



Integrating Icelandic GNSS Data into EPOS

Introduction

GNSS (Global Navigation Satellite System) data is essential for monitoring volcanic unrest and crustal deformation in Iceland.

Within EPOS, the Volcano Observations Thematic Core Service (VOLC-TCS) integrates multidisciplinary data from European volcano observatories, including GNSS. Iceland contributes GNSS data to VOLC-TCS, and work is underway to also meet the requirements of the EPOS GNSS-TCS.

This poster presents the process of making Icelandic GNSS data EPOS-compliant, with a focus on metadata standardisation, quality control, and future integration via GLASS.

Challenges

Iceland's GNSS data spans up to three decades and multiple institutions, but much of it was collected before current standards were in place.

Challenges include:

- Incomplete or inconsistent metadata
- Mismatches between RINEX data (raw GNSS data) headers and station logs
- Varying RINEX versions and naming conventions
- Missing DOMES numbers
- Complex station histories (e.g. equipment changes)
- Data stored across old tapes, discs, and servers

Addressing these issues is key to ensuring the data is FAIR and ready for EPOS-wide discovery and use.

Preparing Icelandic GNSS stations for EPOS Integration

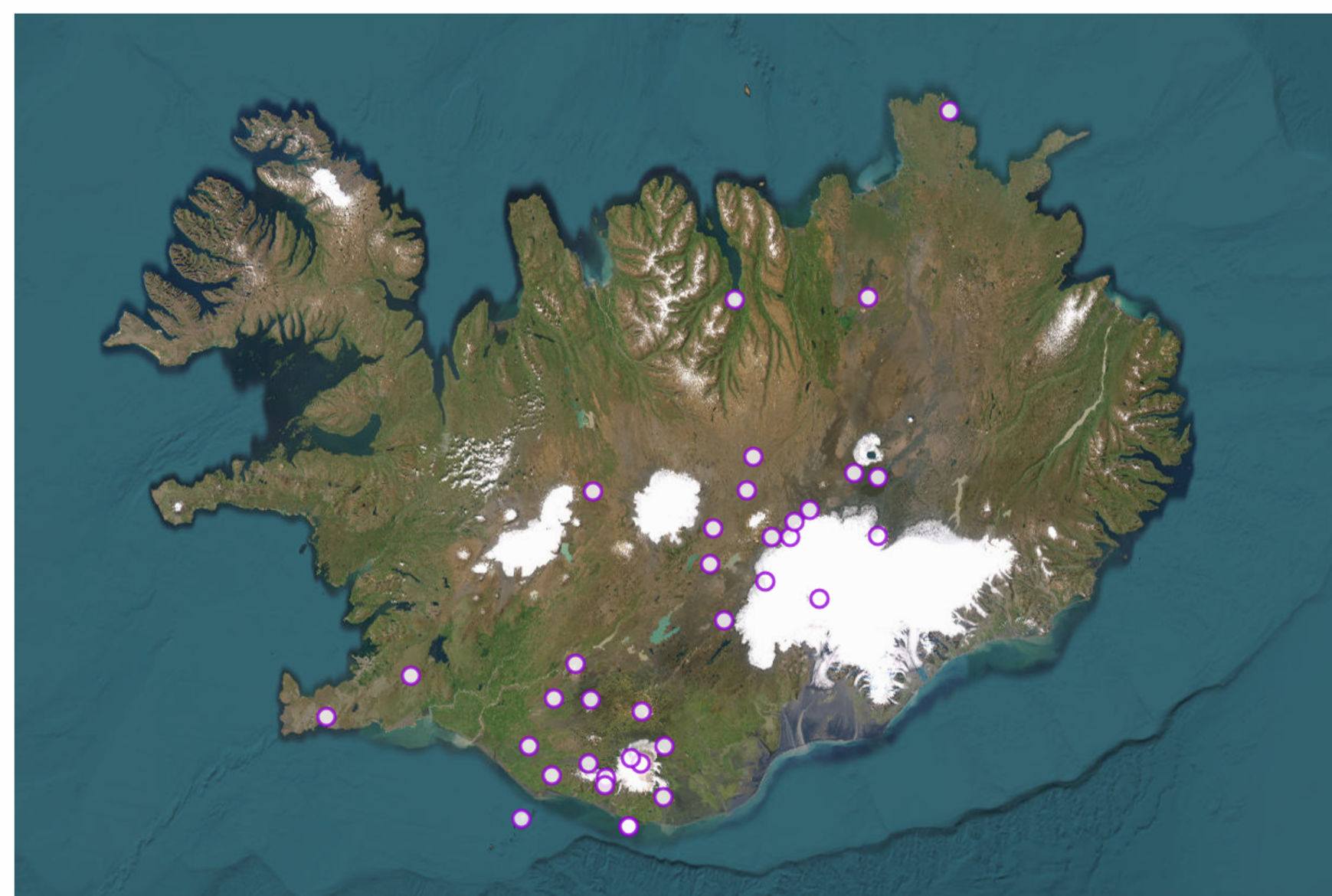
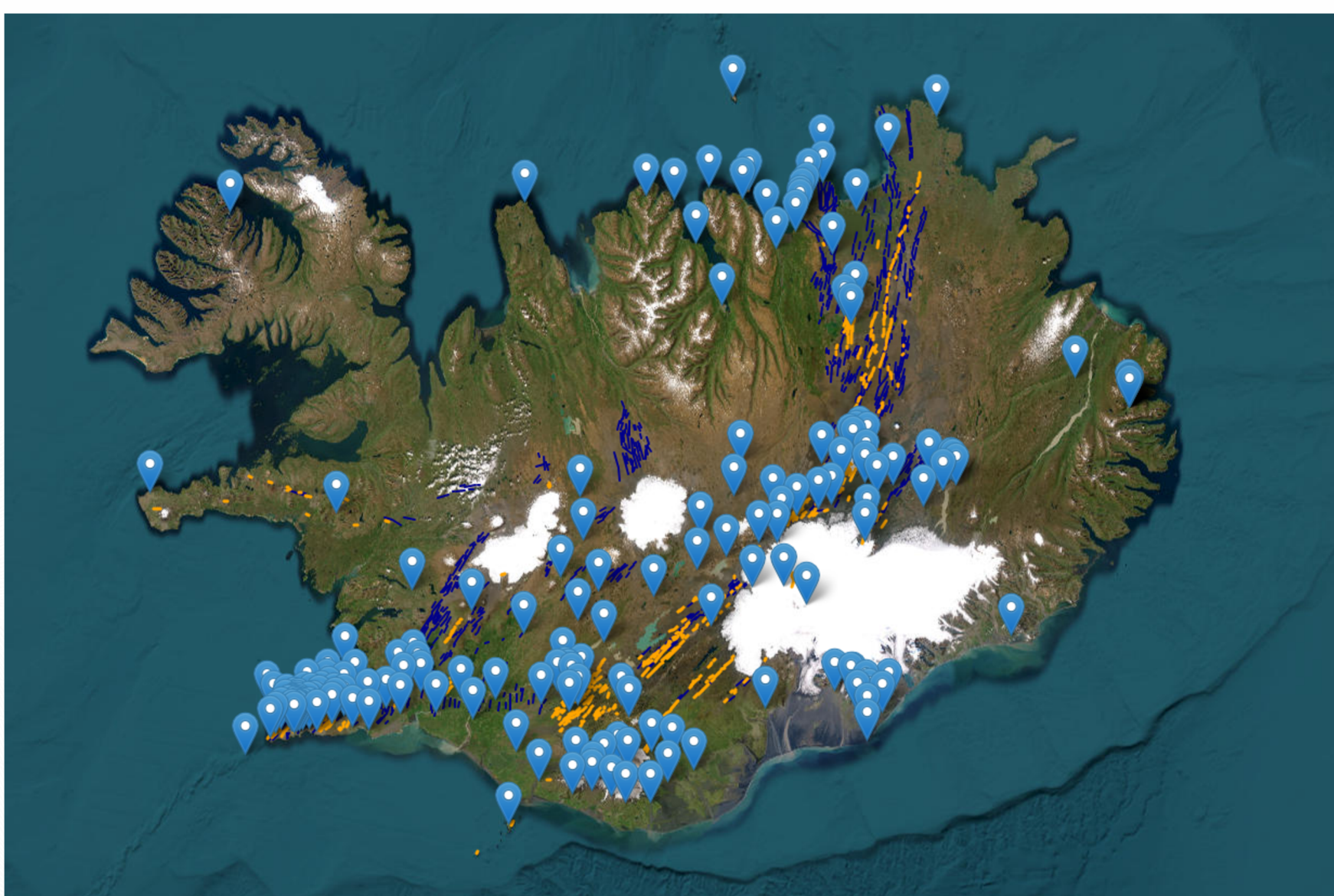
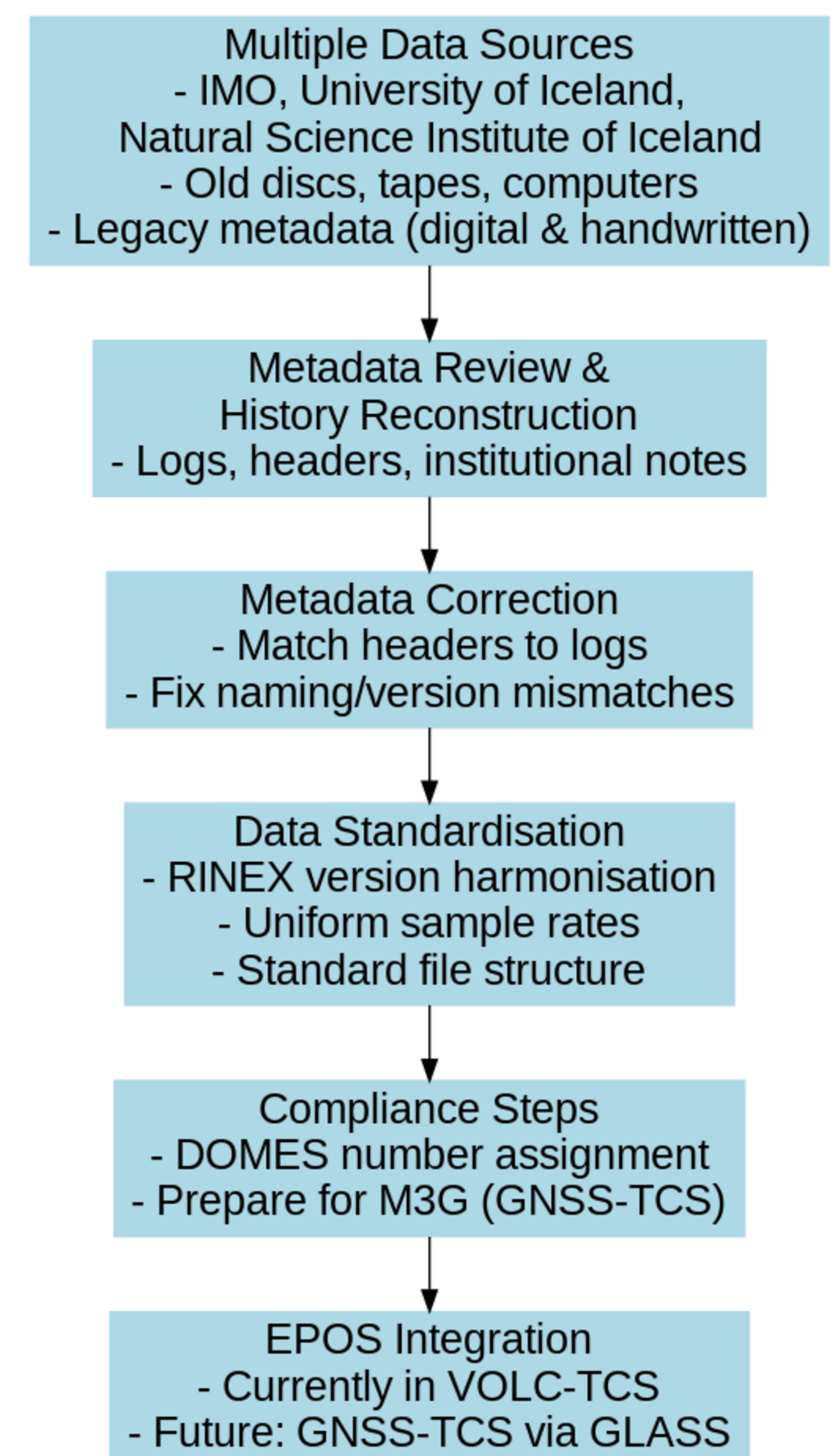
Quality control of Icelandic GNSS data begins with reviewing metadata across stations from different time periods, institutions, and storage systems. Data is often found in legacy archives or incomplete databases and must be carefully validated and reformatted to meet EPOS standards.

For VOLC-TCS, only the GNSS data and associated metadata must be accessible and accurate. For future integration into GNSS-TCS, compliance with stricter requirements is needed, including metadata registration in M3G and assignment of DOMES numbers.

This process requires cross-checking:

- RINEX file headers
- Station logs
- Historic site details
- Naming conventions and file formats

Quality assurance also involves standardising formats (e.g., RINEX 2.11 vs 3.x), correcting metadata mismatches, and reconstructing station history when key information is missing or incomplete.



Left map: All continuous GNSS stations in Iceland operated by multiple institutions, with some spanning up to three decades of observations. While the goal is to make them available through the EPOS Data Portal, many still require thorough quality checks to meet international standards. Right map: Continuous GNSS stations planned for inclusion in the EPOS Data Portal in the coming years. Routine metadata quality control is still needed for many sites to fulfil international standards.

Case example – A station with complex history

Some Icelandic stations have complex operational histories that make metadata standardisation particularly difficult.

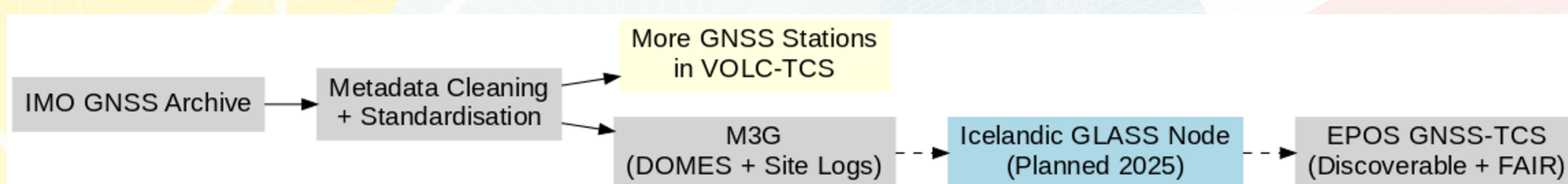
One example is the station AUST, that began as a campaign site, then became continuous, but over time had:

- Multiple equipment changes (receivers, antennas, firmware)
- Incomplete documentation
- Intermittent measurements
- Data scattered across institutional and local archives

The timeline (right) shows how frequently equipment changed before the site stabilized. Reconstructing its history required manually reviewing logs, contacting contributors, and validating archived data.



Device history of cGNSS station AUST, located on top of Katla volcano. The timeline shows frequent equipment changes over the years, including multiple GNSS receivers, and antennas. Stations with long and complicated histories like this require detailed metadata review and reconstruction before they can meet EPOS metadata standards.



Next steps toward GNSS-TCS integration

Work is ongoing to bring Icelandic GNSS data into full compliance with the EPOS GNSS-TCS, by:

- Registering remaining stations in M3G
- Applying for missing DOMES numbers
- Ensuring uniform metadata and data formats
- Coordinating long-term data delivery via the GLASS system

The goal is to make Iceland's GNSS archive fully interoperable, standardised, and discoverable across the EPOS infrastructure.

The value of standardisation & EPOS integration

Integrating Icelandic GNSS data into EPOS helps ensure that decades of geodetic observations are:

- Findable by other researchers
- Accessible through open platforms
- Interoperable across disciplines
- Reusable for future scientific and operational use

For early-career researchers, EPOS offers a framework to turn complex, historical datasets into structured, shareable resources, strengthening both local scientific capacity and international collaboration.