

Interactive comment on “Crustal heat flow measurements in western Anatolia from borehole equilibrium temperatures” by K. Erkan

C. Pascal (Referee)

christophe.pascal@rub.de

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Dear Chris, dear Dr. Erkan

Please find my comments on the paper “Crustal heat flow measurements in western Anatolia from borehole equilibrium temperatures”.

General comments:

The paper presents a new heat flow study in western Anatolia. The paper is clear, well written and therefore very easy to read. The results are derived from temperature logs gathered in shallow water wells and thermal conductivity measurements on hand samples (the latter being the focus of a companion paper). The study is merely a classical one but obviously the author masters perfectly well all its technical and scientific as-

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pects. Determined heat flow values range from 45 to > 100 mW/m² with maxima found in the Menderes extensional area and the region of Çanakkale, in sensible agreement with the geological context of western Anatolia. Ideally, one would prefer to deal with temperature data from deep boreholes when attempting to determine regional heat flow values. However, such material being apparently unavailable, the present study is the most welcome.

I recommend publication after minor to moderate modifications.

Kind regards

C. Pascal

Specific comments:

1- The paper is definitively easy to read and to understand. However, I personally feel that some information is crucially lacking. Please, could you add details about: a- the logging procedure, including the used probes and their respective accuracies, b- the typical diameter of the logged wells (in order to judge about eventual convection as mentioned p. 411), c- how was produced the heat flow map shown in Fig. 3 (weighting strategy? filtering and interpolation algorithms?) and d- how the curves in Fig. 4 have been calculated (using a classical diffusion equation, I presume, but which one?). 2- Table 1: for some of your heat flow sites (e.g. Intepe), the product of the corrected gradient (Cr. G) by the measured conductivity (K) does not correspond to the final heat flow value (Q). Either there are mistakes or I missed something here. Have you applied additional corrections that are not listed in the table? If yes, please be specific. 3- P407 L12-14: "Secondly, the (extrapolated) value of the subsurface temperatures at $z = 0$ (surface boundary condition) must match the mean annual surface temperature (MAST) of the measurement point." Not in general and only provided that air and ground temperatures are fully coupled. I presume that this latter assumption is valid for the sites you studied. Please, comment. 4- P410 L6: "Also for Yapildak, a strong upflow from 25m up to the surface is apparent." I presume that you mean "downflow"

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from the surface down to 25 m” in agreement with both Fig. 2a and your text P410 L17. 5- P414 L1-2: “resulting in lower heat flow near the surface (also called thermal blanketing).” To be rigorous, thermal blanketing does not imply systematic heat flow variations. Once steady-state has been reached, heat flow remains constant all along the vertical section but the thermal gradient varies (i.e. decreases from the blanketing rocks to the rocks that are blanketed below them). 6- P415 L25-26: “Among sedimentary rocks, shale shows radioactivity values equivalent to granite...”. I disagree, not all kinds of shales contain high amounts of heat-producing elements. Please, reformulate. 7- Fig. 2a and 2b: I find that seasonal temperature variations penetrate amazingly deep underground (down to 10 to 15 m depending on location). Could you comment further on that? Are these sites covered by loose, thus highly porous, material that could facilitate heat transfer by convection?

Technical corrections: 1- Fig. 1: I recommend introduction of an inset in order to localise the region of interest. 2- P410 L1: “compared” (also P411 L7) 3- P414 L20: “the modern Gediz graben” (and if formal name it should be “Gediz Graben”) 4- P415 L12: I feel that “modelled” (or something equivalent) is more appropriate than “observed” in the present case. 5- P416 L27: “correspond”

Interactive comment on Solid Earth Discuss., 6, 403, 2014.

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