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

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

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10
11 **Abstract**

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

27
28 **Key words:** potential field modelling, fold-and-thrust belt, subsurface interpretation, Caledonian
29 tectonics, Teisseyre-Tornquist Zone, SE Poland

30
31 **1. Introduction**

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

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