Connecting Antarctica to the World: WMO's OSCAR/Surface metadata system and the Antarctic AWS network

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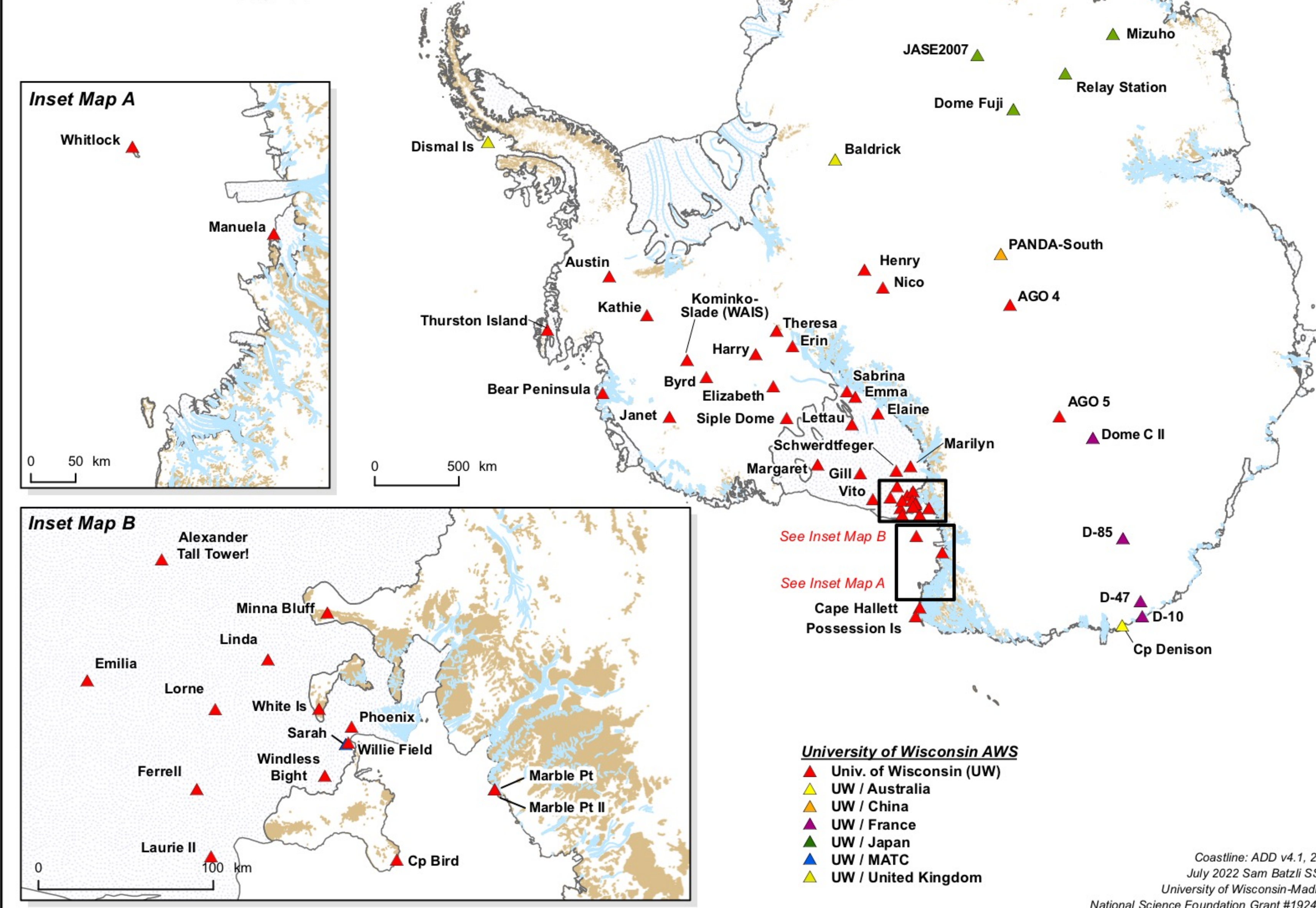
Background

Automatic weather stations (AWS) have aided in collecting meteorological surface observations in Antarctica for over 43 years. The development of the AMRC, now the Antarctic Meteorological Research and Data Center (AMRDC), was a union between the AWS project and the Man computer Interactive Data Access System (McIDAS) project at the UW-Madison. As part of the United States Antarctic Program (USAP), the group focuses on observational Antarctic research and providing real-time and archived meteorological data and observations while managing a network of AWS in Antarctica.

The use of real-time data observations have been used by numerical weather prediction centers and various end users alike in combination with the World Meteorological Organization's (WMO) Global Telecommunications System (GTS). Though it has proved useful, there is a coming evolution of the GTS into the new WMO Information System 2.0 by the end of the decade.

Prior Practices

- Traditional Alphanumeric Codes (TAC) is a form of human readable alphanumeric characters to transmit meteorological data through telecommunication lines which abbreviated code to save bandwidth consumption.
- TAC became incapable of accommodating the expanding needs of data collection.
- It was decided by the WMO to internationally phase out TAC in the coming decade and instead implement Binary Universal Form for the Representation (BUFR).
- BUFR, developed by the WMO, is a compact and flexible binary code which makes transmission of large data sets more accessible. Find Wisconsin AWS observations in BUFR under WMO headers ISMA01-02 and ISMA46-48 under KWBC on GTS.

World Meteorological Organization, 2020. 2023, https://community.wmo.int/en/activity-areas/WIGOS/implementation-WIGOS/RWC

The Future

- After WMO's Integrated Global Observing System (WIGOS) became fully operational in 2019, it is now their top priority as the global framework for all their co-sponsored observing systems so there is a common regulatory management umbrella.
- WIGOS promotes network integration and increased interoperability of systems to build observing capabilities, achieve better global data coverage, and improve economic efficiency.
- This system will not be replacing or taking over existing systems operated by other organizations and programs.
- WIGOS is currently under its initial operational phase which runs until the end of 2023

Automatic Weather Stations
University of Wisconsin 2022

OSCAR/Surface

- OSCAR is the WMO repository of WIGOS metadata for all surface-based observation stations.
- It is a web-based client-server application containing extended information search, filtering and mapping and a fully developed management system to add and edit observational metadata.

How It Works

- WIGOS Metadata Standards (WMDS) outline fields within profiles that describe the station and its observations.
  - Flexible to meet the needs of each station with mandatory, conditional, and optional inputs.
  - Extensible to maintain and reflect evolving observing systems.
- Users will be able to refine their station profiles with details, photos, current status, and station history components.
- When making a profile, users may get started with a variety of different templates in both basic and advanced views. Different colored indicators will denote required fields and indicate any issues that need to be fixed before publication.
  - The generic form will allow users to save a draft of their progress before publishing the profile.

Block	1	2	3	4
Description/Name	WIGOS ID Series	Issuer of ID	Issue Number	Local ID
Range	0	0 – 65534	0 – 65534	16 characters
Example	0	840	11502	Austin

WIGOS Station Identifier

- WSI will replace traditional IDs (e.g., 89324), while remaining backwards compatible (e.g., 0-20000-0-89324), and evolving into the future for new locations (e.g., 0-840-11502-Austin).
- Created WSIs will be a mandatory field in OSCAR/Surface even when a station has more than identifier.
- Those maintaining stations must make metadata for each new WSI available to WMO.
- Station identifiers may not be reused unless a new observing facility replaces it in the same location.

AMRDC AWS Connection

The AMRDC hosts an online repository storing metadata collected by the associated projects in conjunction with campaign meteorological datasets deposited by other Antarctic investigators. In addition to maintaining this resource, their network is listed through the WMO's OSCAR/Surface metadata catalog (Observing Systems Capability Analysis and Review tool) where active and drafted profiles are integrating the new WMO Integrated Global Observing System (WIGOS) Station Identifier.

Repository

Spearheaded by repository project lead Matthew Noojin, this online access point provides archival, preservation, access and metadata authoring services for Antarctic meteorological data from submission to end-user. Included in the multitudes of data one can find raw observational data, imagery, and processed datasets. This leap forward will allow the AMRDC to transition away from the previously managed ftp site while providing an interactive experiences and uniform reference and citation ability.
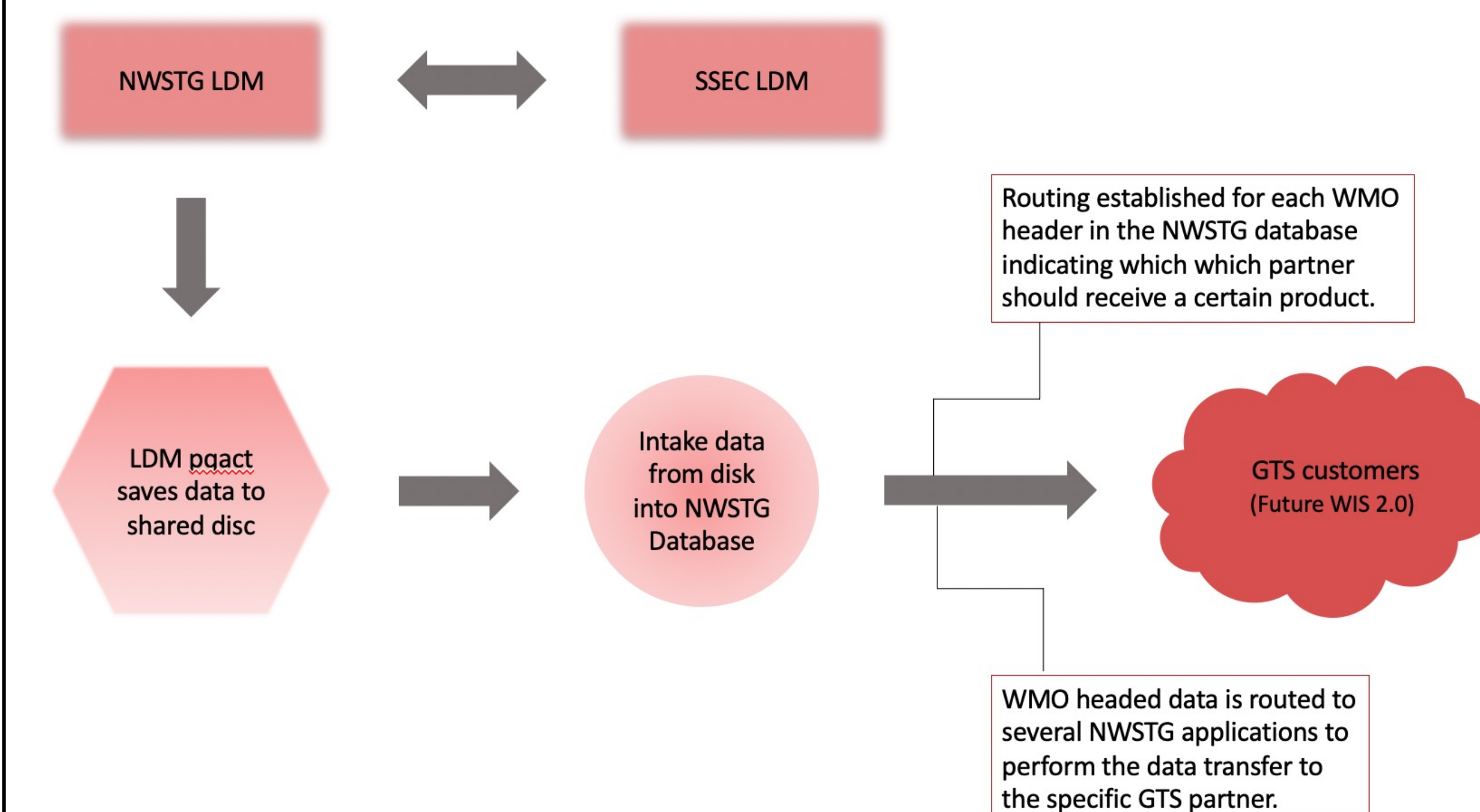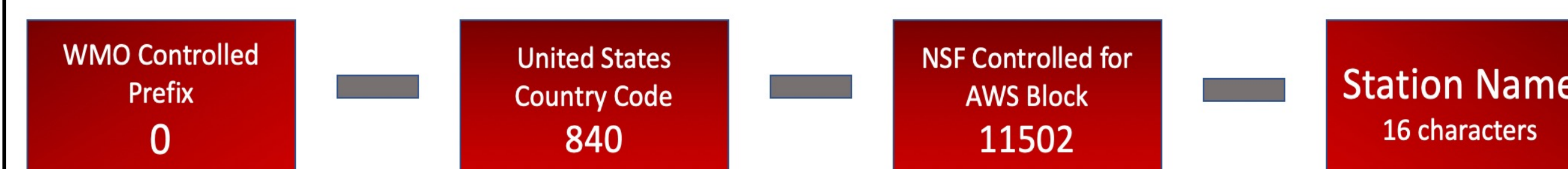
Data Flow

Figure inspired by: Dustin Sheffler – NCEP Central Operations, Dataflow/Data Management

WIGOS

Stations managed by AMRDC through the University of Wisconsin-Madison, as seen on the map, and Madison Area Technical College have a station profile through OSCAR/Surface. These profiles are in various stages, published and drafted, based on the internal review done over the past year. WIGOS identification numbers, instrumentation, and reporting intervals have been updated during this time. WIGOS identification numbers for the AMRDC AWS follow the parameters mapped below.

WMO Controlled Prefix	United States Country Code	NSF Controlled for AWS Block	Station Name
0	840	11502	16 characters