

U.S. DEPARTMENT OF THE INTERIOR

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**Central West Antarctica Aeromagnetic Data:
A Web Site for Distribution of Data and Maps
(paper edition)**

by

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Open-File-Report 99-420

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Abstract

This report is a listing of the pages in the following web site:

<http://greenwood.cr.usgs.gov/pub/open-file-reports/ofr-99-0420/cwantarctica.html>

This web site describes the aeromagnetic data collected as a National Science Foundation (NSF) project entitled, "Lithospheric controls on the behavior of the West Antarctic ice sheet." This is a multi-institutional project that includes the Institute for Geophysics of the University of Texas at Austin, the Lamont-Doherty Earth Observatory, and the U. S. Geological Survey. The Support Office for Aerogeophysical Research (SOAR) collected the data. The website allows users to download (via FTP) data files as 1.5 km grids (in several formats), point data files used to make the grids, and plot files (in HPGL, GIF, and postscript formats) covering the area of Central West Antarctica. The anonymous FTP sites are:

<ftp://greenwood.cr.usgs.gov/pub/open-file-reports/ofr-99-0420/data>

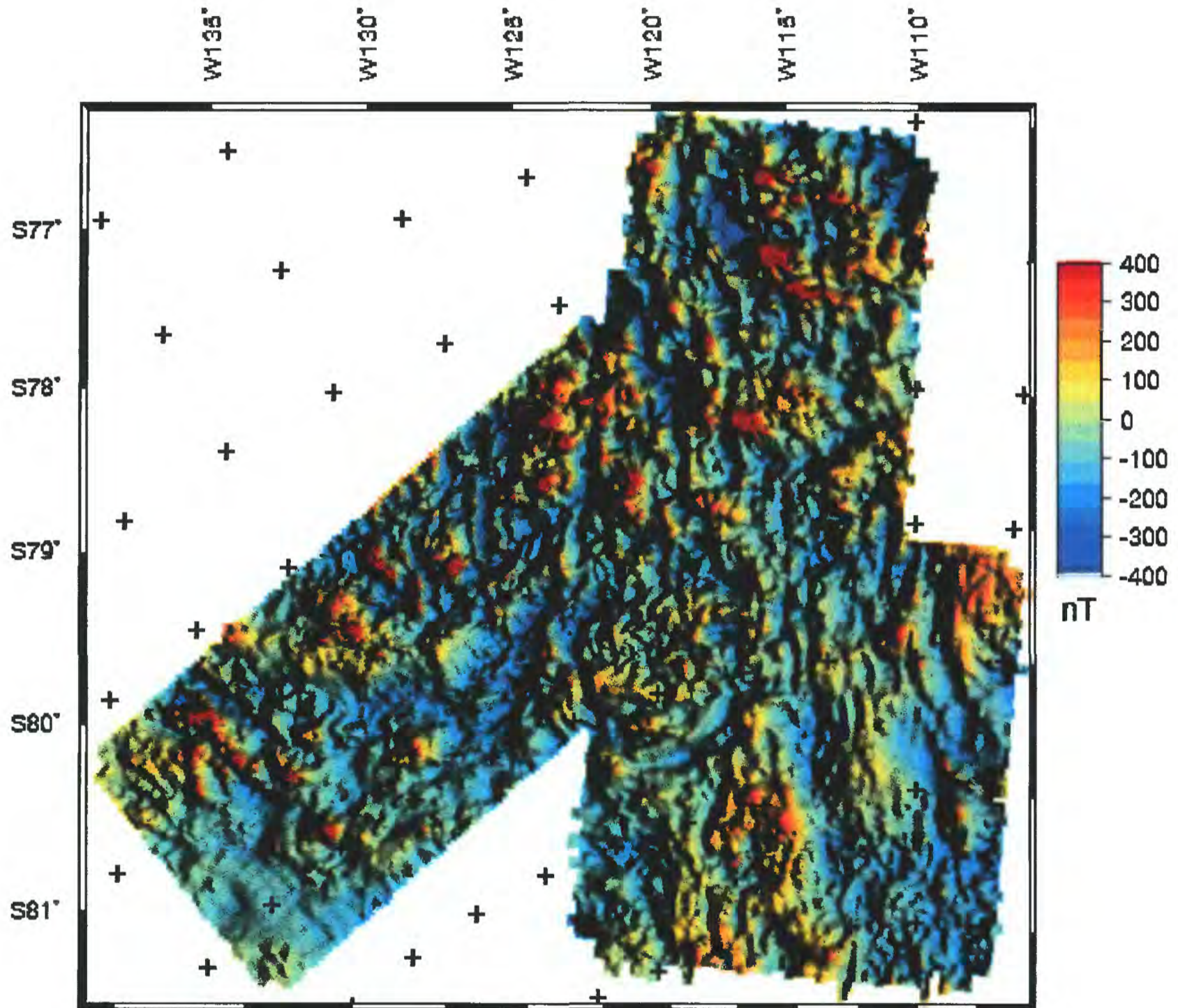
and

<ftp://greenwood.cr.usgs.gov/pub/open-file-reports/ofr-99-0420/plots>

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Central West Antarctica Aeromagnetic Anomaly Map



[gridname = rtz; plotname = rtzshade_intro]

Get
Map
Info...

Get
Processing
Info...

Get
Survey
Info...

Get
Plots...

Get
Data...

Central West Antarctica Aeromagnetic Data

This is a non-image-mapped page to allow those with older browsers to access all the individual pages that make up the Central West Antarctica Aeromagnetic Data web site (USGS Open-file report 99-420).

Select a destination from the list below:

Read map compilation text.

Read data processing details.

View the aeromagnetic data index map.

View the survey specifications table.

View the Central West Antarctica composite aeromagnetic map.

View the other aeromagnetic maps.

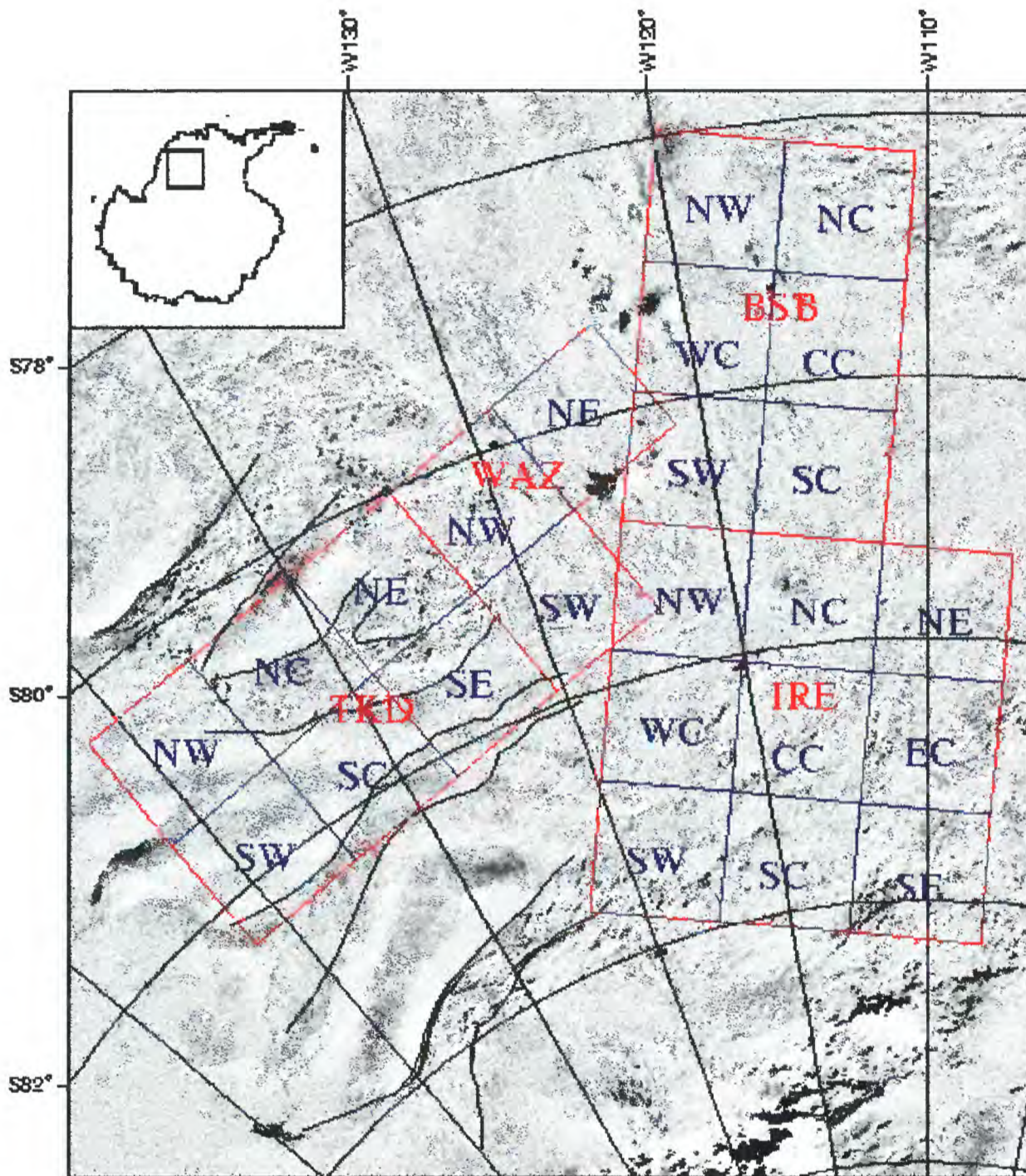
View the reference list.

Download gridded data via FTP.

Download flight-line data via FTP.

Download binary plot files via FTP.

Central West Antarctica Aeromagnetic Data Index Map



The Central West Antarctica aeromagnetic maps contain data from 5 separate Antarctica field seasons including 4 geographic areas (IRE, BSB, WAZ, TKD). The map shown above [gridname = avhrr_index] is an index to the names and geographic regions of the original surveys. The basemap displays AVHRR (advanced very high resolution radiometer) data from Ferrigno and others (1996). A data table summarizes the survey specifications, including dates flown and original flight elevations. The final data, in both point and grid format, are available to copy using FTP.

Table 1.--Survey specifications used in the Central West Antarctica compilation.

SURVEY	DATES	AVERAGE BASEMAG FOR SURVEY	AREA FLOWN	FLIGHT ELEVATIONS (BAROMETRIC)	
CTZ2	12/91 - 1/92	57,150 nT	IRE/CC	2250 m	
			IRE/NC	2500 m	
			IRE/EC	2750 m	
			IRE/NE	2750 m	
CTZ3	12/92 - 1/93	57,070 nT	IRE/SE	2500 m	
			IRE/SC	2000 m	
			IRE/SW	1750 m	
			IRE/WC	1750 m	
RTZ4	1/95	57,260 nT	BSB/SC	2100 m	
			BSB/NW(partial)	2200 m	
			BSB/NC(partial)	2200 m	
			BSB/CC(partial)	2200 m	
			BSB/NW(completed)	2200 m	
RTZ5	12/95 - 1/96	57,190 nT	BSB/NC(completed)	2200 m	
			BSB/CC(completed)	2200 m	
			IRE/NW	1900 m	
			BSB/SW	1900 m	
			BSB/WC	2050 m	
			1/96	57,190 nT	WAZ/NE
				WAZ/NW	1600 m
				WAZ/SW	1600 m
				TKD/NE	3950 ft
				TKD/SE	3950 ft
RTZ6	12/96 - 1/97	59,435 nT	TKD/NC	3300 ft	
			TKD/SC	3300 ft	
			TKD/NW	3300 ft	
			TKD/SW	3300 ft	

Central West Antarctica Aeromagnetic Compilation

The aeromagnetic data presented here are one data set collected as a National Science Foundation (NSF) project entitled, "Lithospheric controls on the behavior of the West Antarctic ice sheet." This is a multi-institutional project that includes the Institute for Geophysics of the University of Texas (UTIG) at Austin, the Lamont-Doherty Earth Observatory (LDEO), and the U. S. Geological Survey (USGS). The scientific objective of this program is to understand the lithospheric framework across the West Antarctic rift system in order to determine the geological controls on the dynamics of the West Antarctic ice sheet. The Support Office for Aerogeophysical Research (SOAR) collected the data.

These data show variations in the Earth's magnetic field caused primarily by the uneven distribution of the mineral magnetite in the rocks that make up the upper part of the Earth's crust. The features and patterns of the maps reveal details of subsurface geology including the locations of buried faults and magnetite-bearing rocks, which include Cenozoic magmatic rocks, and non-magnetic sedimentary and granitic rocks.

The aeromagnetic data were collected in 5 separate field seasons covering 4 geographic regions (IRE, BSB, WAZ, TKD). Each survey made simultaneous measurements of radar ice soundings, laser altimetry, gravity (Bell and others, 1999), and magnetics. The transects flown in all regions were separated by 5.3 kilometers in both the flight-line and orthogonal tie-line directions. The magnetic field observations are accurate to one nT. High-resolution horizontal and vertical positions were obtained from differential positioning techniques based on Global Positioning System (GPS) satellites. When GPS satellite positioning was unavailable, the laser altimetry was corrected using attitude information from an inertial navigation system, and a digital pressure transducer was used to recover vertical positions and accelerations. The latitudes of the final composite map ranged from approximately -77.8 to -84.5 degrees; the longitudes from approximately -103.9 to -153.3 degrees. A data index plot gives an overview of the names and locations of the geographic regions. A data table summarizes the survey specifications, including dates flown and original flight elevations. A list of data processing steps details the procedures used to produce the final maps.

HPGL plot files can be downloaded for plotting at a 1:1,000,000 scale for the composite IRE/BSB, WAZ/TKD, and IRE/BSB/WAZ/TKD maps, and at a 1:750,000 scale for the individual WAZ and TKD maps. GIF and page-sized color postscript plot files can be downloaded for all maps. All maps are also available for screen viewing.

This project was supported by National Science Foundation Grant OPP-9319877 and by the Mineral Resources Team, the Global Change and Climate History Team, and the Coastal and Marine Geology Team, all of the USGS. The authors wish to thank our USGS colleagues Richard Saltus and Kim Oshetski for their assistance in preparing this report, and Robert Arko of LDEO for his assistance with the data processing.

Central West Antarctica Aeromagnetic Data Processing

The assembly of 5 individual aeromagnetic surveys and 4 geographic regions to create the Central West Antarctica compilation was done in several steps.

DATA PROCESSING STEPS

1. Original unsampled field data were edited and filtered, as required, to remove any anomalous noise. This process was applied at varying times to all of the data transects provided, including those from the aircraft magnetometer, base magnetometer, and longitude, latitude, and elevation from the navigation systems.
2. The edited field data for each transect were then sampled at 1 second intervals and merged.
3. The diurnal component of the magnetic field was removed by first subtracting the base magnetometer values from those of the aircraft magnetometer, and then adding an average base magnetometer value, preferably quiet-time, to adjust the resultant residual field amplitudes to reasonable levels. For the CTZ2 survey, we used the average quiet-time geomagnetic value from the recordings of two ground base station magnetometers located at the base camp near the center of the survey (Saltus and Kucks, 1992). For all other surveys, we used the average geomagnetic value from the base magnetometer recordings for each complete survey. (See the data table for survey specifications, including the average base magnetometer values for each survey, and the data index plot for names and locations of all the geographic regions.)
4. The internal (main-field) component of the magnetic field, represented by the 1995 revision of the International Geomagnetic Reference Field (IGRF), which includes the Definitive Geomagnetic Reference Field (DGRF) for 1990, was subtracted from the aircraft measurements (Sweeney, 1990).
5. The data for each transect were then resampled at a 5 second interval.
6. All data were synthesized into a consistent data base by equating the differing magnetic values of the flight-lines and tie-lines at their intersection locations. The remaining data in each line were then adjusted for consistency with the new intersection values (Mittal, 1984). This process not only reduces the effects of a non-lithospheric component in the magnetic data due to the transects being flown at differing times, but it also makes adjustments due to differences in elevation.
7. Preliminary grids were constructed from the sampled aeromagnetic transects with a cell size of 1.5 kilometers (between 1/3 and 1/5 of the flight-line spacing of each survey), using a minimum curvature gridding algorithm (Webring, 1981).
8. Data in adjacent geographic regions were combined, not by application of some smoothing algorithm between adjacent grids, but by adjustment of all transect data that overlapped into the regions occupied by the adjacent grids, using a modification of the algorithm of Mittal (1984). This adjustment was performed by finding the locations where the overlapping data intersected the orthogonal flight lines in the adjacent area, and forcing them to match the mag values at those adjacent intersection locations. Because of the care taken in selecting the average base magnetometer (datum) levels, the correct application of the IGRF/DGRF suite of coefficients, and the adjustment of all transect data in the regions of adjacent survey overlap, no additional datum level adjustment was applied to any of the regional data to minimize boundary differences.
9. Data quality problems were addressed.
10. Final grids were constructed from the fully-adjusted flight line data using a cell size of 1.5 kilometers.

11. The composite IRE/BSB/WAZ/TKD grid was continued from its original flight elevation surface to a draped surface 1,500 meters above the bedrock elevation surface using the chessboard method of Cordell and others (1992), applied with a moderate lowpass filter.

GRID PROJECTION SPECIFICATIONS

- Projection = Polar Stereographic
- Central meridian = 110 degrees W
- Base latitude = 90 degrees S
- True scale latitude = 80 degrees S
- Semi-major ellipsoid axis = 6378206.4 m
- Eccentricity squared = 0.0067686579973

Central West Antarctica Aeromagnetic Maps - View/Download

Select an aeromagnetic map from the list below. For a full survey description, see the page on aeromagnetic compilation. For a detailed data processing description, see the page on aeromagnetic data processing.

View composite grid of all data sets at original survey elevations. [gridname = rtz]

View composite grid of all data sets at 1,500 meters above bedrock elevations. [gridname = rtz_bed1500]

View composite IRE & BSB grid at original survey elevations. [gridname = irebsb]

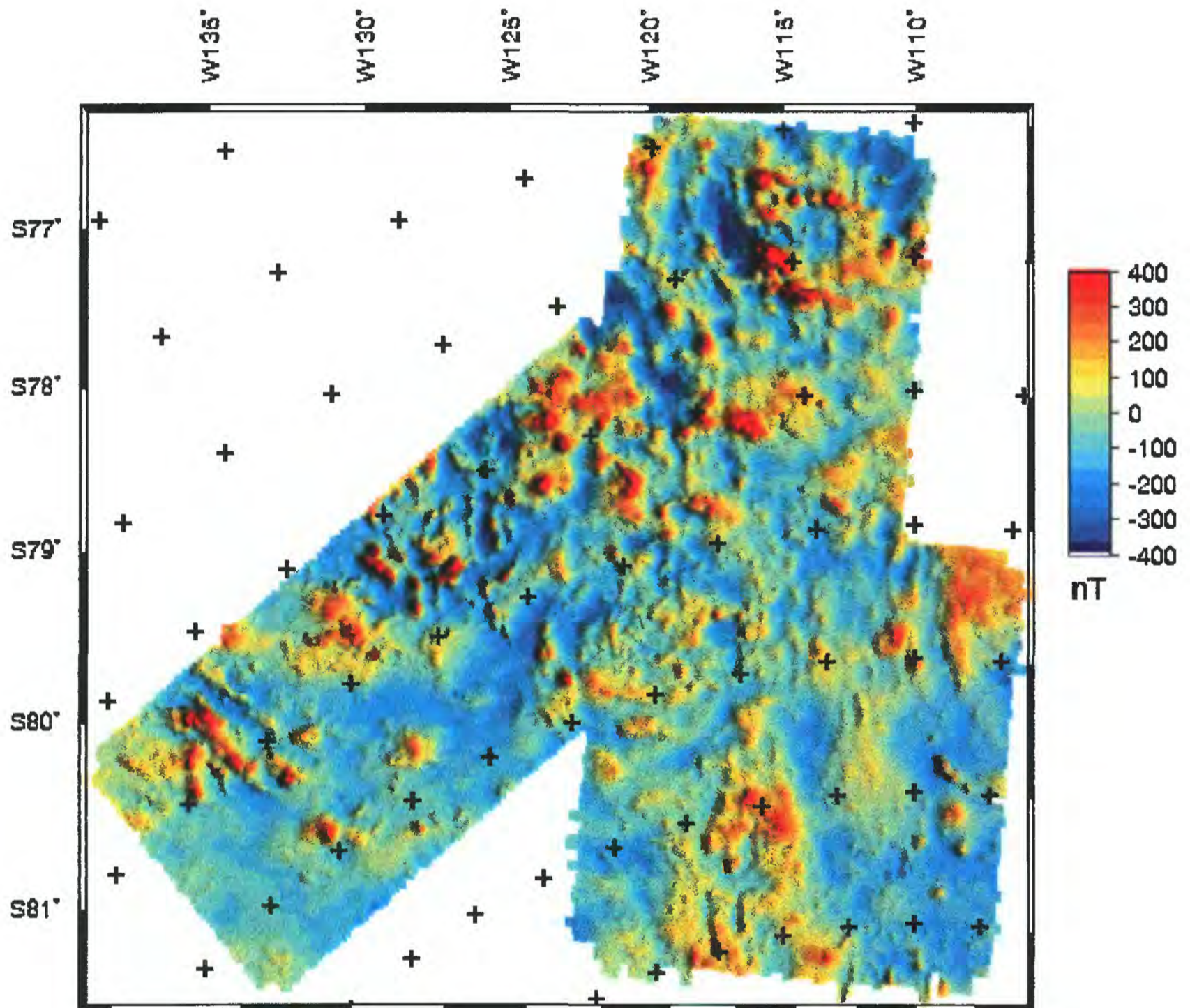
View composite TKD & WAZ grid at original survey elevations. [gridname = tkdwaz]

View composite WAZ grid at original survey elevations. [gridname = waz]

View composite TKD grid at original survey elevations. [gridname = tkd]

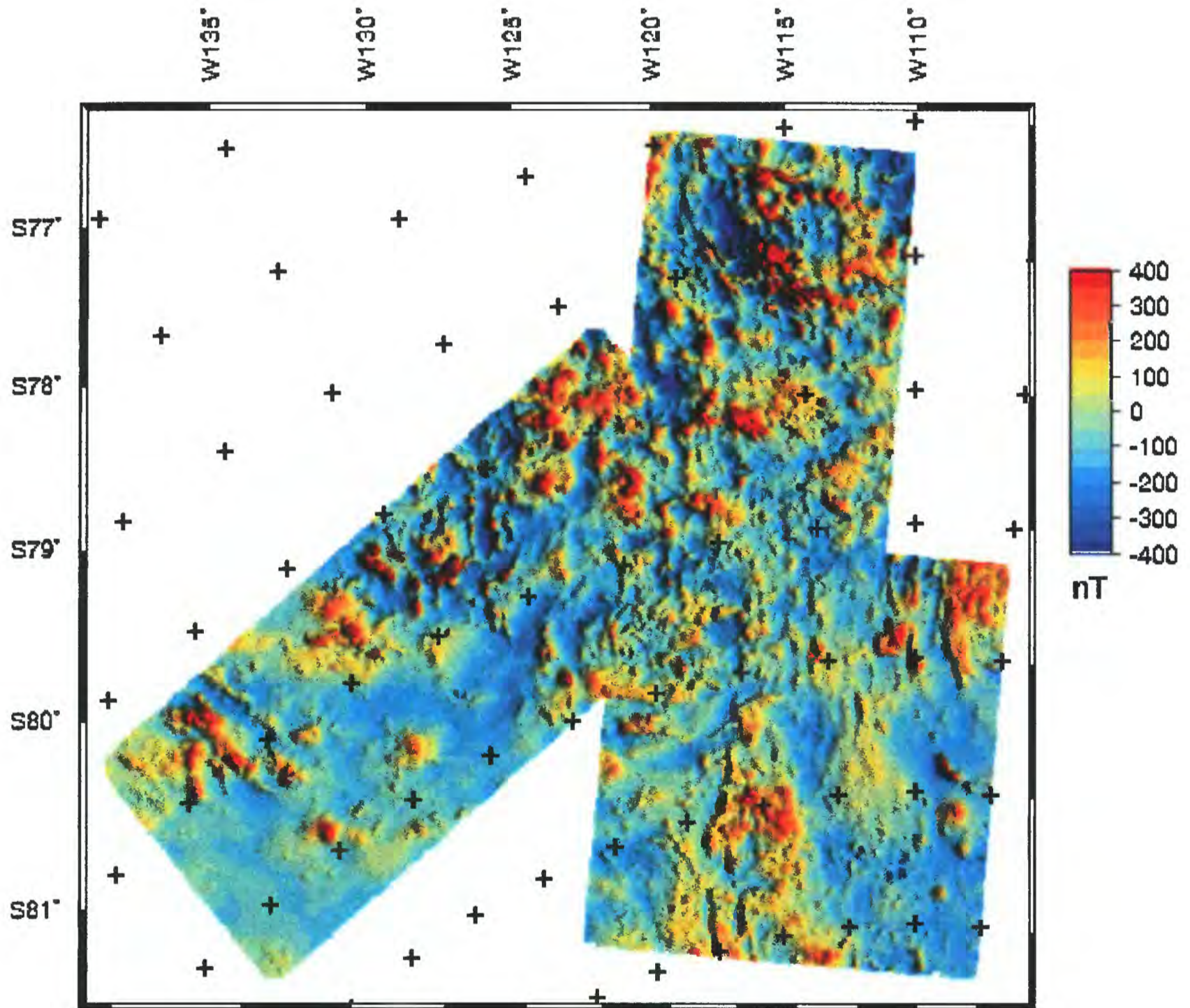
Transfer to plot file directory for downloading HPGL, GIF, & postscript plot files.

Central West Antarctica Composite Aeromagnetic Map



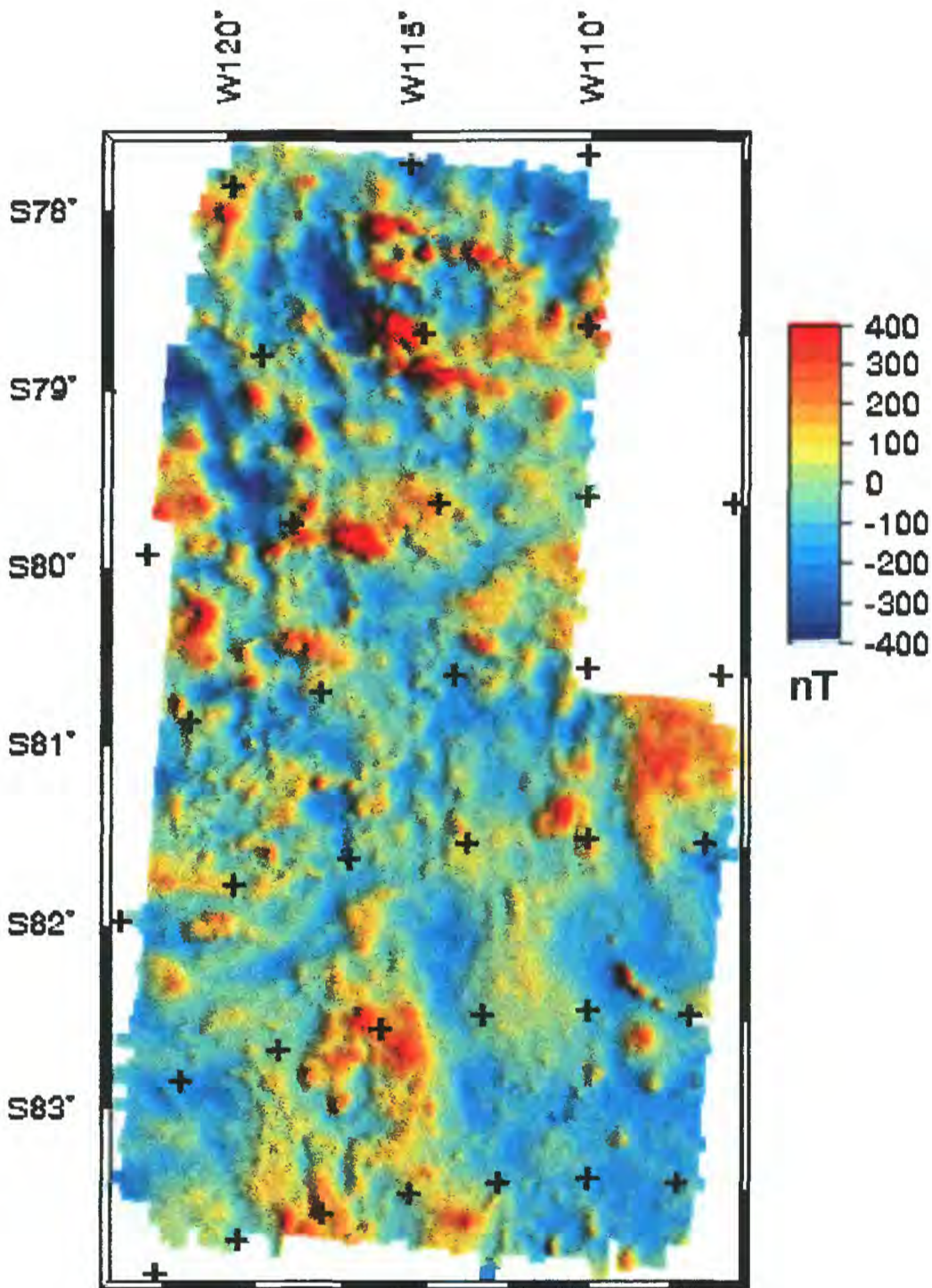
The Central West Antarctica composite aeromagnetic map above was constructed (see data processing details) from data in all the regions of Central West Antarctica shown on the data index plot. A data table summarizes the survey specifications, including dates flown and original flight elevations. [gridname = rtz]

Central West Antarctica Composite Aeromagnetic Map 1500 Meters Above Bed Elevation



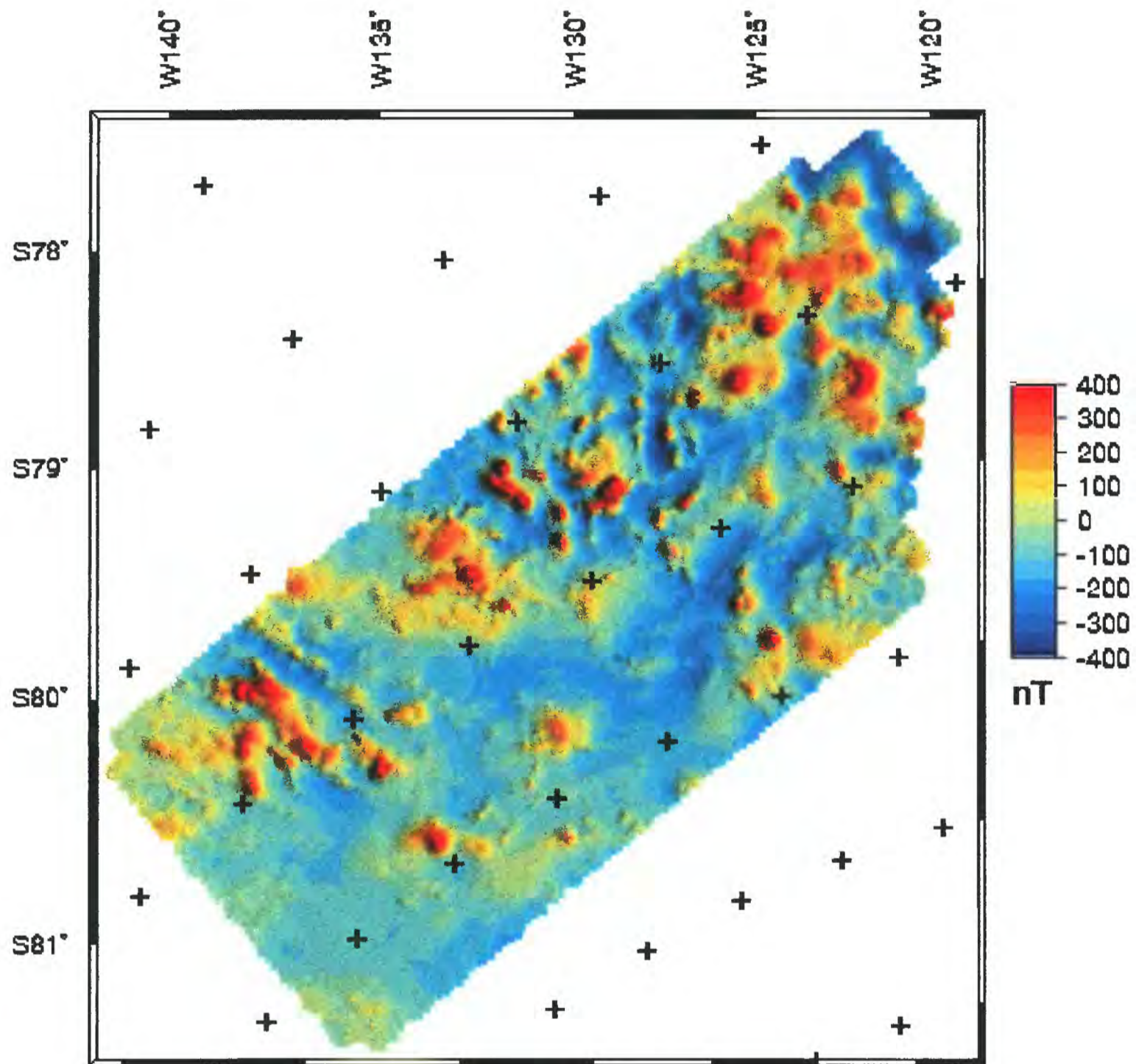
The Central West Antarctica composite aeromagnetic map above was constructed (see data processing details) from data in all the regions of Central West Antarctica shown on the data index plot. The continuation from the original flight elevation surface to a draped surface 1,500 meters above the bedrock elevation surface was performed using the chessboard method of Cordell and others (1992), applied with a moderate lowpass filter. A data table summarizes the survey specifications, including dates flown and original flight elevations. [gridname = rtz_bed1500]

IRE & BSB Composite Aeromagnetic Map



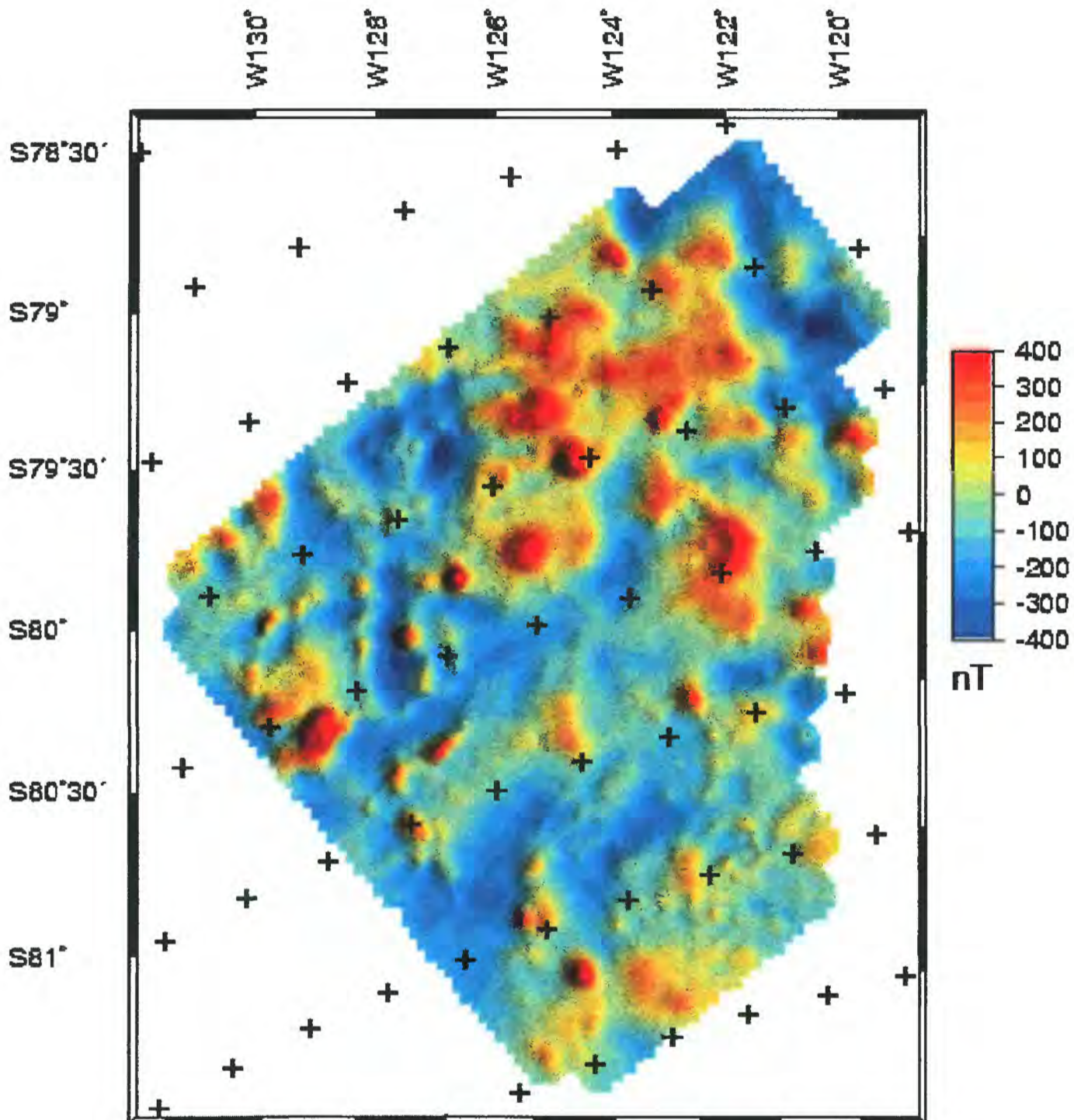
The IRE and BSB composite aeromagnetic map above was constructed (see data processing details) from data in the IRE and BSB regions of Central West Antarctica shown on the data index plot. A data table summarizes the survey specifications, including dates flown and original flight elevations. [gridname = irebsb]

TKD & WAZ Composite Aeromagnetic Map



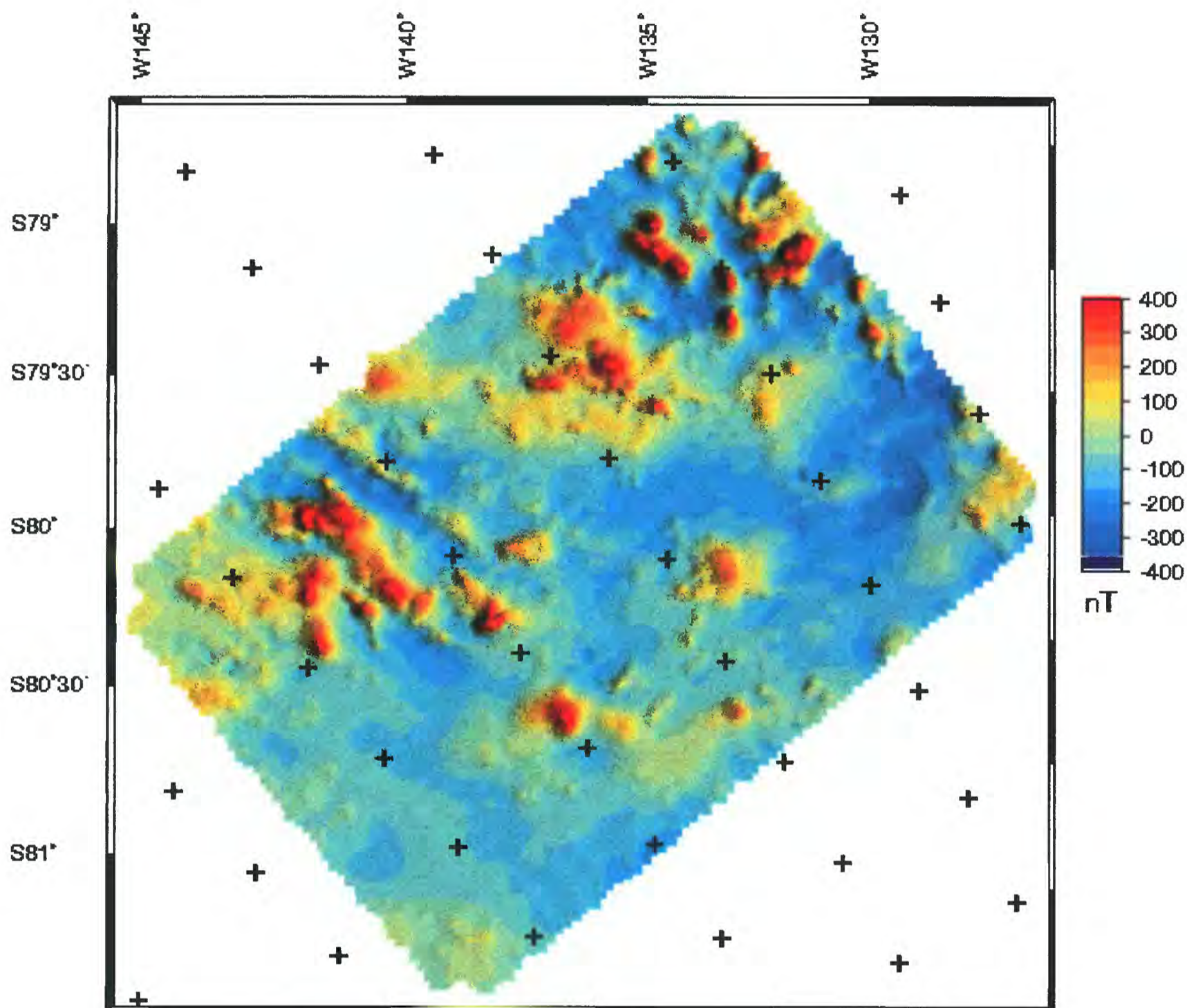
The TKD and WAZ composite aeromagnetic map above was constructed (see data processing details) from data in the TKD and WAZ regions of Central West Antarctica shown on the data index plot. A data table summarizes the survey specifications, including dates flown and original flight elevations. [gridname = tkdwaz]

WAZ Composite Aeromagnetic Map



The WAZ composite aeromagnetic map above was constructed (see data processing details) from data in the WAZ region of Central West Antarctica shown on the data index plot. A data table summarizes the survey specifications, including dates flown and original flight elevations. [gridname = waz]

TKD Composite Aeromagnetic Map



The TKD composite aeromagnetic map above was constructed (see data processing details) from data in the TKD region of Central West Antarctica shown on the data index plot. A data table summarizes the survey specifications, including dates flown and original flight elevations. [gridname = tkd]

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