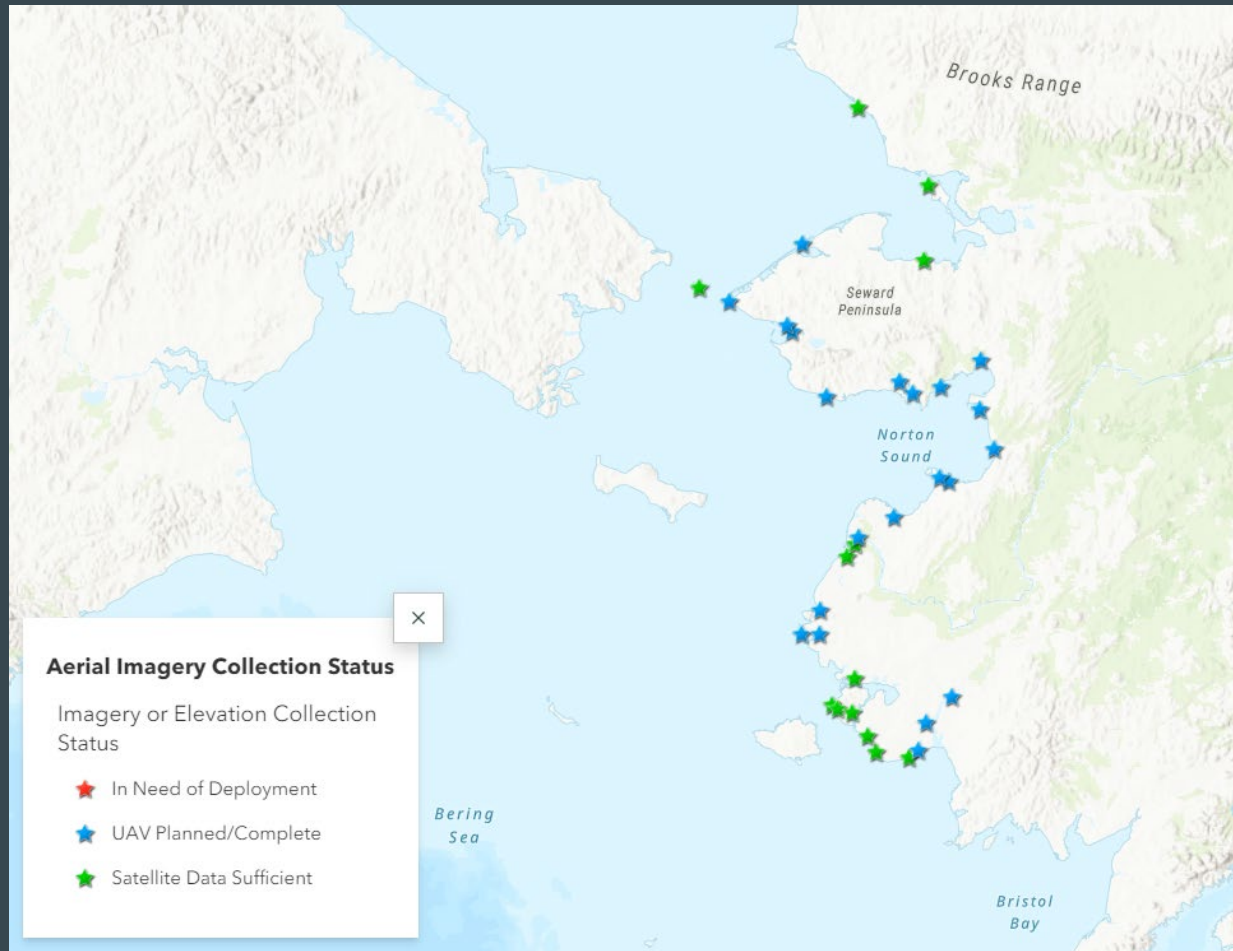
Observed damages, debris, and erosion extent through UAS, fixed-wing, and satellite imagery.



Stebbins

Imagery

Data collected over 35 communities



Imagery



Chris Maio +team., UAF
Geophysical Institute's Arctic
Coastal Geoscience Lab



Photo by Chris Maio
Filmmaker Fritz Mueller walks at the edge of St. Paul Island as waves crash ashore, driven by the remnants of Typhoon Merbok as it passes over St. Paul Island.



Photo by Jessica Garron
Jessica Garron and Mike DeLue at Poker Flat Research Range in August while participating in an exercise to use drones and remote sensing in oil spill response.

Jessica Garron +team, UAF UAF
International Arctic Research
Center.



Photo by Mike DeLue
Katie Daniels, a resident of Bethel, flies a drone during a training exercise in Nome in August.

Imagery

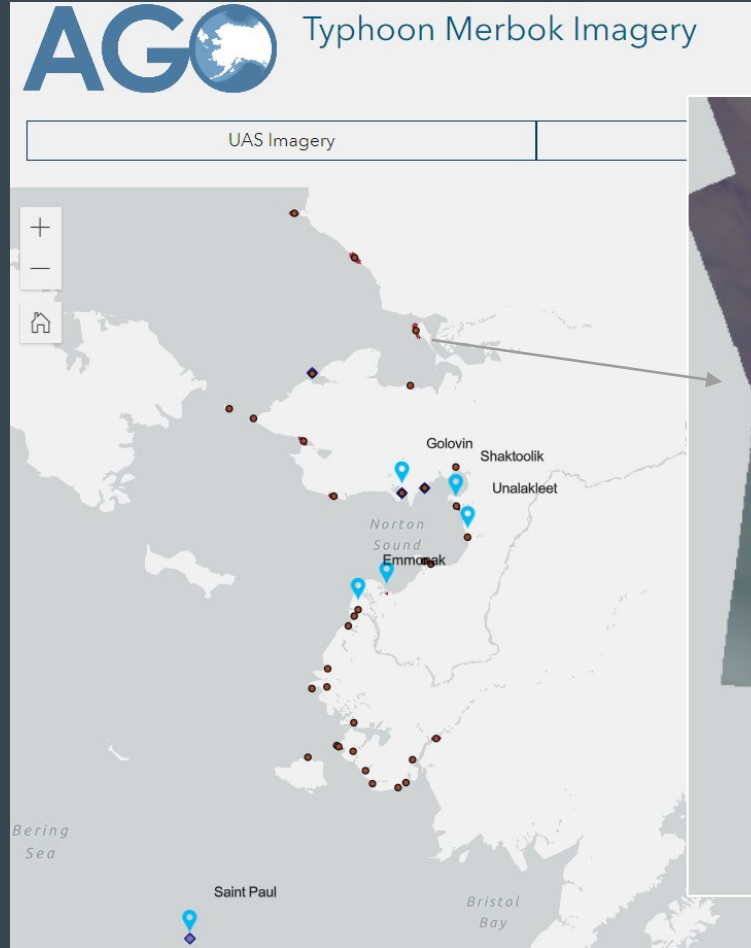
Alaska Dept. of Transportation & Public Facilities
(additional sites TBD), UAS structure from motion and
some lidar.



National Park Service fixed-wing collected structure from
motion.

Imagery

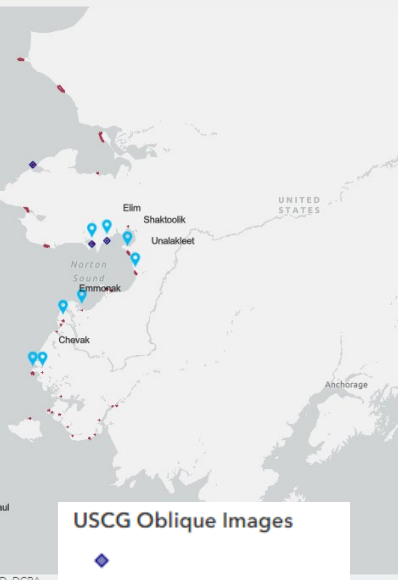
- State of Alaska Geospatial Office utilized existing Planet and Maxar contracts to quickly capture satellite imagery post-storm and evaluate pre-storm imagery needs.



Imagery

UAS Imagery

Oblique Imagery



USCG Oblique Images



Communities with Imagery



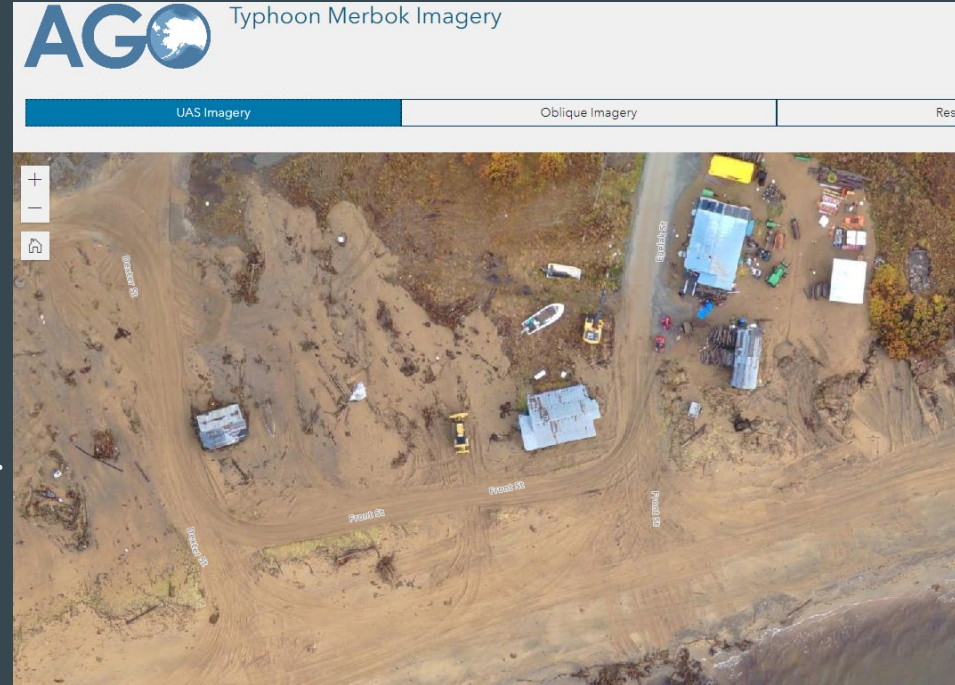
Planned Collections



- Coordinated through Alaska Geospatial Office
- Data submission to Amazon bucket
- Restricted access to satellite imagery (not public, but available to **ANYONE** working on storm response)

Data Use

- Immediate emergency response and recovery.
- FEMA damage assessments.
 - Access to grant funding for recovery.
 - Access to grant funding for mitigation.
- Updated flood modeling.
- Inundation mapping.
- Checks on forecasts of erosion projections.
- Community flood assessments.
- Community planning.
- Assess gaps in monitoring and emergency response procedures - after action assessments.





FEMA



AOOS
Alaska Ocean Observing System



NOAA Office for Coastal Management jacquelyn.overbeck@noaa.gov
Alaska Geospatial Office Leslie.jones2@alaska.gov