



LINEFILT — A Fortran program for low-pass filtering line-based data

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Abstract

Data collected along lines are frequently acquired at close intervals to ensure that all variations are adequately represented. When the data are subsequently gridded the mesh size is often controlled by the spacing between lines rather than the spacing along line, and spatial aliasing may result. The program described here may be used to low-pass filter data before gridding to avoid potential spatial aliasing.

INTRODUCTION

A number of geophysical and geochemical techniques involve the collection of data on grid lines that are spaced at many times the along-line sample interval. An example is aeromagnetic surveying, where the magnetic field may be measured at 5–10 m intervals along lines 150–500 m apart. During subsequent gridding operations the mesh size may be up to 20 times the sample interval thus opening the possibility of spatial aliasing.

Program LINEFILT uses recursive filtering to low-pass filter the data on each line and avoid the possibility of spatial aliasing. Parameters that require setting or modification include the low-pass cutoff wavelength

(normally at least twice the grid mesh size), the value for dummy data, the maximum number of points on one line, and the data format. The data are read line by line and segregated into segments of valid data. Any segment less than 10 points in length is not filtered. Other segments are extended by 50 points at each end, using the end values, and then zero-phase Butterworth filtered using the method described by Beauchamp (1973).

RESULTS

The method was tested using data from the 1981 West Tasmania aeromagnetic survey, with low-pass cutoffs of 125 m, 250 m, 500 m, 1000 m, 2000 m, 5000 m and 10 000 m (fig. 2 to 8). The raw data are shown in Figure 1. All figures have the same vertical scale of -100 nT to +1000 nT. With the exception of the 10 000 m cutoff (fig. 8) all filters applied do not change the end values of the line significantly when compared to the original data.

REFERENCE

BEAUCHAMP, K. G. 1973. *Signal processing using analog and digital techniques*. George Allen & Unwin Ltd : London. p. 324

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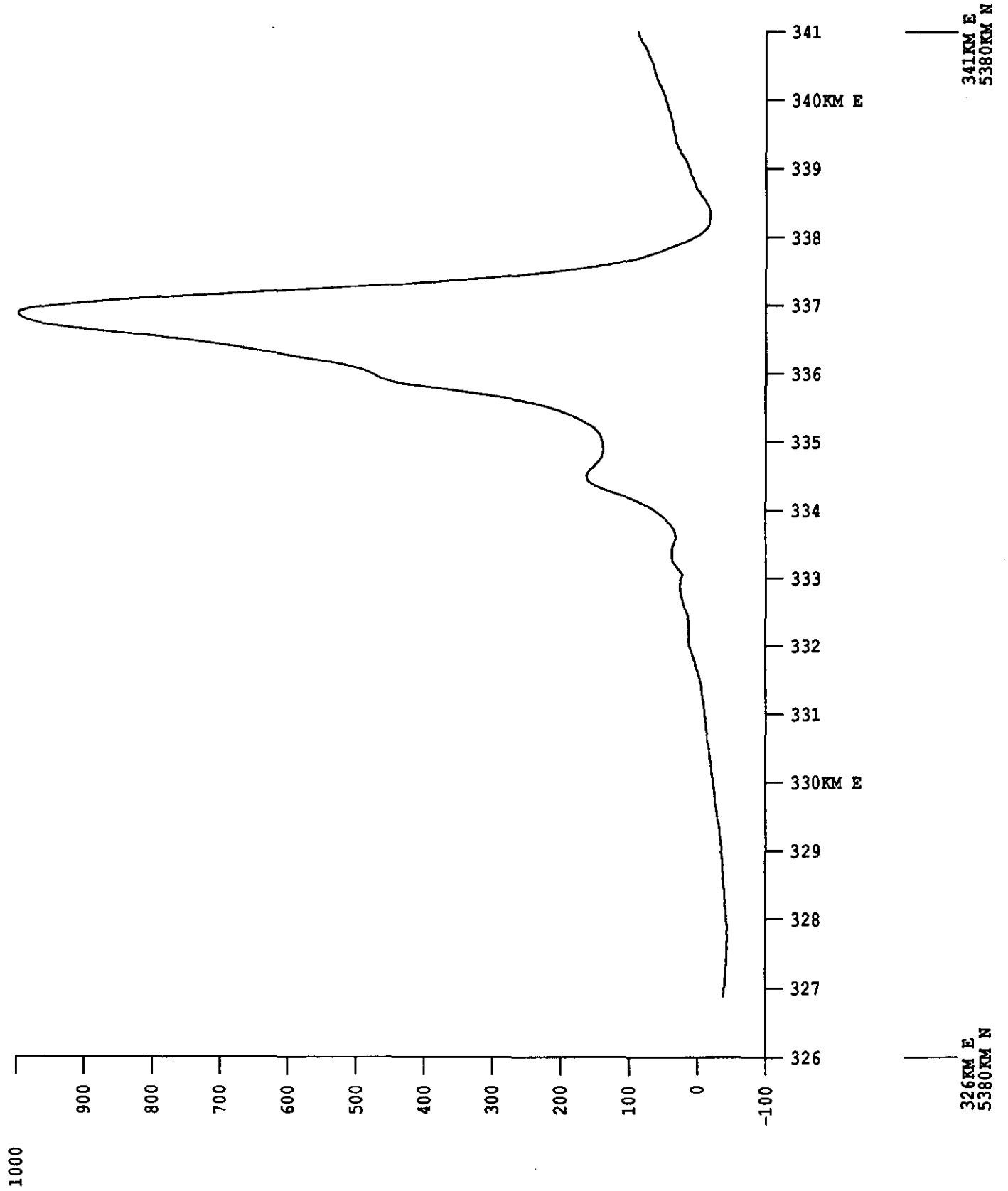


Figure 1
Western Tasmania Aeromagnetic Survey Line 1621 — Raw Data

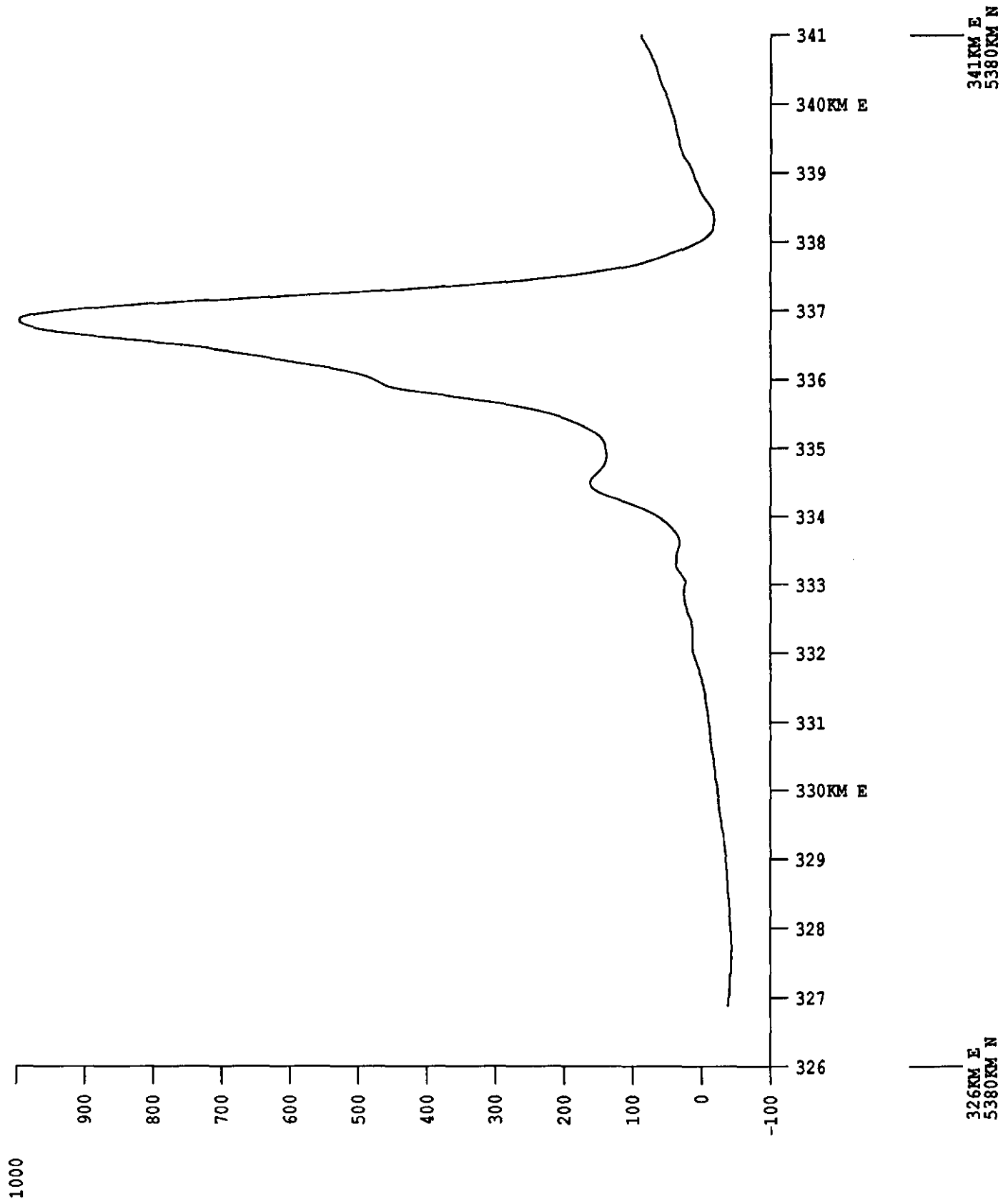


Figure 2

Western Tasmania Aeromagnetic Survey Line 1621 — Low-pass filtered — 125 m cutoff

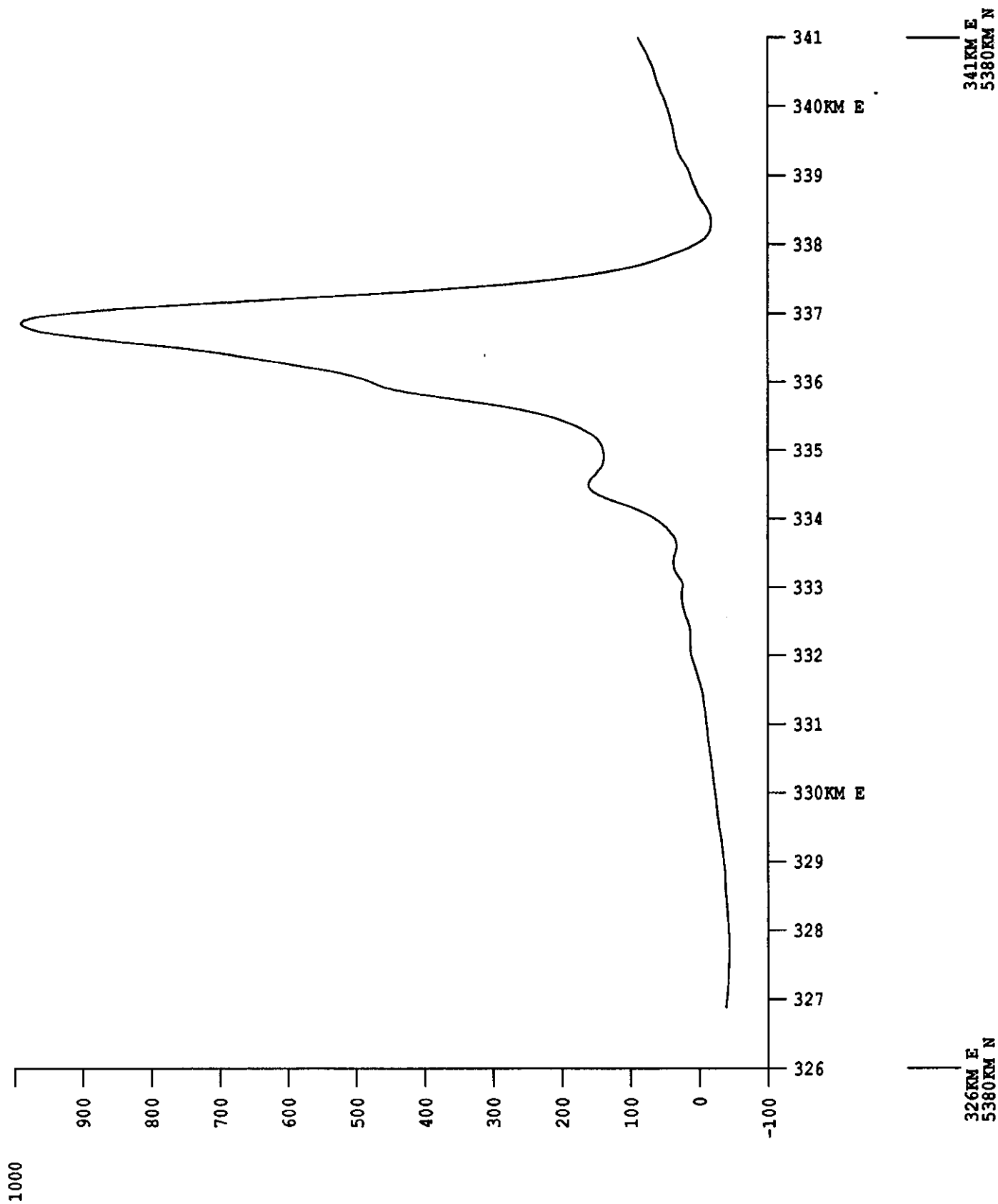


Figure 3

Western Tasmania Aeromagnetic Survey Line 1621 — Low-pass filtered — 250 m cutoff

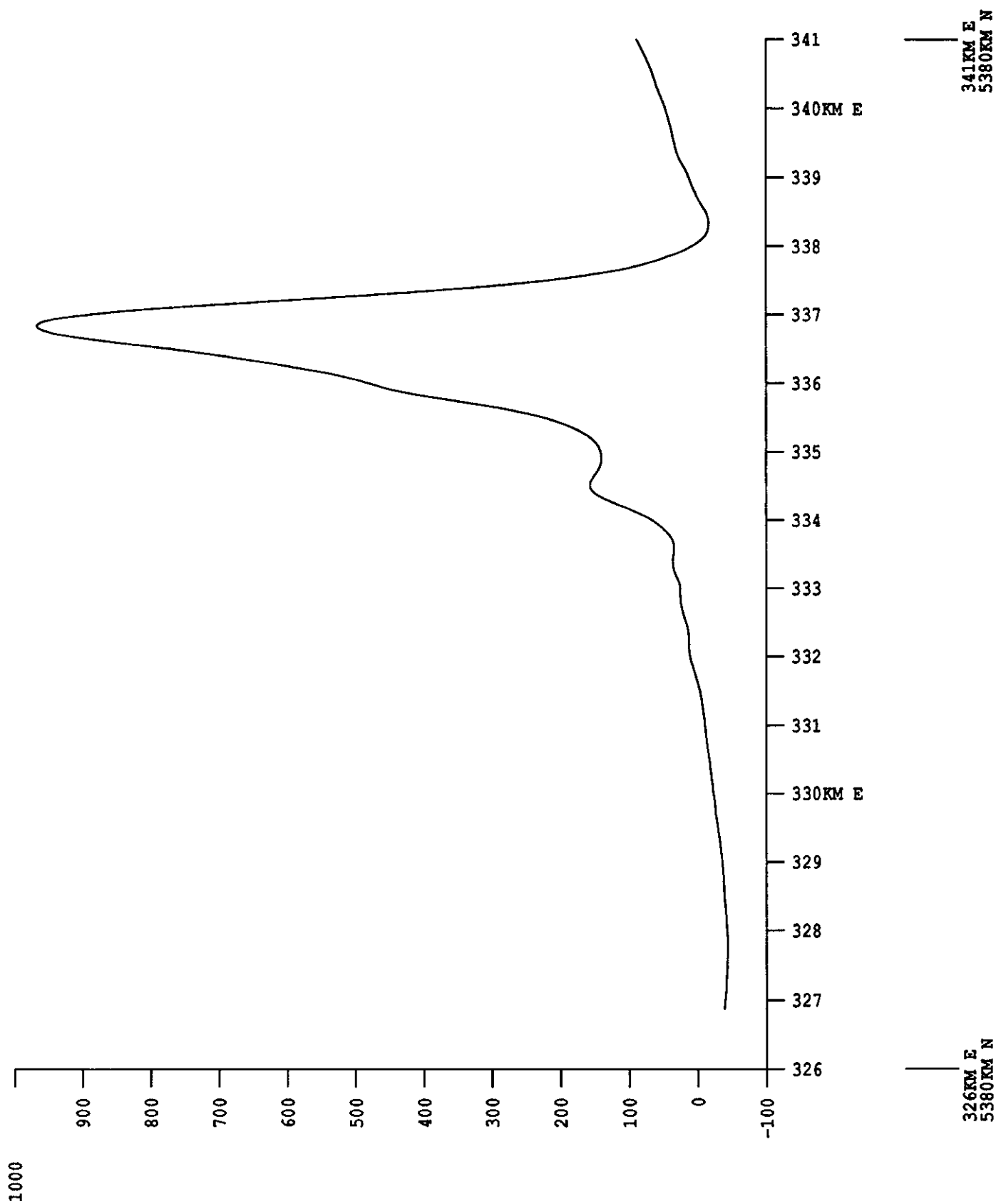


Figure 4

Western Tasmania Aeromagnetic Survey Line 1621 — Low-pass filtered — 500 m cutoff

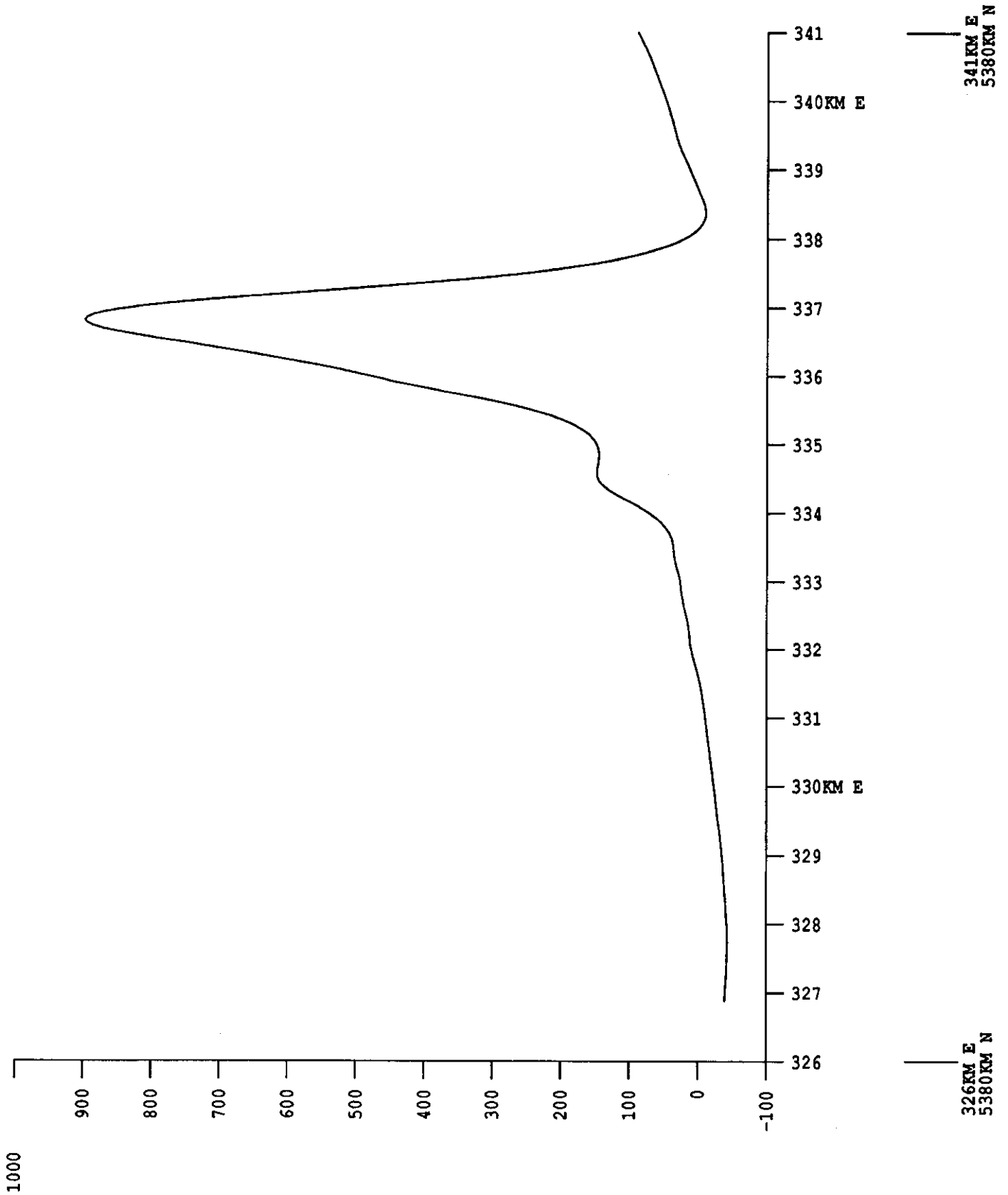


Figure 5

Western Tasmania Aeromagnetic Survey Line 1621 — Low-pass filtered — 1000 m cutoff

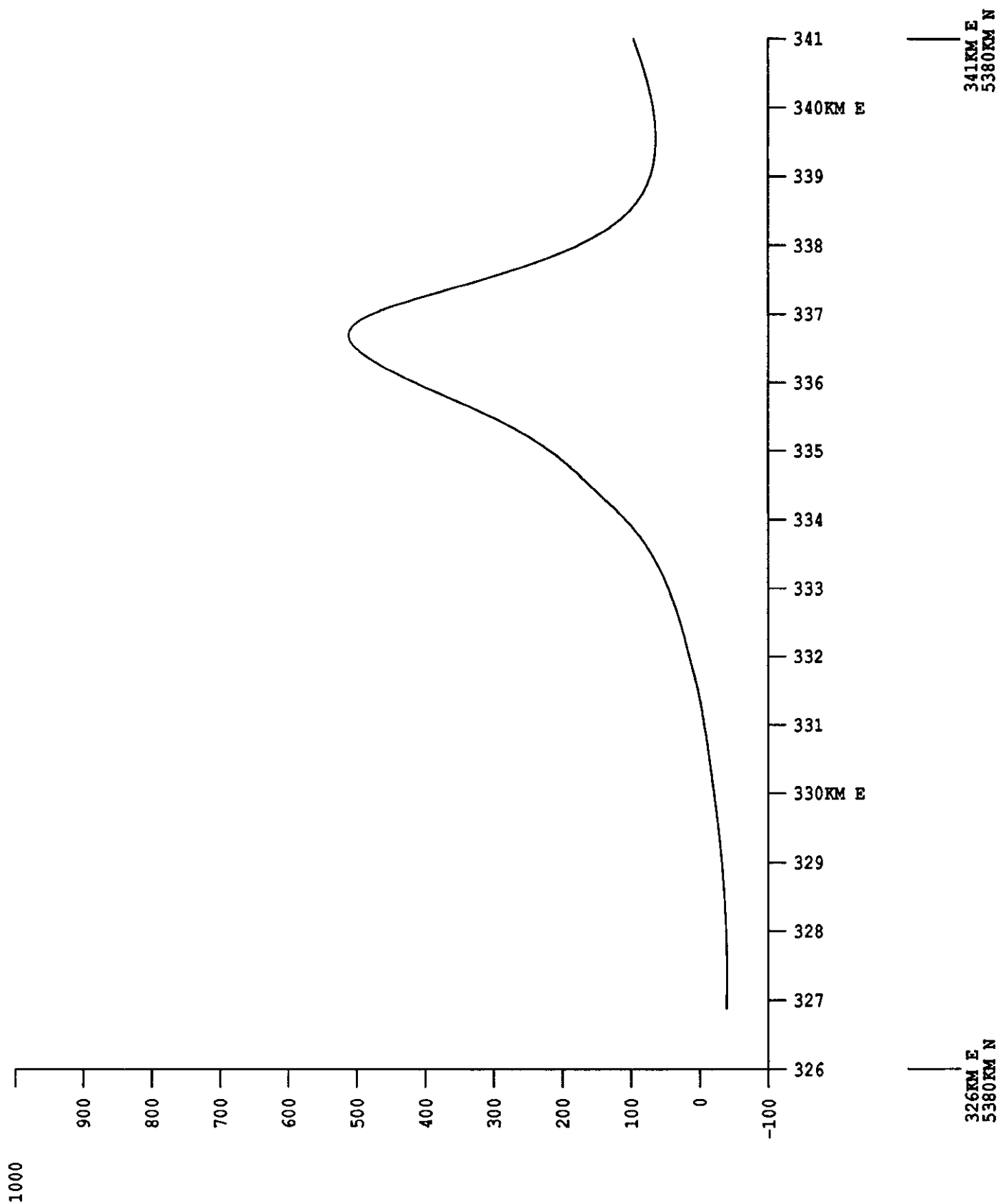


Figure 7

Western Tasmania Aeromagnetic Survey Line 1621 — Low-pass filtered — 5000 m cutoff

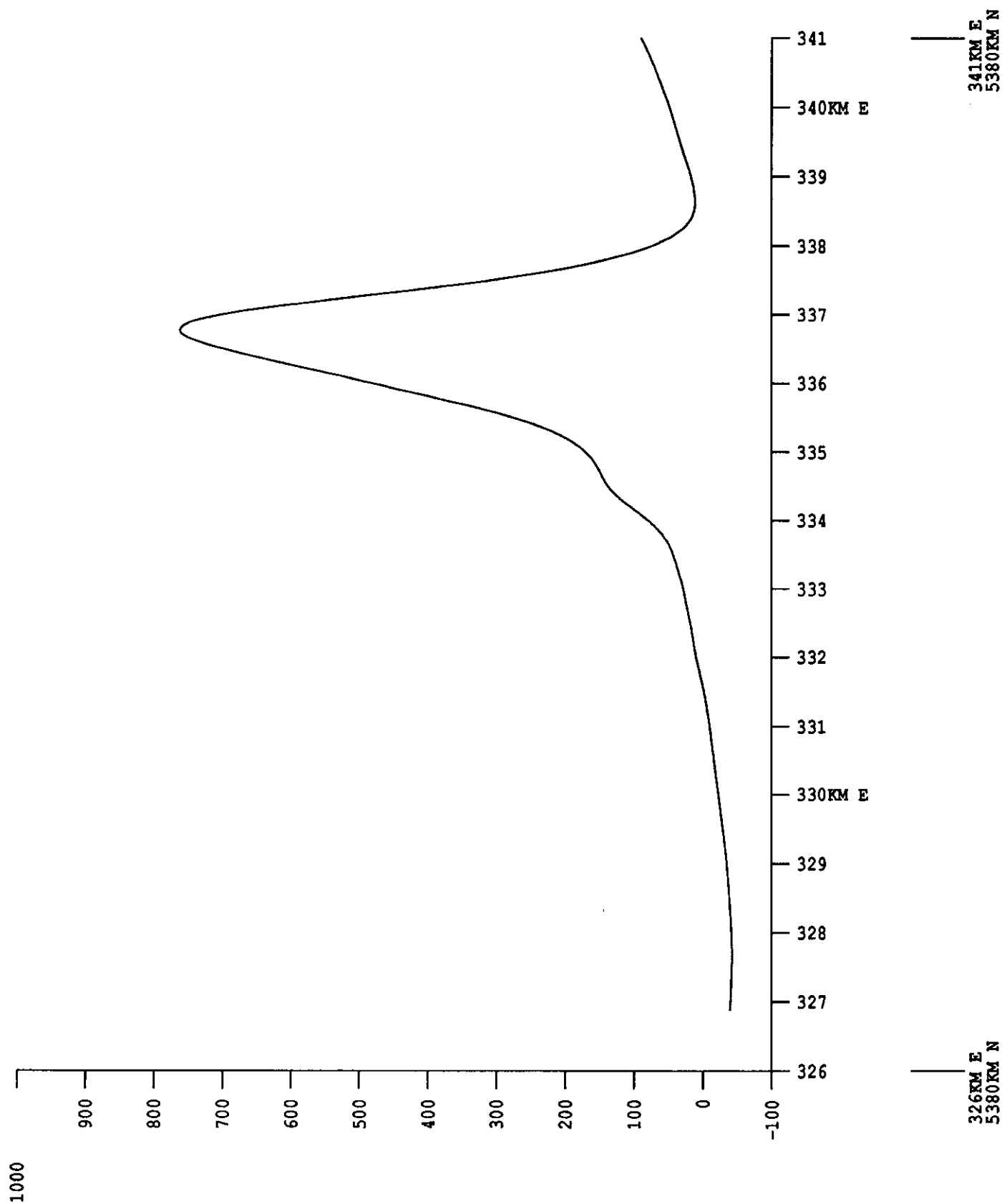


Figure 6

Western Tasmania Aeromagnetic Survey Line 1621 — Low-pass filtered — 2000 m cutoff

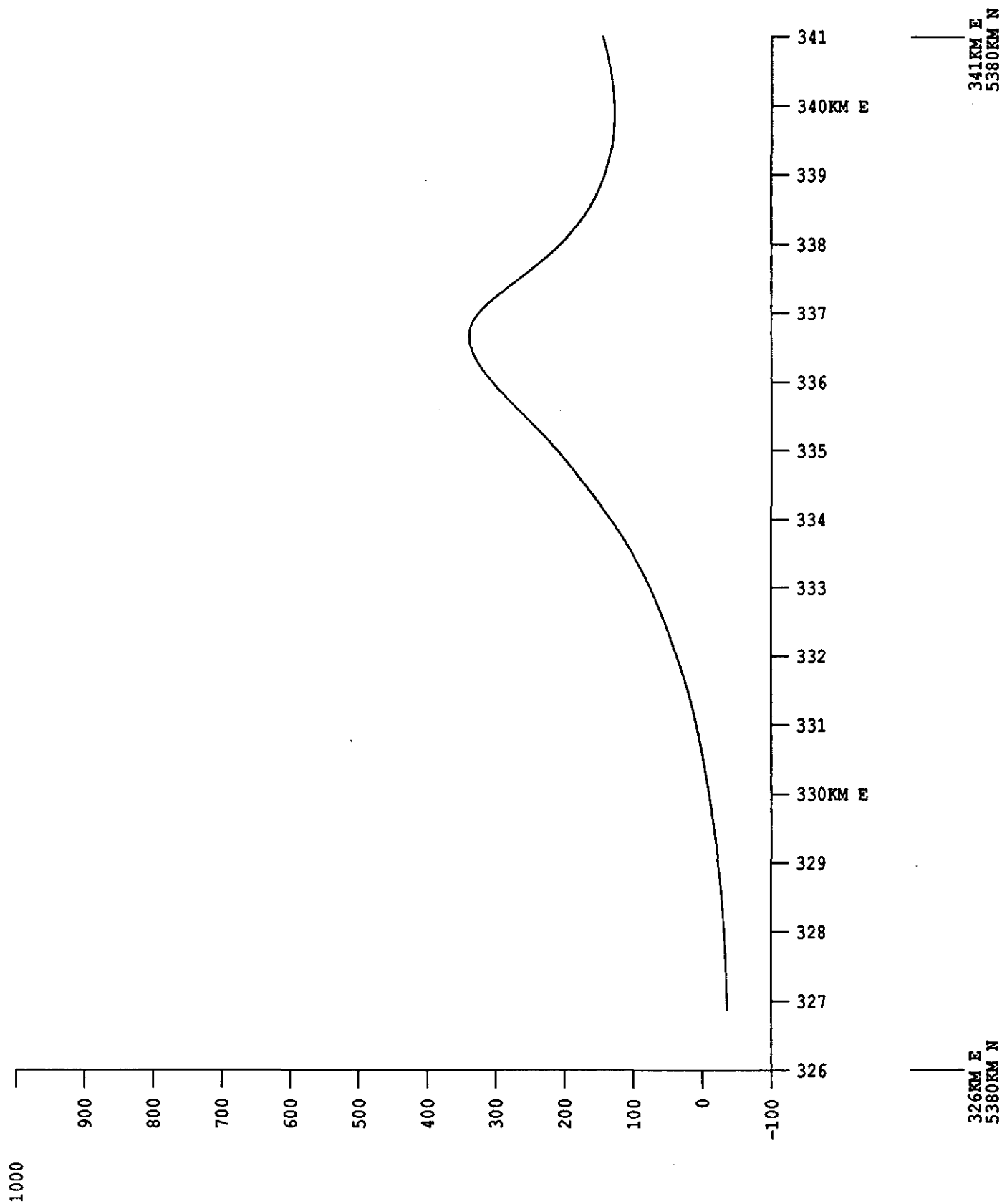


Figure 8

Western Tasmania Aeromagnetic Survey Line 1621 — Low-pass filtered — 10 000 m cutoff