AIRBORNE MAGNETIC DATA MERGE, YUKON-TANANA UPLAND, ALASKA, VERSION 2023

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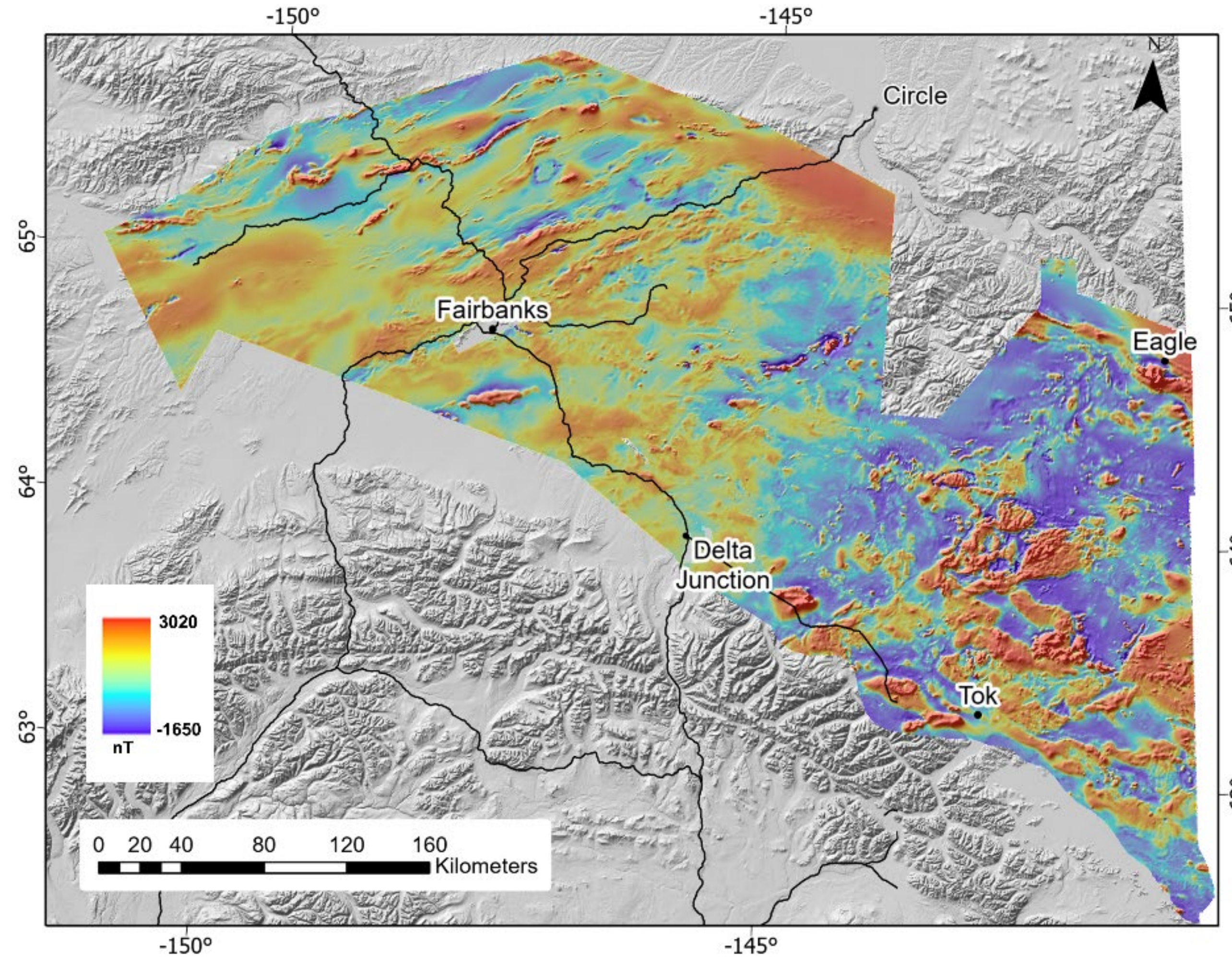

Airborne magnetic data merge of the Yukon-Tanana Upland, Alaska, showing residual magnetic field raster with major roads, towns, cities, and digital terrain model hillshade basemap.

This report has not been reviewed for technical content or for conformity to the editorial standards of DGGS.

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INTRODUCTION

This publication provides a merged raster grid of magnetic data for the Yukon-Tanana Upland (YTU), Alaska. This dataset provides a regionally consistent magnetic grid while retaining as much detail as possible of the originating data by leveling all the region's magnetic grids to one another. This 100-m cell-size magnetic grid of the YTU will assist in evaluating the region's geologic structure, geologic processes, tectonic evolution, and mineral resource potential. The grid was compiled from previous studies published by the Alaska Division of Geological & Geophysical Surveys (DGGS). The data, as well as additional metadata, are available from the DGGS website: https://doi.org/10.14509/31157.

METHODS

Thirty-four individual aeromagnetic datasets from the YTU were processed, gridded, and merged using Oasis montaj. The purpose of this project was to create a singular grid for the YTU to aid in the geological interpretation of the area. For each dataset, the International Geomagnetic Reference Field (IGRF)-corrected aeromagnetic data were gridded at one-fourth of their flight line spacing. The data were continued to 350 meters with the Oasis montaj extension Compudrape using the chessboard method (Cordell, 1985). The chessboard method continues the data in small increments to multiple parallel surfaces until the desired elevation is reached (Phillips, 1996). We chose 350 meters for continuation because it was the lowest elevation the fixed-wing surveys could be continued without the introduction of artifacts. Several fixed-wing surveys (Eagle, Tanana-Big Delta, White Mountains) required the smoothing of radar altimeter readings prior to continuation due to the presence of steep topographic gradients. These gradient-generated artifacts were successfully removed by the smoothing of the radar grids. Decorrugation of the data was performed following continuation on these fixed-wing surveys to remove along-line artifacts.

Following the processing of each dataset, the data were merged using the Oasis montaj Gridknit extension. Static shifts were applied in the merging process along survey boundaries to suture the datasets together. The merged grid "*_residualmag" was the product of this process and represents a merged total-field anomaly map of the YTU. It should be noted that the Circle dataset was not used in this merge due to data-processing errors that cannot be corrected. A reduction-to-pole (RTP) was performed on the total-field anomaly dataset to shift the magnetic field to vertical (inclination: 90°, declination: 0°) to locate anomalies directly above the producing bodies. The

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inclination used for RTP was 77.26° and the declination was 18.78°. The RTP dataset is represented by the dataset "*_rtp". A first-vertical derivative of the data was computed from the RTP dataset to remove long-wavelength features and enhance short-wavelength anomalies. This dataset is represented by "*_c1vdmag". Finally, the horizontal gradient magnitude (HGM) was calculated from the RTP dataset to delineate the edges of anomalous bodies and geologic contacts. This dataset is represented by "*_hgrad_magnitude". The processing and gridding parameters are described below for each individual dataset.

PROCESSING STEPS

The processing steps used for each dataset are listed below. The originating data may retain greater detail than this merge; users should defer to the original data when appropriate. Published data can be found using the DGGS publication search page (https://dggs.alaska.gov/pubs) or with the interactive Web Map available here: https://maps.dggs.alaska.gov/gp.

Alaska Highway Corridor – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2020a)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Black Mountain – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2019a)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Eagle – Flight lines are 400-meter spacing, fixed-wing survey (Emond and MPX Geophysics LTD, 2021a)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 4,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 4,000-meter gridded radar altimeter readings.
4. Decorrugation of the data was then performed to remove along-line generated artifacts.

East Richardson – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2019b)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Fairbanks – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2019c)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Forty Mile – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2015a)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Goldstream – Flight lines are 100- to 200-meter spacing, helicopter survey (Emond and others, 2018)

1. IGRF-corrected magnetic data gridded to 50-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 50-meter grid cell size radar altimeter data.

Goodpaster – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2019d)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Headwaters of Little Chena – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2020b)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Ladue – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2020c)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Liscum – Flight lines are 300- and 400-meter spacing, helicopter survey (Burns and others, 2019e)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Livengood – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2015b)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Northeast Fairbanks – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2019f)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Rampert Manley – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2020d)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Richardson – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2020e)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Salcha Pogo – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2019g)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Salcha Pogo SE Extension – Flight lines are 400-meter spacing, helicopter survey (Burns and others, 2019h)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Shaw-Shawnee, helicopter survey (Emond and MPX Geophysics LTD, 2020)

Eagle – Flight lines are 100-meter spacing

1. IGRF-corrected magnetic data gridded to 25-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 25-meter grid cell size radar altimeter data.

Echo - Flight lines are 100-meter spacing

1. IGRF-corrected magnetic data gridded to 25-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 25-meter grid cell size radar altimeter data.

Healy - Flight lines are 100-meter spacing

1. IGRF-corrected magnetic data gridded to 25-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 25-meter grid cell size radar altimeter data.

LMS-X - Flight lines are 100-meter spacing

1. IGRF-corrected magnetic data gridded to 25-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 25-meter grid cell size radar altimeter data.

Mertie Mountains - Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Stoneboy - Flight lines are 200-meter spacing

1. IGRF-corrected magnetic data gridded to 50-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 50-meter grid cell size radar altimeter data.

Shaw Creek - Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Volkmar River - Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

Tanacross - Flight lines are 500-meter spacing, fixed-wing survey (Emond and others, 2015)

1. IGRF-corrected magnetic data gridded to 125-meter grid cell size using minimum curvature.

2. Upward continuation of data to 350 meters using 125-meter grid cell size radar altimeter data.

Tanana-Big Delta, fixed-wing survey (Emond and MPX Geophysics LTD, 2022)

Chena – Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 6,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 6,000-meter gridded radar altimeter readings.
4. Decorrugation of the data was then performed to remove along-line generated artifacts.

Eisen – Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 4,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 4,000-meter gridded radar altimeter readings.
4. Decorrugation of the data was then performed to remove along-line generated artifacts.

Eisen Infill – Flight lines are 200-meter spacing

1. IGRF-corrected magnetic data gridded to 50-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 2,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 2,000-meter gridded radar altimeter readings.

Healy – Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 4,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 4,000-meter gridded radar altimeter readings.
4. Decorrugation of the data was then performed to remove along-line generated artifacts.

North Pole – Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 6,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 6,000-meter gridded radar altimeter readings.
4. Decorrugation of the data was then performed to remove along-line generated artifacts.
5. A buttersworth filter was applied to this dataset due to the presence of high-frequency noise. The filter was applied with a low pass of 800 meters.

Tanana – Flight lines are 400-meter spacing

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 4,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 4,000-meter gridded radar altimeter readings.
4. Decorrugation of the data was then performed to remove along line generated artifacts.

Western Forty Mile – Flight lines are 400-meter spacing, helicopter survey (Emond and others, 2018b)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Upward continuation of data to 350 meters using 100-meter grid cell size radar altimeter data.

White Mountains – Flight lines are 400-meter spacing, fixed-wing survey (Emond and MPX Geophysics LTD, 2021b)

1. IGRF-corrected magnetic data gridded to 100-meter grid cell size using minimum curvature.
2. Prior to continuation, radar altimeter grids were smoothed to 4,000 meters to remove artifacts in the data caused by steep topographic gradients.
3. Data were continued to 350 meters using 4,000-meter gridded radar altimeter readings.
4. Decorrugation of the data was then performed to remove along line generated artifacts.

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