Interactive comment on "From oil field to geothermal reservoir: First assessment for geothermal utilization of two regionally extensive Devonian carbonate aquifers in Alberta, Canada" by Leandra M. Weydt et al.

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Author's comment on "Referee comment 1 – Review MS se-2017-129" by Anonymous Referee 1

Dear Reviewer,

Thank you for your useful comments. Please see the answers and changes below:

Referee 1 – C2 line 1: *"However, besides the thermo- and petrophysical properties, the heat flow of the basin has to be taken into account to assess the economic feasibility. In the conclusions I would like to see this point addressed – alternatively the authors might add an outlook where they list the next steps to localize the most promising area with regard to depth and temperature including the available information from published data. Eventually, it is the economically recoverable heat (ERH) which increases the feasibility and this should be clearly stated at the end of the paper."*

Answer: We agree with Referee 1 that heat flow is an important parameter and should be taken into account during the assessment of the economic feasibility of a geothermal reservoir. This study was intended to create an initial data set of Upper Devonian carbonate rock properties relevant to geothermal modelling. Statements about economic feasibility were not planned for this early stage of the project, however, a short section will be added to the chapter "discussion and conclusions" summarizing the most important parameters necessary to assess the economic feasibility of this reservoir.

Outlook: To complement the data set presented in this study, measurement of further parameters (e. g. thermal diffusivity, specific heat capacity and ultrasonic wave velocity) on well core samples has been planned. Well data provided in the AccuMap or GeoScout databases will be evaluated, interpreted and probably mapped to identify the most promising areas for geothermal utilization in the reservoir. Due to the high amount of well data, this will be only possible on a regional scale.

The construction of a regional geological 3D model, using already existing data from previous studies (Majorowicz et al., 2012; Nieuwenhuis et al, 2015), is planned for the most promising areas.

Referee 1 – C2 line 7: *"The dataset clearly shows that the aquifer systems under discussion have to be operated as transitional system and thus need stimulation. Again, a point to be considered for economic operation."*

Answer: Agreed**.** This point needs to be considered during cost calculation and for economic operation. We will add this point in chapter 6 "Discussion and conclusions".

Referee 1 – C2 line 12:"*Please, check the reference list for consistency (also fonts)."*

Answer: Thank you very much for the detailed proofreading. The reference list was checked and corrected accordingly.

Referee1 – C2 line 12:"*Can you please add the coordinates of the outcrop and well locations in Table 1."*

Answer: A list of coordinates of the outcrops and well locations was added to Appendix B.

Table 1: Coordinates of the well locations and outcrops in the Front Ranges

Nr.	Well-ID	Location	Latitude (WGS84)	Longitude (WGS84)	X (UTM WGS84)	Y (UTM WGS84)	Zone
1	7-33-48-12W5	Nisku Reef Trend	53.183281	-115.692914	587345	5893457	11U
2	2-19-48-12W5	Nisku Reef Trend	53.150544	-115.741671	584151	5889757	11U
3	11-32-47-12W5	Nisku Reef Trend	53.099565	-115.723309	585480	5884108	11U
4	5-22-48-27W4	RMRT	53.1541428	-113.8754164	307740	5893279	12U
5	10-31-37-9W5	RMRT	52.226049	-115.272296	618005	5787587	11U
6	16-18-61-15W5	SCCC	54.2814211	-116.2296687	550152	6015107	11U
7	2-36-54-23W5	SCCC	53.7027132	-117.2535089	483264	5950476	11U
Nr.	Outcrop	Location	Latitude (WGS84)	Longitude (WGS84)	X (UTM WGS84)	Y (UTM WGS84)	Zone
1	Toma Creek	SCCC	52.844521	-117.218291	485298	5854997	11U
2	Jasper Railroad	SCCC	52.919106	-118.053117	429194	5863791	11U
3	Mt. Greenock	SCCC	53.087822	-118.063258	428790	5882568	11U
4	Nigel Peak	Fairholme Complex	52.218794	-117.180125	487695	5785389	11U
5	Grassi Lakes	Fairholme Complex	51.072316	-115.405563	611704	5659076	11U
6	Gap Lake	Fairholme Complex	51.058531	-115.231311	623948	5657822	11U

Further corrections:

Table 1: The depth levels of well 2-36 and 16-18 in Table 1 were reversed. The analysed depth interval of well 16-18 is now "2741.00 m to 2779.77 m" and the analysed depth intervals of well 2-36 are "4068.77 m to 4095.00 m" and "4145.00 m to 4165.39 m" as shown in Fig. 9.

Table 2 – Perdrix Formation: The number of measured plugs for the density measurements is N = 17.

Page 6 line 22: It is IHS instead of HIS – also in the references. I apologize for the unfortunate auto correction.

References

Majorowicz,J., Gosnold,W., Gray,A., Safanda, J.,Klenner,R., Unsworth, M.: Implications of post-glacial warming for northern Alberta heat flow-correcting for the underestimate of the geothermal potential, GRC Transactions, 36, 693-698, 2012.

Nieuwenhuis, G., Lengyel, T., Majorowicz, J., grobe, M., Rostron, B., Unsworth, M. J. and Weides, S.: Regional-Scale Geothermal Exploration Using Heterogeneous Industrial Temperature Data; a Case Study from the Western Canadian Sedimentary Basin, Proceedings of the World Geothermal Congress,19-25 April 2015, Melbourne, Australia, 5 pp., 2015.