Solid Earth Discuss., 6, C1004–C1006, 2014
www.solid-earth-discuss.net/6/C1004/2014/

Solid Earth
Discussions
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Interactive comment on "A lithosphere-scale structural model of the Barents Sea and Kara Sea region" *by* P. Klitzke et al.

Anonymous Referee #2

Received and published: 26 September 2014

Ref: A lithosphere-scale structural model of the Barents Sea and Kara Sea region by Faleide et al.

General Comments

The authors present an integrated 3D lithospheric model of the Barents and Kara seas that can be used to enhance the knowledge of a complex area that has potential for hydrocarbon resources.

Unlike previous studies –mainly integrating data either on the sedimentary succession or the crustal structure- the authors integrate for the first time all publicly available geological and geophysical data into a 3D lithosphere scale regional model that resolves the first-order characteristics of the sedimentary fill, the crystalline crust and the litho-

spheric mantle and discuss it in the context of regional geodynamics. The final 3D model extends over 2400 km in W-E and 1280 km in N-S direction. Undoubtedly the work is very interesting not only for the complexity and extension of the study area but also for the value of compiling a vast amount of data at lithospheric scale and making them available to the community.

Having said that, I have some doubts that should be clarified either by the authors or by the editor. Since I have no experience as a reviewer for Solid Earth (my first time) I do not know whether data collection falls into the scope of the journal. If the answer is yes then I do feel that the paper should be published. On the other hand, it is a pity that the authors have not modeled the 3D gravity or even gravity and geoid response of the proposed lithospheric structure. 3D modelling could provide further veracity to the proposed crustal and lithospheric mantle structure. With the advantage of the availability of 3D academic or commercial software I do strongly recommend that the authors explore how the proposed 3D structure fits gravity and geoid data.

I recommend the paper to be accepted for publication with minor/moderate revision providing that its contents meet the scope of the journal.

Other/Minor comments

Pag. 1859. I have some doubts on the following statement "We interpreted the depth where the incremental velocity reduction is greatest for an XY -position (Évs =minimum) as the depth at which the geotherm cuts the solidus of mantle rock to induce first significant partial melting". Velocity reduction could also be related to thermal gradient variations, which means that there could be inversion of velocities without partial melting.

Minor comments

Proposed wording

Pag. 1589: Therefore, the shear wave velocity of a grid node located at shallower

depth, z1, is subtracted from the velocity at a grid node at larger depth, z2, respectively

Pag. 1589: Thus, this reduction corresponds to an inversion of the usual, pressure-controlled trend (Évs > 0) as evident above and below this zone of decreasing velocities.

Pag 1589: In the central parts of this zone the vertical velocity gradient is of up to Évs = -0.02 kms-1 per kilometer.

Pag 1604: 1) . . ...sediments indicating that its major subsidence phase. . ..

Pag. 1604: and northern Kara Sea and may suggest an affiliation with the Siberian plate.

Others

Page 1605: Lithospheric buckling with associated phase transitions (Gac et al., 2012, 2013; Semprich et al., 2010) could explain the intense subsidence in Permian to Triassic times, but also the elevated velocities in the lithospheric mantle. It should be better justified

Please check typos and misspelling

Fig B1. . . ..of western Barents Sea and use as vertical interpolation barriers for the respective megasequence boundaries.

Interactive comment on Solid Earth Discuss., 6, 1579, 2014.