

Depth filtering of the gravity data
over the Witwatersrand basin
and Bushveld igneous complex,
South Africa



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Introduction



- ❧ Gravity
- ❧ Usage
- ❧ Gravity analysis methods
- ❧ Data processing correction
- ❧ Digital Signal Process
- ❧ Retaining data and edges method
- ❧ Finite Impose Response Filtering (FIR)

Gravity



- ❧ Lateral density changes in the subsurface causes a change in the force of gravity at the surface.
- ❧ Precise measurement of gravity, correction, variations - gravity survey can detect natural or man-made voids, variations in the depth to bedrock, and geologic structures of engineering interest.

Data Processing

Correction

☞ Four main corrections:

☞ International Gravity formula - variation of gravity with latitude.

☞ The Free Air correction - change of gravity for the distance of the station

☞ The Bouguer correction - attraction of the rock material between a datum level.

☞ Topographic corrections - materials higher than the gravity stations are removed, or below the gravity station are filled in.

Filtering



⌘ Noise

⌘ Reduce unwanted contours

⌘ Data that are interested in

The removal of unwanted edge contours from gravity datasets

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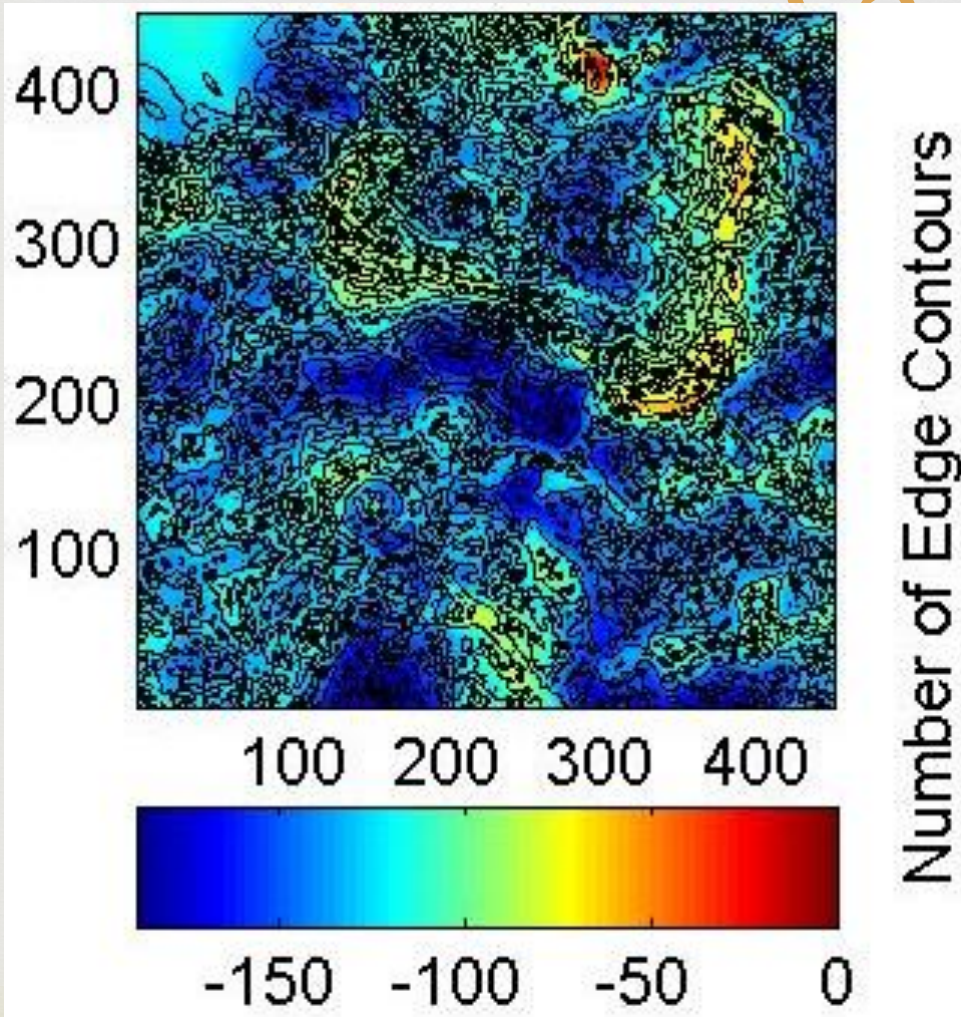
Email: Gordon.Cooper@wits.ac.za

Abstract. Gravity data is widely used in the search for mineral deposits, and can be collected using ground, borehole, airborne, shipborne and satellite platforms. The boundaries between rocks with differing densities result in boundaries in their corresponding gravity anomalies. These boundaries, or edges, can be located using techniques based on horizontal derivatives of the data. Edge contours that do not relate to the current interpretation project can be considered as noise, and high resolution data can possess a proliferation of such edges, making interpretation difficult. While smoothing can be applied to reduce the number of edges, it has the disadvantage that the remaining edge locations are shifted and the shape of the edge contours is altered. Three methods are discussed here for the removal of unwanted edge contours. The first method removes edges which are not present in the data after its upward continuation to a user-selected height. The second method removes edges whose amplitude is below a given threshold, and the final method removes the smallest edge contours.

Key words: potential fields, semi-automatic interpretation methods.

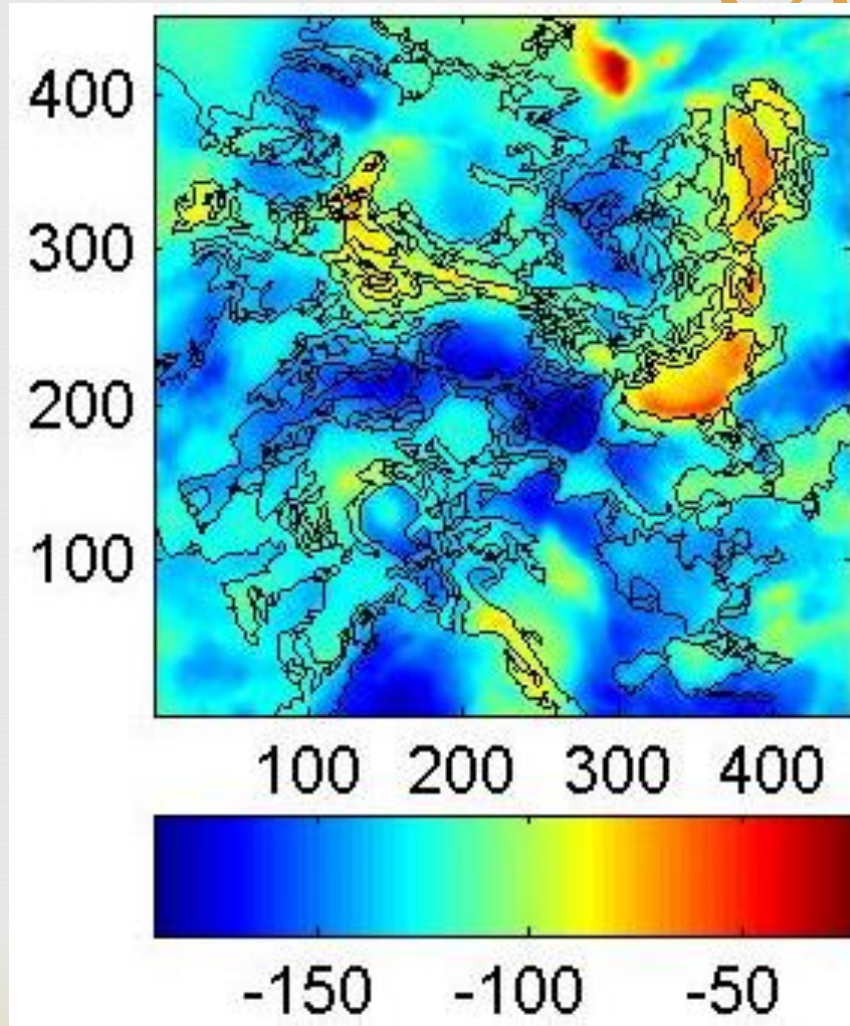
Received 10 May 2012, accepted 12 September 2012, published online 16 October 2012

Data and Edges



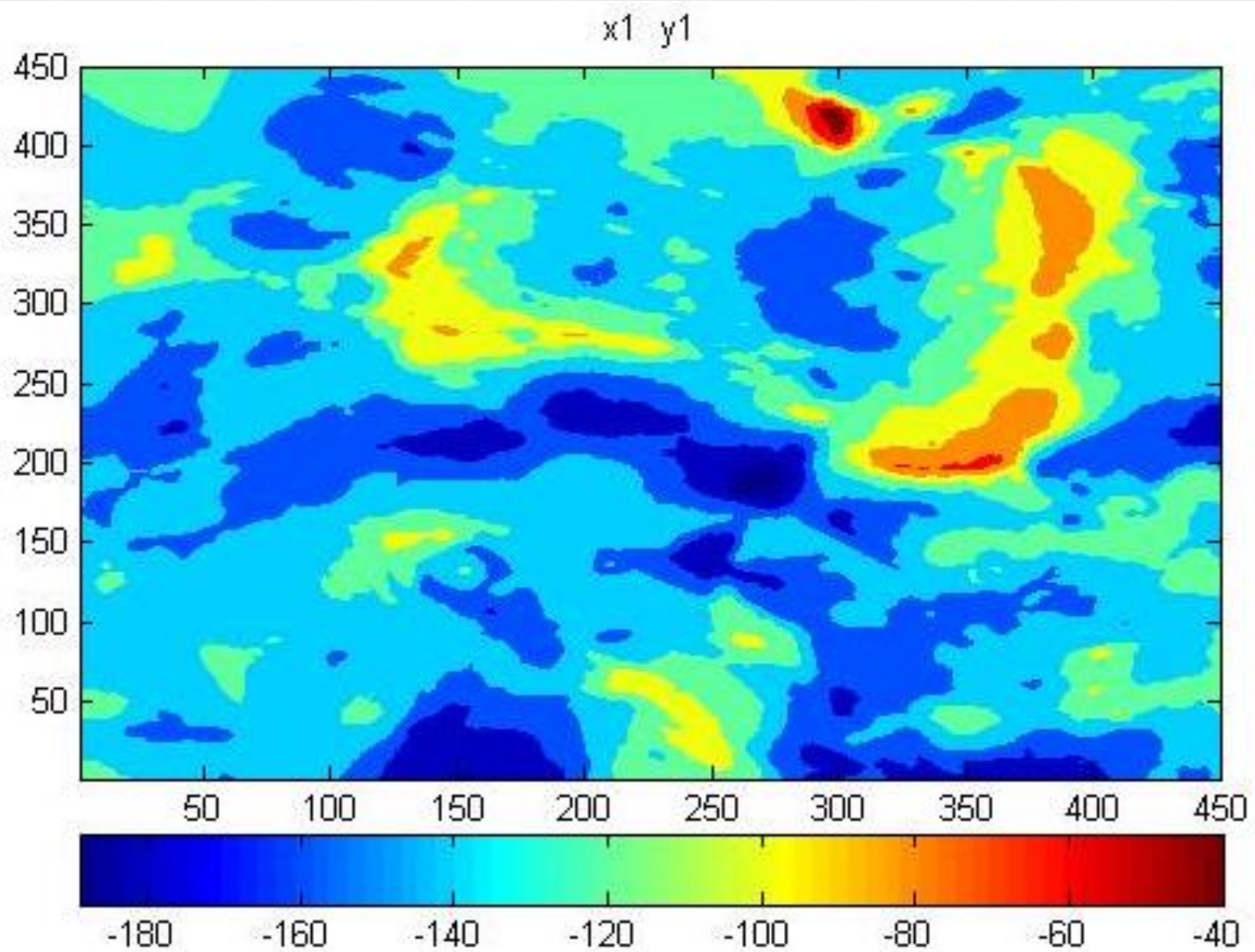
- ☞ The Council for Geoscience, Pretoria, the gravity data
- ☞ Gordon R. J. Cooper, 2012, The removal of unwanted edge contours from gravity datasets: *Exploration Geophysics*, 2013,44,42-47

Data and Retained Edges



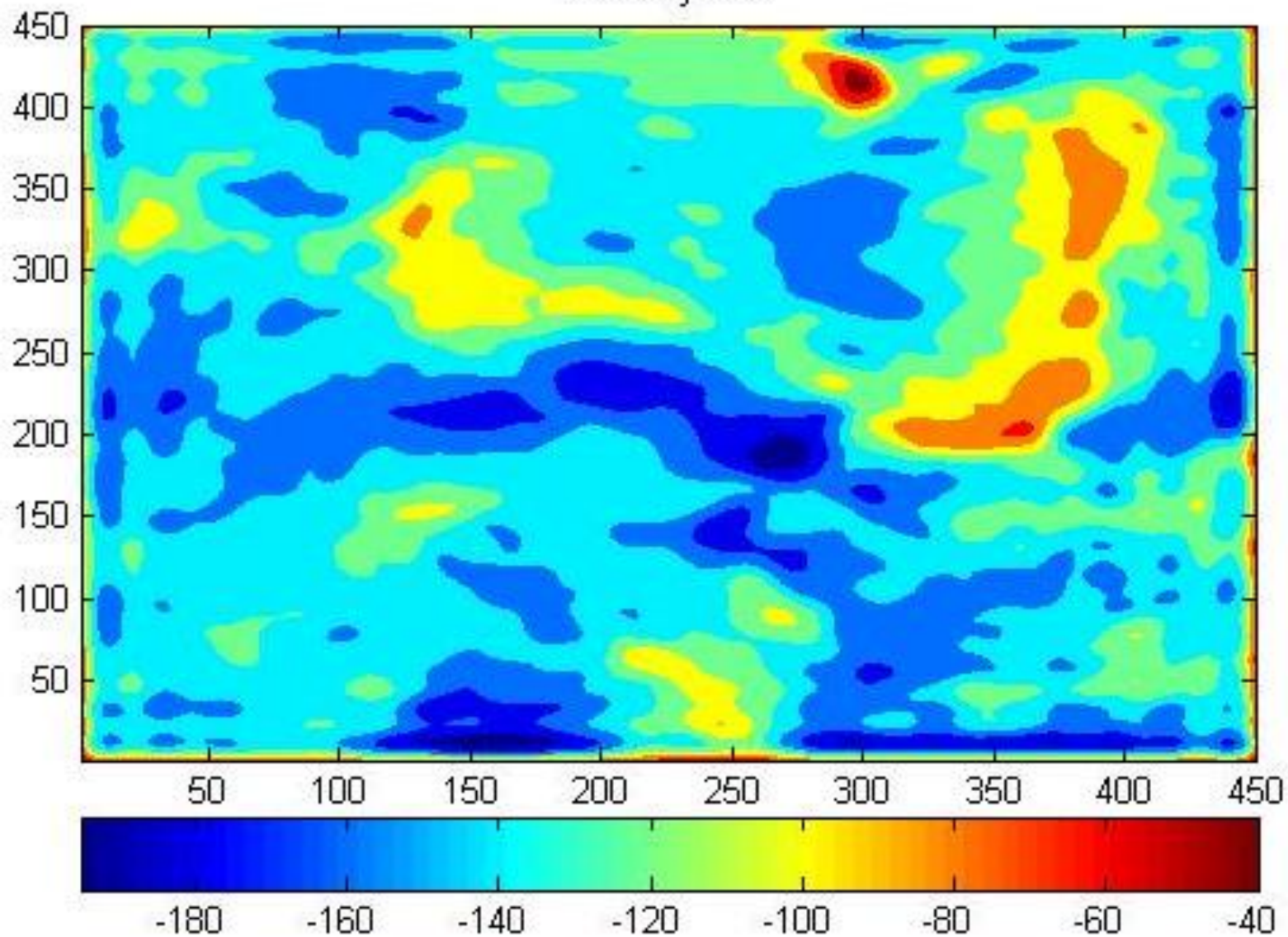
- ☞ The Council for Geoscience, Pretoria, the gravity data
- ☞ Gordon R. J. Cooper, 2012, The removal of unwanted edge contours from gravity datasets: *Exploration Geophysics*, 2013,44,42-47

FIR



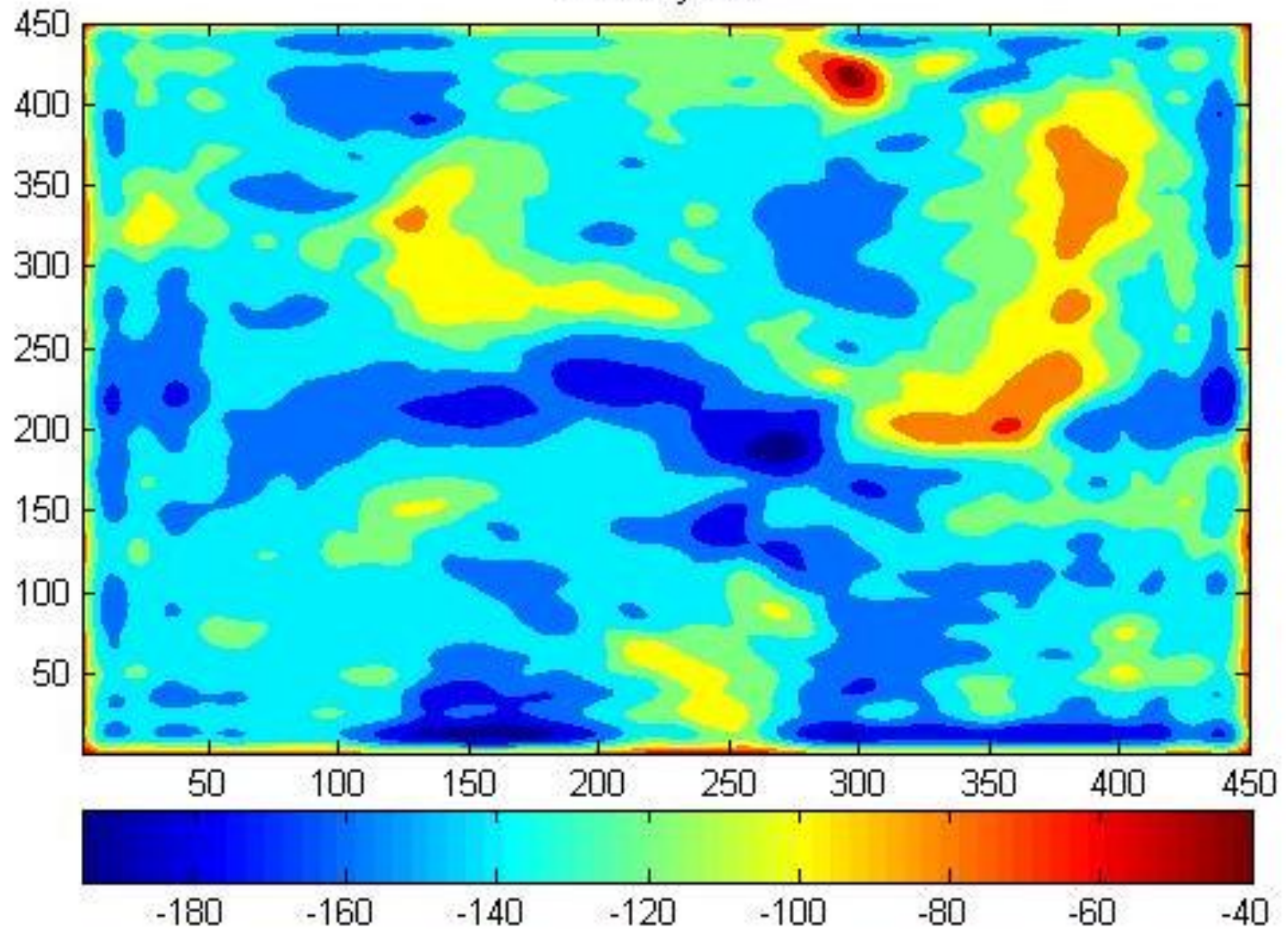
FIR

x0.09 y0.09



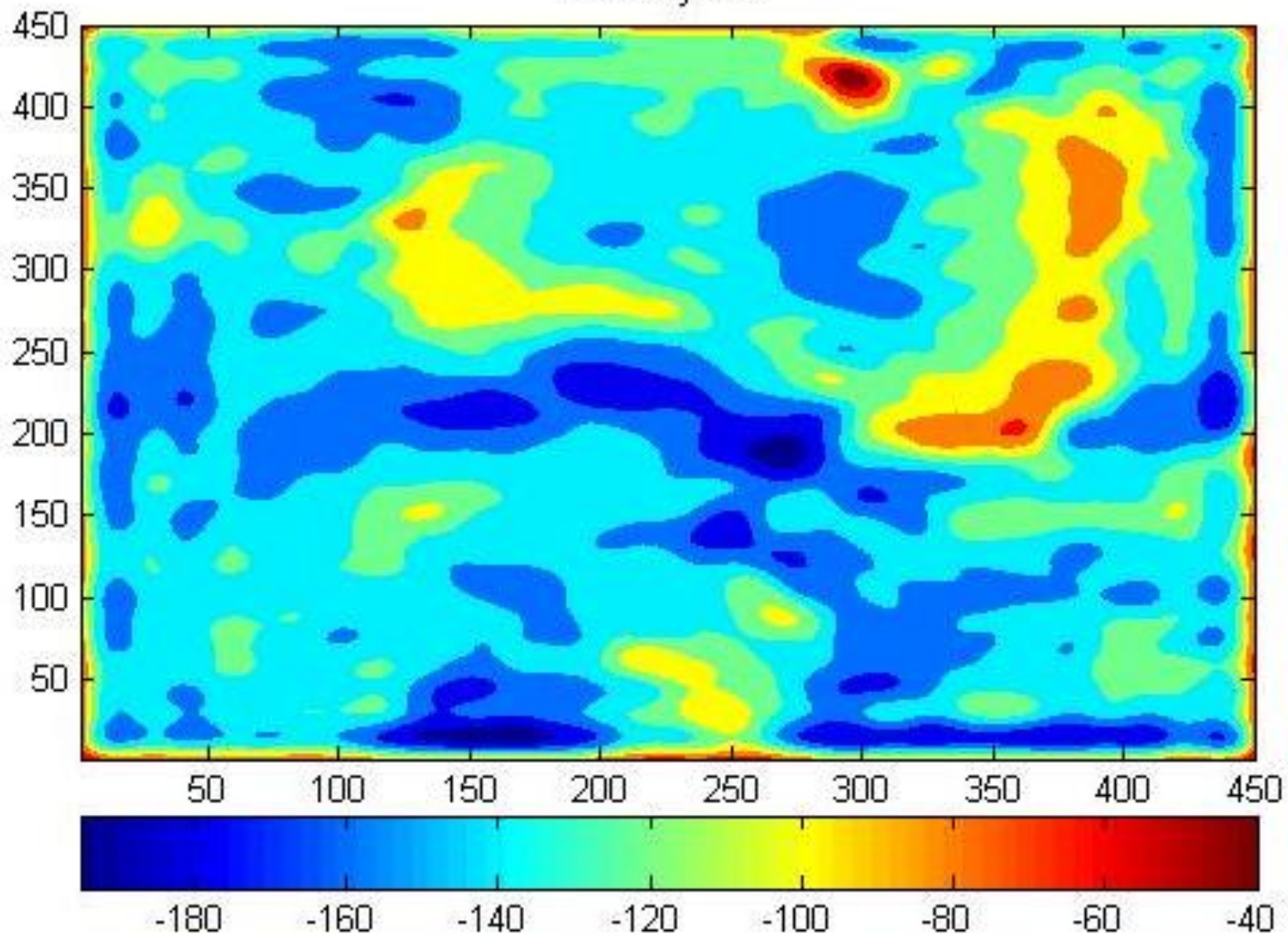
FIR

x0.08 y0.08



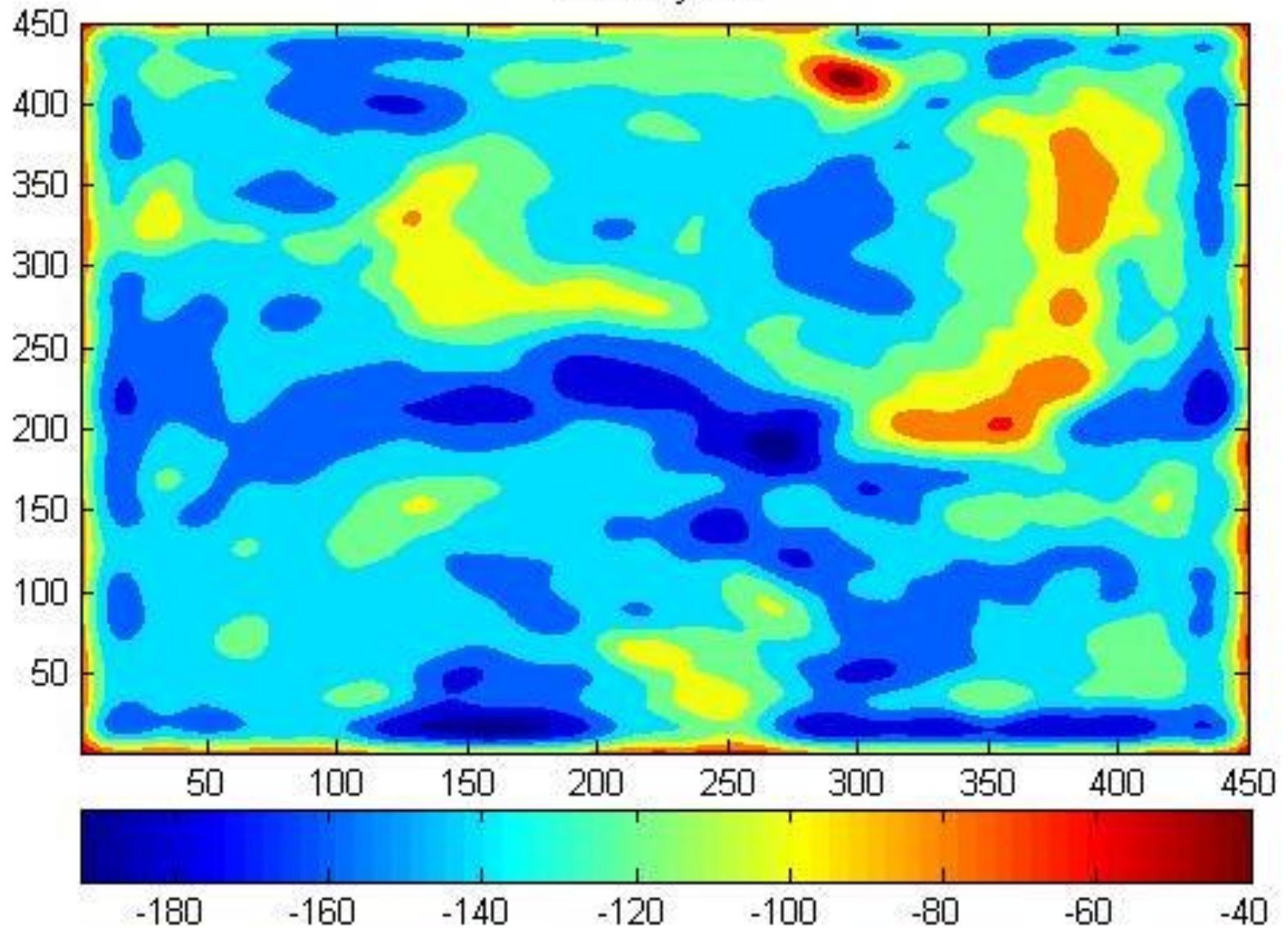
FIR

x0.07 y0.07



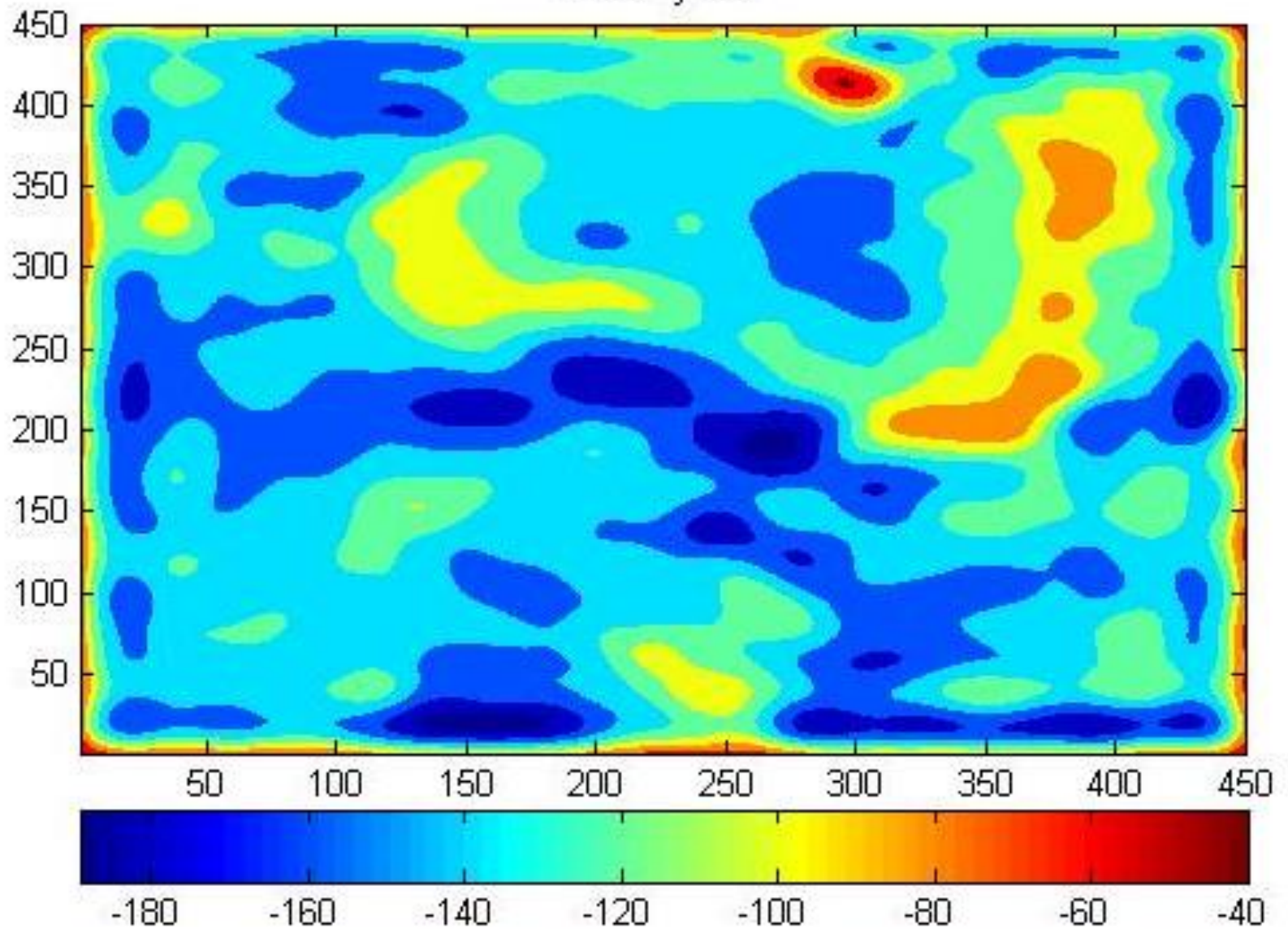
FIR

x0.06 y0.06

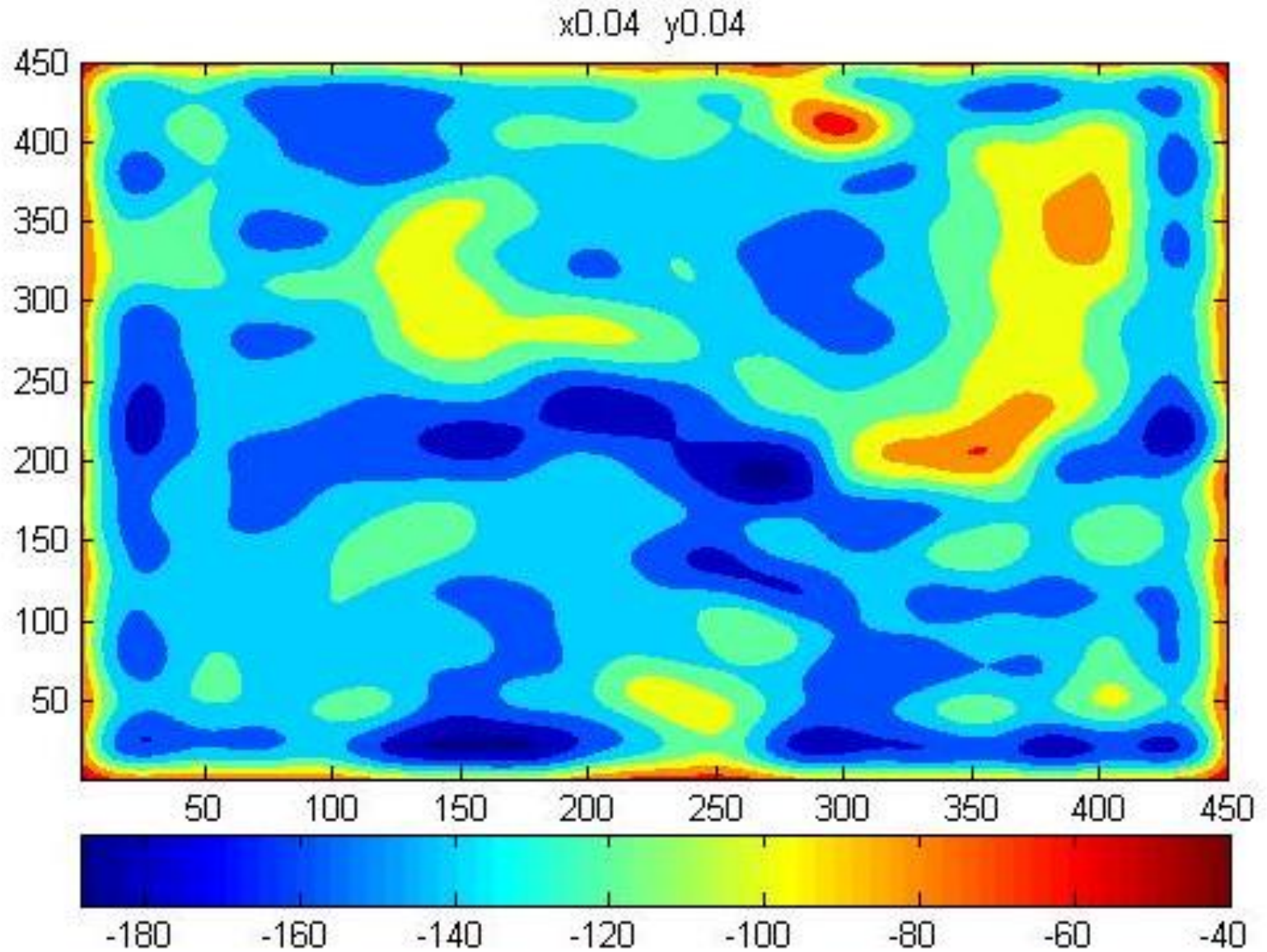


FIR

x0.05 y0.05

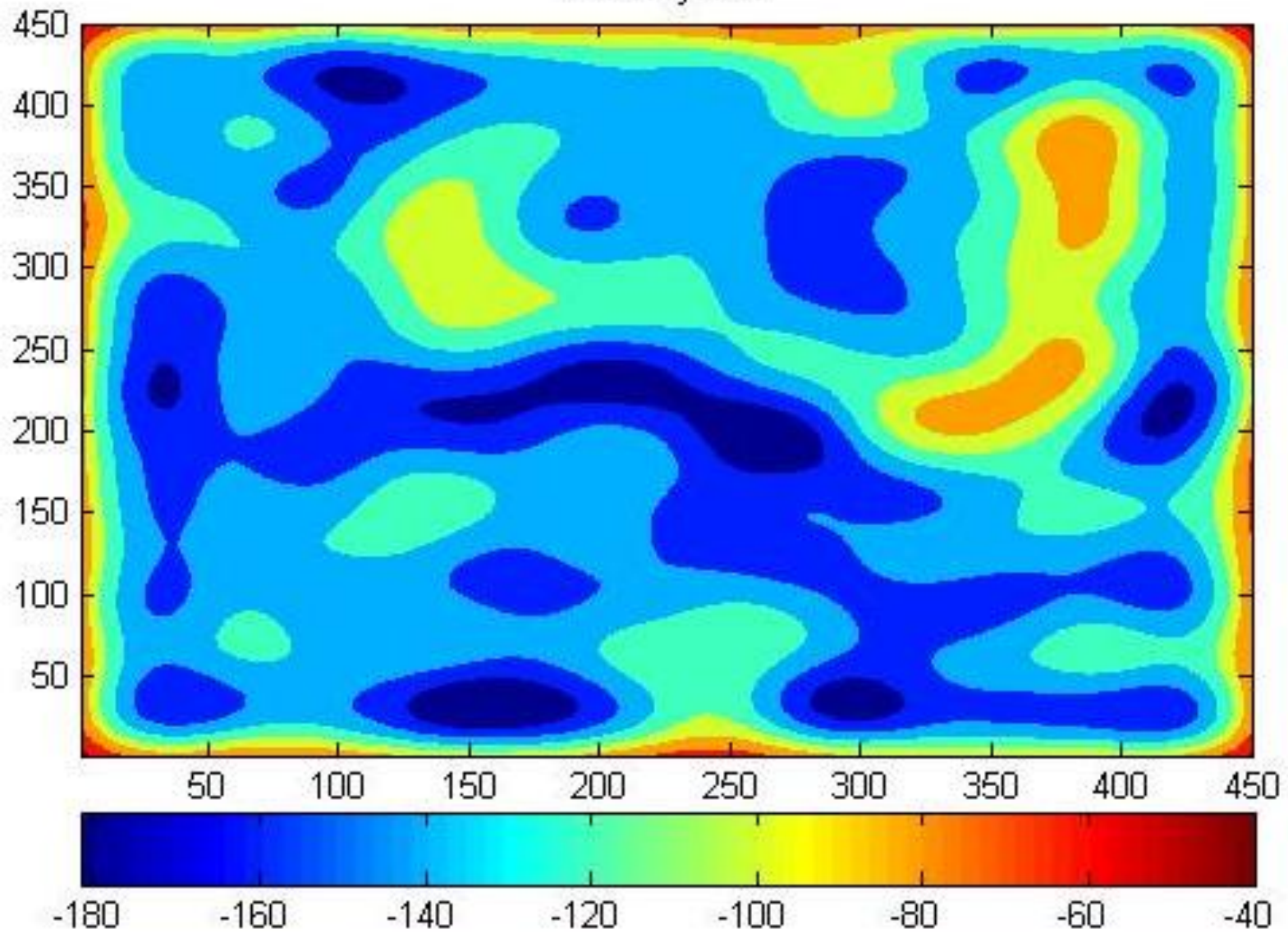


FIR



FIR

x0.03 y0.03



Acknowledgements



- ❧ Professor Yih Jeng
- ❧ Professor Gordon R.J Cooper
- ❧ The Council for Geoscience, Pretoria, South Africa

References



- ❧ The Council for Geoscience, Pretoria, the gravity data
- ❧ Gordon R. J. Cooper, 2012, The removal of unwanted edge contours from gravity datasets: *Exploration Geophysics*, 2013,44,42-47