GAGE
National Science Foundation's Geodetic Facility for the Advancement of Geoscience

Uncharted Territory:
Reviewing the USGS Standard Operating Procedure (SOP) for future hydrographic mapping endeavors.

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UNAVCO

Project Overview

Background

In conjunction with state and federal partners, the United States Geological Survey (USGS) has collected Interferometric Synthetic Aperture Radar (IfSAR) data for the state of Alaska and **plans to utilize the 5m digital elevation models to update the National Hydrography Dataset**. Under the guidance of the staff at the National Geospatial Technical Operations Center (NGTOC), we were involved in the inspection and review of the standard operating procedure used to assess and accept IfSAR-derived Hydrography data.

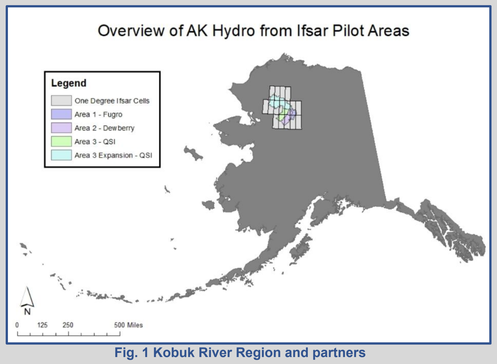

Fig. 1 Kobuk River Region and partners

1. **Skill Development**
   - Intro to USGS and NGTOC organization
   - **ESRI training to test insp. process methods**
   - Attend EDH tools workshop and meetings
2. **Analysis**
   - Analyze insp. process documentation (SOP)
   - **Test inspection methods on sample dataset**
   - Share status and results with NGTOC team
3. **Synthesis**
   - Compile inspection process test results
   - Provide future change recommendations
   - **Share findings and feedback to EDH team**

Purpose

Our experience and feedback will be valuable going forward, as our role in this project will ensure for all future endeavors:

1. **Streamlined inspections**
2. **Standardized processes**
3. **Improved recommendations**

Standard Operating Procedure Process

Goal of the SOP:
To provide feedback to contractors for improvement of collection methods and to researchers developing new Elevation Derived Hydrography (EDH) tools for automated inspection.

Major Steps

1. Access the data: Pulse Secure Connection
- Requires an access card and USGS laptop
- Connect to virtual machines for increased processing speed
- Future reviewers may potentially be able to download the data as an alternative to server access

2. Small scale inspection: Review of general data collection quality
- Reviewer will get a feel for error types
- Water feature density problems
- Error flag clusters

Fig. 2 Small scale view of data for general inspection.

3. Large scale inspection: Review of every water feature
- Scan the data at about a 1:5,000 scale
- Feedback for contractors - verifying flags and unflagged errors
- Feedback for EDH researchers - note whether the EDH tools are catching errors and flagging them correctly

Fig. 3 Large scale view of data for error inspection.

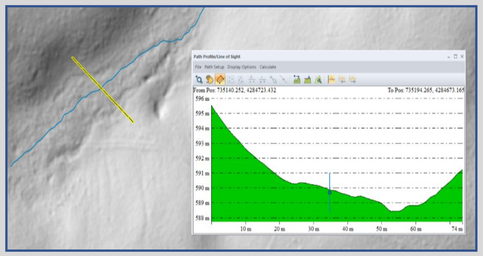

Fig. 4 3D analyst tool for inspecting a placement error.

Manual inspection techniques
- Working in a grid format to keep track of inspection
- Inspecting error flags - using extension tools and contour lines
- Assigning error codes

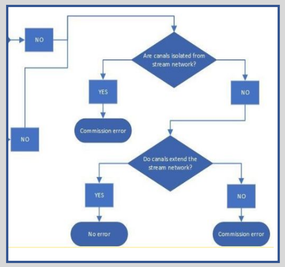

Fig. 5 Flowchart for assigning an error code

Giving feedback

Questions and thoughts on the instructional power of the SOP were compiled in a document and shared with the EDH team at USGS.

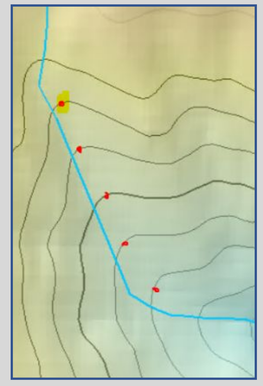

Fig. 6 Visual example of a placement error

Feedback Given
- SOP organization - step by step instructions instead of stream of information
- Visual examples of errors
- Discrepancies between examples in the SOP and the data
- Notes on where more instructions were needed for functions within ArcMap.
  - Difficulties with viewing contour lines
  - Problems with the 3D analyst tool

With the limited time during which feedback was given secondary testing of an updated SOP was not possible.

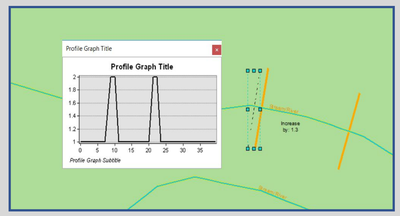

Fig. 7 Malfunctions of the 3D analyst tool while inspecting an error

Future of the Project

The goal of the 3D Elevation program is to have 100% acquisition of LiDAR and IfSAR data by 2023 **to provide the first-ever national baseline of consistent high-res topographic elevation data collected in a timeframe of less than a decade**.

This includes work by federal and private enterprises along with student contractors whose duties will include:
- Performing QC inspections of geospatial data deliverables.
- Reviewing and assessing vector geospatial data to determine if it meets USGS specification for EDH data.

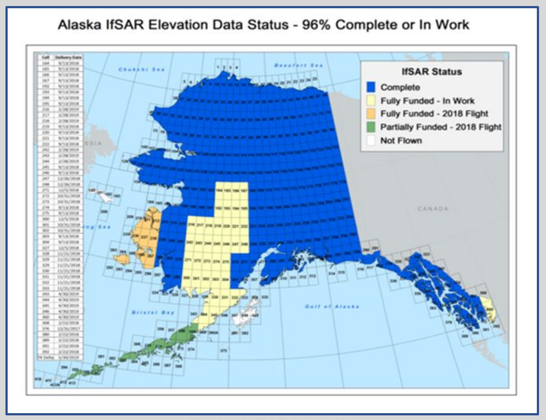

Fig. 8 AK IfSAR Status Map

Real-World Applications
- Water rights
- Flood risks
- Resource mining
- Energy infrastructure
- Natural hazards

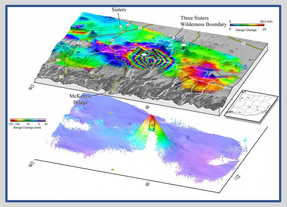

Fig. 9 Ground-uplift Interferogram South Sister Volcano, OR

Working Remotely

The current outbreak of Covid-19 made necessary a remote format for this project.

Technical Difficulties
- Delayed or unsuccessful acquisitions of USGS access cards and laptops.
- Unsuccessful attempts to download sample data.
- Trouble getting access to the laptop and server.

These experiences will inform the onboarding process for future reviewers and will help ensure more time can be put towards the project.

USGS science for a changing world

Geo-Launchpad

Front Range Community College

Red Rocks Community College

Acknowledgements: We would like to thank Amanda Lowe, Christy-Ann Archuleta, Kelsey Russo-Nixon, Andria Ellis, Max Miller, and Blake Mayberry for their guidance and support for this project.

This material is based upon work supported by the National Science Foundation under Grant No. 1540524 and Grant No. 1724794. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References available on request