

Interactive comment on “Positive geothermal anomalies in oceanic crust of Cretaceous age offshore Kamchatka” by G. Delisle

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This paper presents new measurements that confirm and document the existence of high heat-flows in the offshore Kamchatka, but the final interpretation related to fluid circulations differs from previous works that attributed the anomaly to deep-seated processes. Some improvement of the manuscript could strengthen this new interpretation and I give here few suggestions and remarks:

- 1) The different geographic locations and geologic structures should appear on a map (e.g. Komandorsky basin, Kamchatka subduction zone, Meiji seamount, plates locations, volcanism on land, etc...).
- 2) The previous data figure should appear in the related paragraph (Previous work)

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rather than in the discussion (figure 9).

3) A short probe (1.75 m) was used during this study. The advantage is that it can penetrate hard grounds more easily, but there are conversely several inconveniences that need to be discussed. The first one is the sensitivity to seasonal bottom water temperature variations (see Davis et al, 2003, doi:10.1029/2001JB001695) that could affect significantly the thermal gradient in the first two meters below the sea floor. The second one is related to the curvature of the thermal gradient in this first two meters below the sea-floor when vertical fluid circulations exist. In figure 5, most of the temperature profiles show a curvature, which suggests that one of these effect perturbs measurements. Are therefore the high values observed in this study directly comparable to previous heat-flow measurements probably obtained with longer probes? In addition, I also noticed several inversions of the temperature gradient (the most important on HF17, but also HF29 and HF38), which you can comment on, and add in table 1 the error associated with each temperature gradient estimate.

4) Why the conductivity measurement at site HF25 should be lower than water conductivity?

5) Can you explain or reference the method used for terrain correction.

6) Can you add a color scale to figure 5.

7) The suggested hydrothermal system should be described more explicitly. It is not clear if the driving mechanism of convection is related to the presence of magmatic bodies at depth (line 13 page 460), to the increase permeability related to the local tectonic context or both. In addition, it would be useful to delimit on a map, the area where you think convection occurs and compare this zone to the relevant geologic information. You should also discuss the absence of low values that should appear on the return flow of a convection cell (bias due to the small number of data?), and therefore why you favor the convection hypothesis rather than meteoric recharge although both require low heat-flow somewhere. You need to change the color palette of figure

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9 so that "low" heat-flow can be distinguished from "normal" heat-flow, or alternatively plot heat-flow anomalies rather than heat-flow values.

8) Sedimentation effect: why did you assume conductivity of 1.7 when your maximum value is 1.4 ? The conclusion on this importance of this effect is not clear: is it likely (line 15 page 462, conclusion) or implausible (line 8 page 463)?

9) Have you considered the possibility of mantle hydration and serpentinization in the bending-related horst and graben area? Serpentinization reaction should be exothermic and increase significantly the surface heat-flow (e.g. Delescluse and Chamot-Rooke, 2007, doi:10.1016/j.epsl.2008.09.017) and there are evidences that hydration of the mantle can occur at the outer rise faults (e.g. Ranero et al, 2003, Nature, 425, 367-373).

10) Table 2 is not very useful.

11) Some figures are difficult to read (quality vs size)

Interactive comment on Solid Earth Discuss., 3, 453, 2011.