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# A geophysical model of the major Tasmanian Granitoids

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*Abstract*

Interpretation of the residual gravity map of Tasmania (mainland Tasmania only) has allowed the compilation of a map showing the shapes of the larger Devonian granites and, where data density and rock mass permit, the associated granodiorites. The model is based on the present (April 1992) data base and will be revised as further data are acquired.

## INTRODUCTION

The first attempt to define the gross form of the Tasmanian granitoids was by Leaman *et al.* (1980) and entailed filtering the gravity data set to allow removal of some regional effects, and then modelling of the granites and the Moho surface. At that time the available gravity maps were derived from a data set where most of the gravity stations were 5 to 7 km apart (fig. 1).

Data acquisition by the Department of Mines (East Coast Coal Project, Zeehan granite study, Midlands groundwater study, and the Mt Read Volcanics Project), the University of Tasmania, and exploration companies has improved the station spacing to better than 2 km over about 20% of the State (fig. 2). Leaman (1986*a*) showed that it may be possible to use a crustal model to extract crustal components of the gravity field and so enhance the value of the data for specific projects.

## DATA AND METHODS

Only public-domain gravity and magnetic data have been used for this study. All data are available from the Department of Mines, Hobart. The gravity data are held in the databases TASGRAV (whole state regional) and MTREAD (data acquired for the Mt Read Volcanics Project in west and northwest Tasmania). All stations have been reviewed and checked for errors and consistency (refer to Richardson and Leaman, 1987) and fully corrected (including 20 km terrain corrections). The coverage remains somewhat uneven on a State or regional basis.

Five regional aeromagnetic surveys with a nominal line spacing of 500 m and terrain clearance of 150 m cover the west, northwest, central north and part of the northeast (Corbett *et al.*, 1982; Leaman, 1986*b*; Bishop, 1986; Bishop, 1987; Richardson, 1989). The remainder of the State is covered with a 1500 m line spacing (BMR, 1988).

The provisional results of analysis of these data bases as presented here are based on an extended, but still fundamental, evaluation. The evaluation has not been directed solely at extraction of information relevant to the granites but rather at the simultaneous solution of the contributions from basement blocks and forms, troughs, crustal structure and first order structures in the upper crust. The key elements of the interpretation depend on the gravity data bases, and the various factors listed above have been assessed by a series of long, randomly-oriented but overlapping profiles modelled in accordance with the procedures outlined in Appendix A of Leaman and Richardson (1989).

The results provided here, with minor exceptions, are based on two-dimensional methods, and it is known that three-dimensional methods will always lead to revision wherever applied, and where data permits.

A secondary use of this study relates to the provision of regional components of the gravity field so that more reliable residual analysis of smaller and shallower sources is possible. Tables of values of regional components for the "MANTLE88" water (bathymetry) and Moho (derived from the modelled sections) models are presented in Leaman (1988*a*), and further modelling has resulted in more refined values based on the "MANTLE91" model (Leaman, pers. comm.). Figure 3 presents the residual gravity field calculated using the "MANTLE91" model.

## DISCUSSION

Compilation of this model (fig. 4) of the major Tasmanian granitoids was prompted by continued use of the model presented by Leaman *et al.* (1980). The latter model was presented at a scale of 1:4 000 000 and, as discussed earlier, was based on filtering the gravity data set to produce a residual. Leaman (1988*b*) presented a revised compilation of the granitoid model for west and northwest Tasmania in 1988.

The present model has been compiled at a scale of 1:500 000 but is suitable for presentation at scales as large as 1:250 000 in most areas. It is not claimed to be final and could be refined in all areas. In many cases further detail cannot be supported by the extant data. The model has highest reliability in the west and northwest. The Cambrian granites have not been included in this model as work by Leaman and Richardson (1989) has shown them to be small bodies with the intrusion style of pipe-plugs with a depth

taper. Granodiorites are only shown where there are substantial volumes or sufficient data to provide good definition.

Major features of interest are the steep nature of the western boundary of the East Coast granites and adamellites, the large size of the southwest granitoids, and the approximately east-west cutoff at the southern boundary of the West Coast granites. The extent of the granodiorites is poorly defined except in the Tamar area. There are suggestions of other granodiorites in the Midlands.

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[4 May 1992]

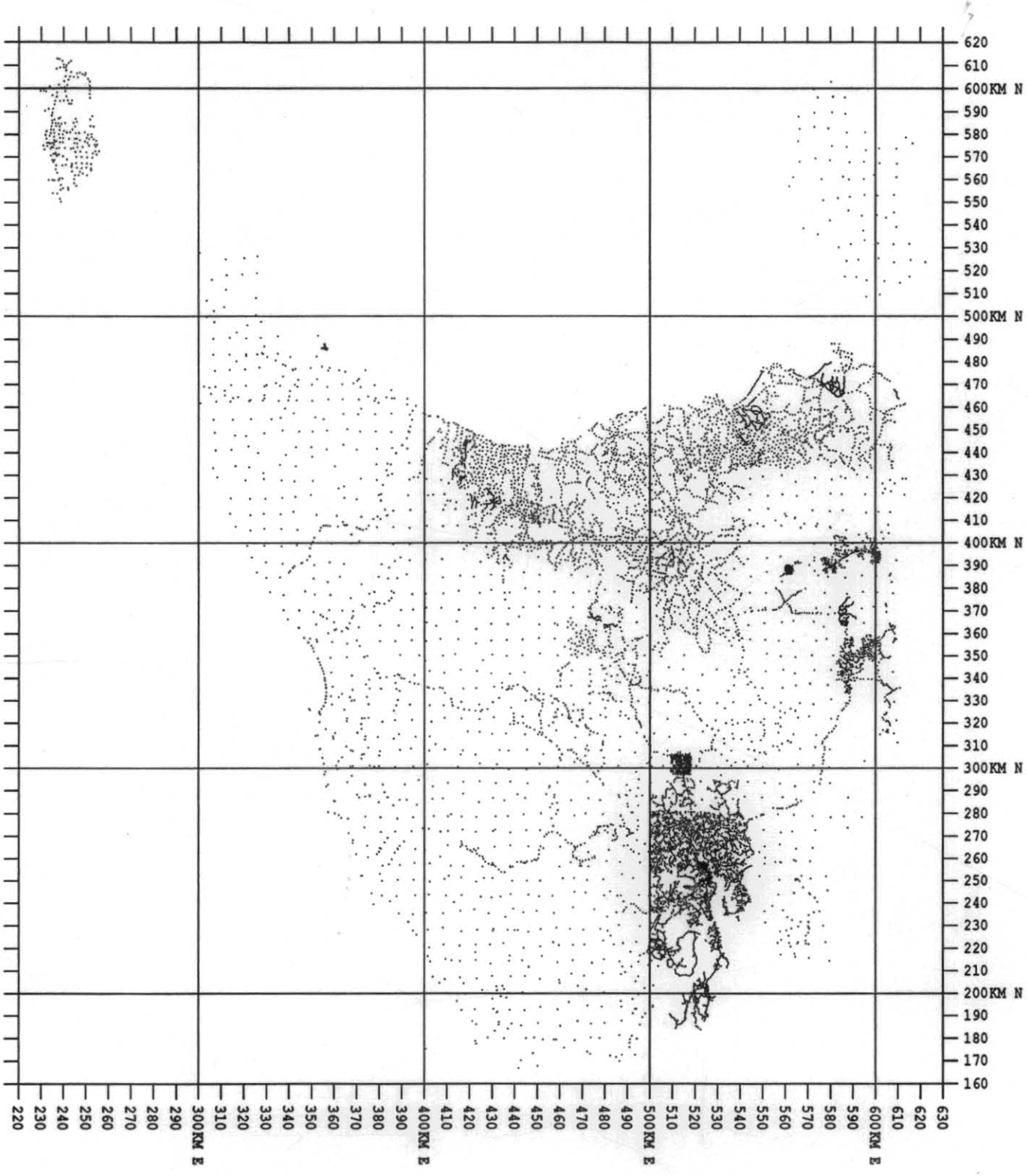



**Figure 1.**

Gravity data points used in compilation of the 1980 granite model.

5 cm

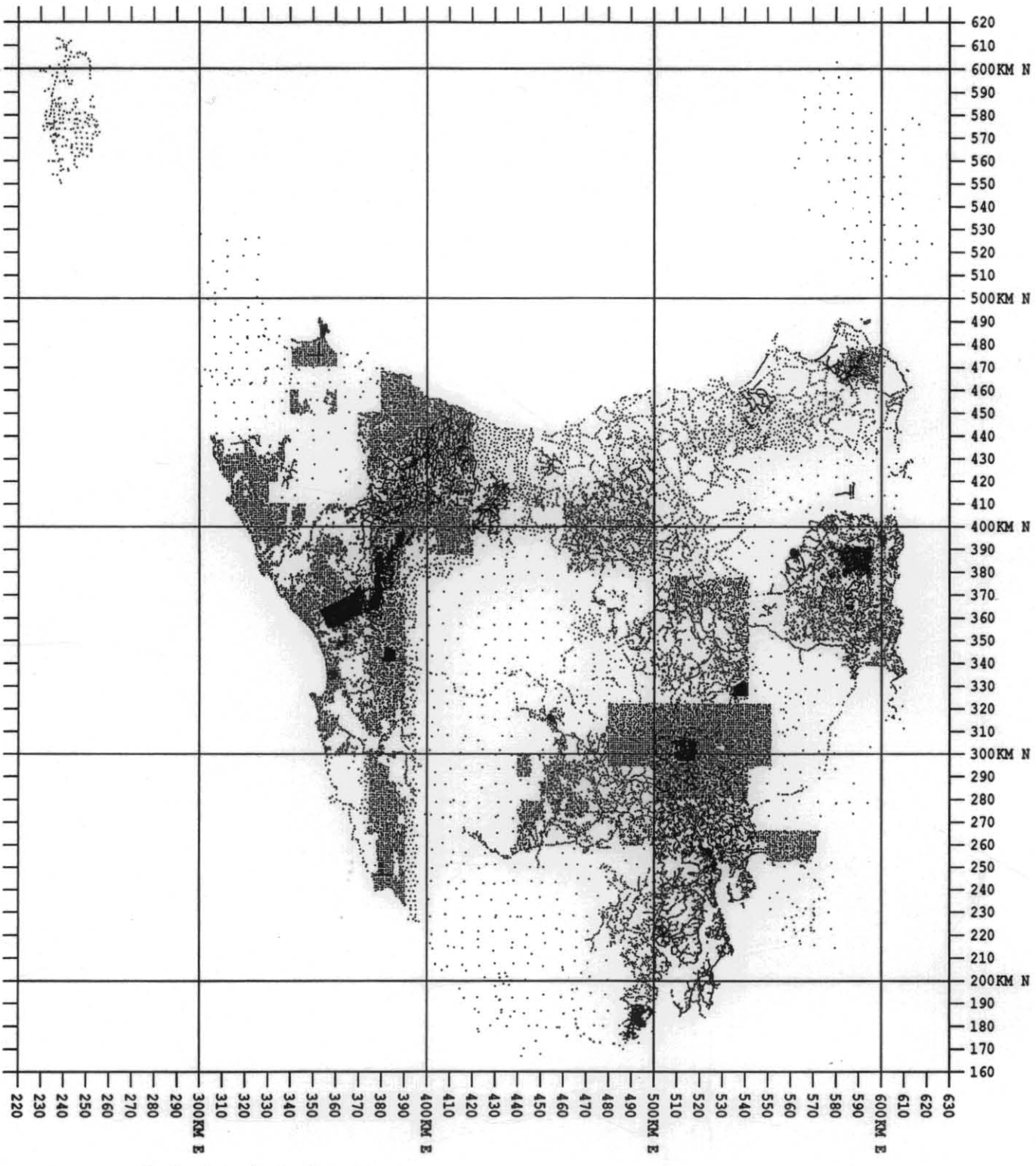


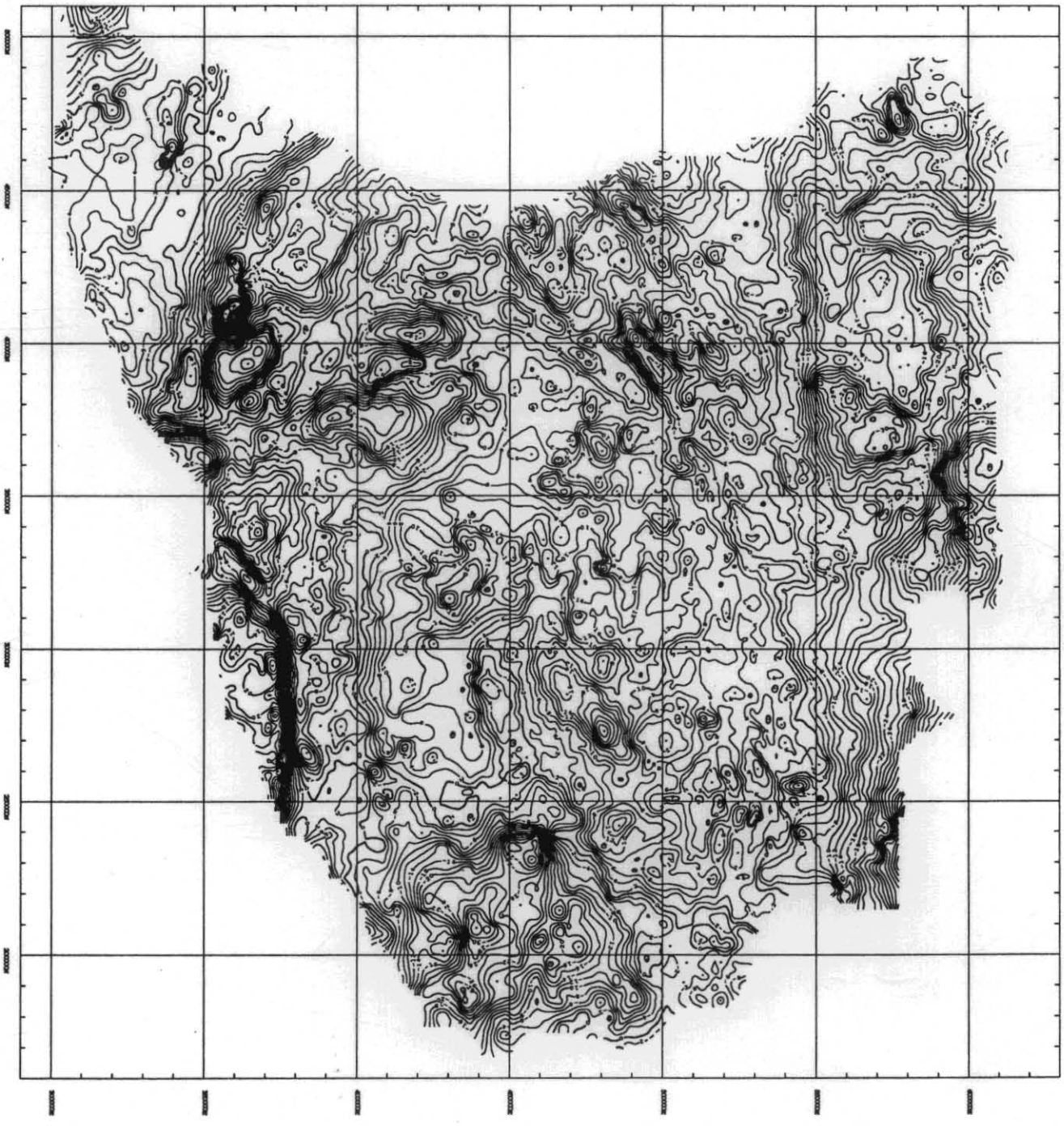

**Figure 2.**

The current gravity station coverage (April, 1992).

5 cm

**Figure 3.**

Residual gravity anomaly (Bouguer Anomaly — MANTLE91)
Contour interval 2 mgal.



# MAJOR TASMANIAN GRANITOIDS

BASED ON DATA AVAILABLE MAY 1992 AND SUBJECT TO REVISION
AS FURTHER DATA IS ACQUIRED.

SCALE: 1:500,000

0 50 100km

5500000mN

5400000mN

5300000mN

5200000mN

280000mE

300000mE

400000mE

500000mE

5160000mN

WESTERN BOUNDARY:
GRANITE–ADAMELLITES

? MINIMUM EXTENT

OTHER POSSIBLE
GRANODIORITES

B A T H O L I T H

? GRANITE ? POSSIBLE ?

OTHER POSSIBLE
GRANODIORITES

? MINIMUM EXTENT

GRANITE

WESTERN BOUNDARY:
GRANITE–ADAMELLITES

9 DEPTH TO GRANITE (km)

9 DEPTH TO GRANODIORITE (km)

THIS DATA SHOULD NOT BE PRESENTED
AT A SCALE LARGER THAN 1:250,000

THIS MAP IS BASED ON THE BEST AVAILABLE
COMPILATION AS AT MAY 1992.
AS FURTHER DATA IS ACQUIRED THE MODEL MAY CHANGE
SIGNIFICANTLY, PARTICULARLY IN THE EAST AND SOUTH-WEST

5411

FIGURE 4