Accepted Manuscript

Application of two-dimensional gravity models as input parameters to balanced cross-sections across the margin of the East European Craton in SE Poland

Stanisław Mazur, Łukasz Gągała, Mateusz Kufrasa, Piotr Krzywiec

PII: S0191-8141(18)30057-9

DOI: 10.1016/j.jsg.2018.05.013

Reference: SG 3654

To appear in: *Journal of Structural Geology*

Received Date: 28 January 2018

Revised Date: 13 May 2018

Accepted Date: 15 May 2018

Please cite this article as: Mazur, Stanisł., Gągała, Ł., Kufrasa, M., Krzywiec, P., Application of two-dimensional gravity models as input parameters to balanced cross-sections across the margin of the East European Craton in SE Poland, *Journal of Structural Geology* (2018), doi: 10.1016/j.jsg.2018.05.013.

Application of two-dimensional gravity models as input parameters to balanced cross-sections across the margin of the East European Craton in SE Poland

Stanisław Mazur[1,2], Łukasz Gągała[3], Mateusz Kufrasa[4] and Piotr Krzywiec[4]

1 Institute of Geological Sciences, Polish Academy of Sciences, Kraków, Poland; ndmazur@cyf-kr.edu.pl

2 School of Earth and Environment, University of Leeds, United Kingdom

3 Hellenic Petroleum, Marousi, Greece

4 Institute of Geological Sciences, Polish Academy of Sciences, Warsaw, Poland

Abstract

Our paper demonstrates how two-dimensional density models can deliver critical constraints that permit construction and validation of geological models in an underconstrained subcropped fold-and-thrust belt. As a case study, we use a newly discovered thrust-and-fold belt developed above the margin of the East European Craton (EEC) in SE Poland. A geological model constructed using gravity data resolved the basement-cover interface and a top-Cambrian horizon. This model was used as a framework for cross-section construction employing at this step also borehole and seismic evidence. Two cross-sections were created to address a source of uncertainty related to non-uniqueness of gravity modelling with different emphasis on gravimetric vs geological evidence. Model 1 strictly obeys the top-Cambrian derived from gravity modelling that was treated as an envelope of deeper structures. Model 2 allowed for local departures from the gravity model, especially in the case of conflicts with formation thicknesses. The comparison between the present structure and restorations allowed for separating effects of Caledonian and Variscan shortening. Although the fit of both models to the gravity data is satisfactory, model 2 better complies to geological constraints, resolving the long-discussed problem concerning the distribution and intensity of Caledonian tectonics across the SW periphery of the EEC.

Key words: potential field modelling, fold-and-thrust belt, subsurface interpretation, Caledonian tectonics, Teisseyre-Tornquist Zone, SE Poland

1. Introduction

Validation of geological cross-sections via 2D forward gravity modelling is a well-established method of de-risking in subsurface prospecting and exploration (e.g. Kadima et al., 2011; Nemčok et al., 2013;