**Development and application of a new exponential model for the hydraulic conductivity with depth of rock mass**

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1. **Other sensitive analysis**

Sensitivity analyses were performed for the exponential and power-like models in the range 0 to 5km, setting the baseline: log *K*s = -5, log *K*r = -11, and *α* = 1.2. Figure S1 shows that the decay rate of both models increases as the residual hydraulic conductivity (log *K*r) decreases. However, the decay rate of the exponential model is faster than that of the power-like model, and the hydraulic conductivity of the exponential model decays steadily up to log *K*r easier. This reflects that for the same parameter like log *K*s and *α*, the exponential model decays faster than the power-like model.



**Figure S1** **Sensitivity analysis of two models** **on log *K*r, (a) proposed exponential model and (b) the power-like model.**

Figure S2 focus on the effect of the decay coefficient *α* on the models. When the decay coefficient *α* increases, the hydraulic conductivity curves of two models shift to the left. The larger the decay coefficient *α*, the distance that the curve shifts to the left is shorter. For the exponential model, a smaller decay coefficient *α* (like *α*=0.6) allows the curve to approach the residual hydraulic conductivity log *K*r, whereas for the power-like model, a larger decay coefficient *α* (like *α=*1.8) allows the curve to stabilize around the residual hydraulic conductivity log *K*r. Thus the exponential model requires a smaller value of *α* for the permeability coefficient to stabilize. This further illustrates that the exponential model is more suitable for patterns where the distribution of hydraulic conductivities is more concentrated.



**Figure S2** **Sensitivity analysis of two models on *α*, (a) proposed exponential model and (b) the power-like model.**

Based on above discussion, the actual decay rate is a function of the decay coefficient *α*, log *K*r-log *K*s. For the case where the decay mode is more concentrated (e.g. due to the influence of weathering unloading, the surface hydraulic conductivities fluctuate greatly while the deep hydraulic conductivities are more intense), the exponential model is more applicable due to the characteristics of easier attenuation to the stable log *K*r. On the other hand, for the case where the decay mode is more dispersed (the deep hydraulic conductivities are not concentrated), the power-like model is more applicable.

1. **The conversion method for hydraulic conductivity**

The hydraulic conductivity *K* and the permeability *k* can be transformed standardly by the following equation, where ρ is the density of the fluid and μ is the viscosity of the fluid:

(S1)

The relationship is not consistent. It is acceptable to use the constants at 25°C for estimation, due to the low depth of data points in the database. The approximate Eq. 10 is expressed as:

(S2)

where the unit of the hydraulic conductivity *K* is cm/s and the permeability *k* is in m2.

The lugeon value is determined by conducting the packer test. The packer test is conducted at three levels of pressure. The process can be divided into five stages about pressure application and pressure release. In the pressure application stage, the pressure increases from P1 to P2 and then to P3. In the pressure release stage, it decreases again from P3 to P2 and then to P1(P1=0.3MPa, P2=0.6MPa, P3=1MPa).The lugeon value can be expressed as:

(S3)

where *q* is the lugeon value of the test section, *Q*3 is the flow rate of the third stage, P3 is the test pressure of the third stage, and *L* is the length of the test section.

There is no precise conversion relationship between the lugeon value and the hydraulic conductivity. If the water flow is laminar and the lugeon value is less than 10, the conversion can be made using the following equation:

(S4)

where *K* is the hydraulic conductivity of the test section, *Q*3 is the flow rate of the third stage, *H* is the water head of the third stage, *L* is the length of the test section, and r is the borehole radius.

If there is insufficient information about the packer test, take the third stage flow rate *Q*3 as 1L/min, the head difference *H* as 100m, the length of the test section as 1m, then the lugeon value is 1Lu by Eq. 12. For common boreholes with diameters of 56 to 150mm, the following equation can be used as an approximation:

(S5)

where the unit of the hydraulic conductivity *K* is cm/s and the lugeon value *q* is in Lu.

1. **Normalization method**

Data normalization is a method of scaling characteristics and is a key step in data pre-processing. Evaluation indicators often have large numerical differences with the difference in magnitude, which can affect the results of data analysis. To eliminate these effects, data normalization is required to address the comparability of data indicators. After the raw data have been normalized the indicators will be of the same order of magnitude, making them suitable for comprehensive comparative evaluation. Normalization is essentially a linear transformation, and there are many good properties of linear transformations that ensure that changes to the data do not "invalidate" the data, but rather improve its performance, which is a prerequisite for normalization. Common mapping ranges are [0, 1] and [-1, 1]. The most common normalization method is Min-Max normalization, also known as divergence normalization, which is a linear transformation of the original data such that the resultant values map between [0, 1]. The transformation function is as follows:

(S6)

where *X*max is the maximum value of the sample data and *X*min is the minimum value of the sample data.

The decay rate *β* in the paper were normalized using the method described above so that the compared decay rates *β* were all in the interval (0, 1). The closer the decay rates are to 0, the closer the hydraulic conductivities converge to residual hydraulic conductivity.

1. **The engineering project area data**

In Chapter “Application of the exponential model to engineering” of the paper, we apply the exponential model to a specific project area. Several major faults pass through the engineering area as Table S1. A number of boreholes were drilled in this project area and a lot of permeability data was obtained as Table S2.

Table S1 Major faults information for the engineering project

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fault name | Length(Km) | Fault strike | Fault dip | Property |
| F2 | 81 | NW | S | strike-slip |
| F3 | 105 | NWW | SW | Thrust tectonics |
| F5 | 170 | EW-NWW | N | strike-slip |
| F6 | 180 | NWW | S | strike-slip |

Table S2 The borehole hydraulic conductivity information

|  |  |  |
| --- | --- | --- |
| Borehole Description | Depth(m) | Log K(cm/s) |
| QZK01-02  Mean burial depth is 115m  Main lithology is granodiorite/ without fault crossing | 1.5 | -3.77995 |
| 5.4 | -3.23209 |
| 6.8 | -4.04141 |
| 15 | -3.17215 |
| 24 | -3.42969 |
| 24.5 | -3.20273 |
| 27.1 | -3.89449 |
| 29.5 | -3.93554 |
| 32.1 | -4.25493 |
| 34.5 | -3.97881 |
| 37.1 | -4.5544 |
| 39.5 | -3.29671 |
| 42.1 | -3.80382 |
| 44.5 | -3.4034 |
| 47.1 | -4.11805 |
| 49.5 | -3.59176 |
| 52.1 | -3.22475 |
| 54.5 | -3.31515 |
| 57.1 | -3.07469 |
| 59.5 | -3.42022 |
| 62.1 | -3.73518 |
| 64.5 | -4.08092 |
| 67.1 | -3.17134 |
| 69.5 | -4.42022 |
| 72.1 | -3.47756 |
| 74.5 | -3.54212 |
| 77.1 | -3.37366 |
| 79.5 | -3.40012 |
| 82.1 | -3.37161 |
| 84.5 | -3.19654 |
| 87.1 | -3.61618 |
| 89.5 | -3.02919 |
| 92.1 | -4.03152 |
| 94.5 | -3.08566 |
| 97.3 | -3.90309 |
| 99.5 | -3.28651 |
| 104.5 | -3.28819 |
| 109.5 | -3.45223 |
| 114.5 | -3.64207 |
| 119.5 | -3.31247 |
| 124.5 | -3.47366 |
| 128.5 | -3.54821 |
| QZK03~12  Mean burial depth is 90m  Main lithology is granodiorite/ without fault crossing | 1 | -3.99823 |
| 1.8 | -3.98352 |
| 2 | -4.00941 |
| 2 | -4.17309 |
| 3 | -4.04487 |
| 3.1 | -4.00211 |
| 4.9 | -4.17851 |
| 4.9 | -4.09136 |
| 5 | -4.07182 |
| 5 | -4.11077 |
| 5 | -4.03882 |
| 5.6 | -4.28971 |
| 6.1 | -4.20846 |
| 7.5 | -4.07665 |
| 7.5 | -4.23597 |
| 7.5 | -4.35223 |
| 8.3 | -4.27258 |
| 8.5 | -4.10516 |
| 9 | -4.16391 |
| 9.6 | -4.40666 |
| 9.6 | -4.26715 |
| 10 | -4.26793 |
| 11 | -4.25852 |
| 11.5 | -4.25618 |
| 12.1 | -4.27376 |
| 12.5 | -4.2426 |
| 12.5 | -4.19368 |
| 12.5 | -4.42205 |
| 14.8 | -4.16276 |
| 16.5 | -4.31186 |
| 16.5 | -4.28651 |
| 17 | -4.39911 |
| 17.1 | -4.42205 |
| 17.5 | -4.33951 |
| 17.5 | -4.34266 |
| 17.5 | -4.10491 |
| 17.5 | -4.33124 |
| 17.5 | -4.47573 |
| 19.9 | -4.33002 |
| 21.5 | -4.32818 |
| 22.1 | -4.55721 |
| 22.5 | -4.36091 |
| 22.5 | -4.41454 |
| 22.5 | -4.29964 |
| 22.5 | -4.09173 |
| 22.5 | -4.54363 |
| 22.5 | -4.80024 |
| 25 | -4.37965 |
| 26 | -4.4005 |
| 26.5 | -4.26664 |
| 27.5 | -4.33124 |
| 27.5 | -4.51456 |
| 27.5 | -4.14972 |
| 27.5 | -4.20121 |
| 27.5 | -4.05988 |
| 27.5 | -4.44009 |
| 27.5 | -4.53047 |
| 27.5 | -4.56767 |
| 31.5 | -4.33329 |
| 32.1 | -4.64474 |
| 32.5 | -4.60836 |
| 32.5 | -4.43227 |
| 32.5 | -4.42713 |
| 32.5 | -4.42458 |
| 32.5 | -4.14972 |
| 32.5 | -4.39513 |
| 32.5 | -4.65758 |
| 33 | -4.52272 |
| 36.5 | -4.3999 |
| 37.1 | -4.67081 |
| 37.5 | -4.45346 |
| 37.5 | -4.55377 |
| 37.5 | -4.36311 |
| 37.5 | -4.50836 |
| 37.5 | -4.15652 |
| 37.5 | -4.55377 |
| 37.5 | -4.66194 |
| 40 | -4.60944 |
| 41.5 | -4.43227 |
| 42.1 | -4.74909 |
| 42.5 | -4.75449 |
| 42.5 | -4.41953 |
| 42.5 | -4.49026 |
| 42.5 | -4.31319 |
| 42.5 | -4.26664 |
| 42.5 | -4.19219 |
| 42.5 | -4.45346 |
| 42.5 | -4.55377 |
| 46.5 | -4.48439 |
| 47.1 | -4.75449 |
| 47.5 | -5.04479 |
| 47.5 | -4.47289 |
| 47.5 | -4.45892 |
| 47.5 | -4.49921 |
| 47.5 | -4.42205 |
| 47.5 | -4.15927 |
| 47.5 | -4.56067 |
| 47.5 | -4.52724 |
| 51.5 | -4.36311 |
| 52.1 | -4.71806 |
| 52.5 | -4.94157 |
| 52.5 | -4.60836 |
| 52.5 | -4.48149 |
| 52.5 | -4.46725 |
| 52.5 | -4.32514 |
| 52.5 | -4.25964 |
| 52.5 | -4.50224 |
| 52.5 | -4.56767 |
| 56.5 | -4.55721 |
| 57.1 | -4.71309 |
| 57.5 | -4.83803 |
| 57.5 | -4.31417 |
| 57.5 | -4.44806 |
| 57.5 | -4.35438 |
| 57.5 | -4.37202 |
| 57.5 | -4.3292 |
| 57.5 | -4.52724 |
| 57.5 | -4.71309 |
| 61.5 | -4.48149 |
| 62.1 | -4.69379 |
| 62.5 | -4.9017 |
| 62.5 | -4.56067 |
| 62.5 | -4.37428 |
| 62.5 | -4.34795 |
| 62.5 | -4.46445 |
| 62.5 | -4.39041 |
| 62.5 | -4.41953 |
| 62.5 | -5.10127 |
| 66.5 | -4.54699 |
| 67.1 | -4.74376 |
| 67.5 | -4.80632 |
| 67.5 | -4.68909 |
| 67.5 | -4.47006 |
| 67.5 | -4.51456 |
| 67.5 | -4.35438 |
| 67.5 | -4.49026 |
| 67.5 | -4.81248 |
| 68.4 | -4.5857 |
| 71.5 | -4.64898 |
| 72.1 | -4.74909 |
| 72.5 | -4.96738 |
| 72.5 | -4.58939 |
| 72.5 | -4.67985 |
| 72.5 | -4.48149 |
| 72.5 | -4.41454 |
| 72.5 | -4.51145 |
| 72.5 | -4.4786 |
| 72.5 | -4.80024 |
| 76.5 | -4.7333 |
| 77.1 | -4.79425 |
| 77.5 | -5.04479 |
| 77.5 | -4.62819 |
| 77.5 | -4.77109 |
| 77.5 | -4.5784 |
| 77.5 | -4.39751 |
| 77.5 | -4.64898 |
| 77.5 | -4.55721 |
| 77.5 | -4.38112 |
| 81.5 | -4.5857 |
| 82.1 | -4.67985 |
| 82.5 | -5.11351 |
| 82.5 | -4.67985 |
| 82.5 | -4.56767 |
| 82.5 | -4.51145 |
| 82.5 | -4.41454 |
| 82.5 | -4.68909 |
| 82.5 | -4.29585 |
| 86.5 | -4.77676 |
| 87.1 | -4.69379 |
| 87.5 | -4.98548 |
| 87.5 | -4.82507 |
| 87.5 | -4.69144 |
| 87.5 | -4.36311 |
| 87.5 | -4.78252 |
| 88 | -4.75449 |
| 90.3 | -4.67985 |
| 92 | -4.75721 |
| 92.1 | -4.56767 |
| 92.5 | -4.81248 |
| 92.9 | -4.69616 |
| 97.1 | -4.63639 |
| 102.1 | -4.75449 |
| 107.1 | -4.76548 |
| 112.1 | -4.84466 |
| 117.1 | -4.84802 |
| SZK01  Burial depth is 190m  Main lithology is granodiorite/ without fault crossing | 4 | -3.12867 |
| 7.8 | -3.16883 |
| 10.3 | -3.27432 |
| 15.9 | -3.24427 |
| 26 | -3.35111 |
| 36 | -3.22308 |
| 45 | -3.49898 |
| 55 | -3.34227 |
| 65 | -3.39255 |
| 75 | -3.67438 |
| 85 | -3.45143 |
| 95 | -3.5497 |
| 105 | -3.60022 |
| 114 | -3.54314 |
| 120 | -3.4371 |
| 122.5 | -3.12537 |
| 127.5 | -3.35507 |
| 132.5 | -3.53546 |
| 137.5 | -3.68484 |
| 142.5 | -3.76494 |
| 147.5 | -3.79334 |
| 152.5 | -3.91438 |
| 157.5 | -3.83006 |
| 162.5 | -3.78751 |
| 167.5 | -2.98297 |
| 172.5 | -3.77047 |
| 177.5 | -3.83006 |
| 182.5 | -3.94656 |
| 187.5 | -4.03932 |
| SZK03  Burial depth is 840m  Main lithology is granodiorite/ without fault crossing | 7 | -3.64584 |
| 15 | -3.80859 |
| 21 | -4.11467 |
| 26.3 | -4.18847 |
| 31.2 | -4.32624 |
| 39.8 | -4.59552 |
| 44.5 | -4.56953 |
| 51 | -4.37822 |
| 57 | -4.40762 |
| 61.8 | -4.48874 |
| 78.5 | -4.07823 |
| 84 | -3.9038 |
| 103.5 | -3.73507 |
| 120 | -4.16909 |
| 130.1 | -4.32754 |
| 140 | -3.99354 |
| 150 | -4.49025 |
| 160.9 | -4.54049 |
| 175 | -3.72969 |
| 190 | -3.48895 |
| 205 | -3.59027 |
| 221.8 | -3.41396 |
| 243.5 | -4.02668 |
| 254.5 | -3.77958 |
| 294.6 | -4.19866 |
| 345.9 | -4.22573 |
| 376 | -4.10453 |
| 405 | -4.05507 |
| 437 | -4.23838 |
| 469 | -4.00503 |
| 499.3 | -4.00841 |
| 530 | -4.26847 |
| 558.7 | -4.46112 |
| 570.9 | -4.16284 |
| 586.9 | -4.26034 |
| 619.4 | -4.4977 |
| 648.5 | -4.73919 |
| 664.1 | -4.30628 |
| 712.1 | -4.20579 |
| 746 | -4.03153 |
| 772.5 | -4.43726 |
| 777.5 | -4.16564 |
| 782.5 | -4.32212 |
| 787.5 | -4.99047 |
| 792.5 | -5.10627 |
| 797.5 | -4.86323 |
| 802.5 | -5.00936 |
| 807.5 | -4.50421 |
| 812.5 | -5.08279 |
| 817.5 | -5.10627 |
| 822.5 | -5.4073 |
| 827.5 | -5.38382 |
| 832.5 | -5.23121 |
| 837.5 | -4.74349 |
| SZK04  Burial depth is 666m  Main lithology is conglomerate, sandstone, mudstone/ without fault crossing | 6.8 | -3.41213 |
| 22.7 | -3.19105 |
| 40 | -3.24552 |
| 56.4 | -3.41052 |
| 66 | -3.46867 |
| 84 | -4.04962 |
| 101 | -3.32223 |
| 111 | -3.42735 |
| 117.6 | -3.56859 |
| 131.5 | -3.38186 |
| 145.9 | -3.89568 |
| 165 | -3.82768 |
| 186 | -3.48173 |
| 208 | -3.03041 |
| 223.8 | -3.25761 |
| 239.7 | -3.12027 |
| 252.7 | -3.5561 |
| 294.6 | -3.50813 |
| 320 | -2.95892 |
| 343 | -2.91218 |
| 363.6 | -3.98045 |
| 397 | -3.46642 |
| 431.6 | -3.71094 |
| 450 | -4.05774 |
| 476.6 | -3.97145 |
| 499.7 | -4.25372 |
| 515 | -3.91031 |
| 542.1 | -3.9268 |
| 559.8 | -4.04442 |
| 586.8 | -4.24615 |
| 602.5 | -4.36372 |
| 607.5 | -4.32411 |
| 612.5 | -4.62514 |
| 617.5 | -4.55536 |
| 622.5 | -4.60187 |
| 627.5 | -4.18113 |
| 632.5 | -4.53546 |
| 637.5 | -4.87018 |
| 642.5 | -4.50421 |
| 647.5 | -4.83649 |
| 652.5 | -4.66693 |
| 657.5 | -4.59811 |
| 662.5 | -4.53224 |
| SZK05  Burial depth is 430m  Main lithology are schist, marble, phyllite/ without fault crossing | 15.81 | -4.01757 |
| 36.61 | -3.76966 |
| 66.7 | -3.5553 |
| 104 | -3.79802 |
| 145 | -3.8819 |
| 182 | -3.47141 |
| 229 | -4.2247 |
| 271.4 | -4.64124 |
| 286.6 | -4.16771 |
| 294.8 | -4.26936 |
| 323 | -4.06033 |
| 338.5 | -4.91664 |
| 357 | -4.5922 |
| 362.5 | -4.59069 |
| 367.5 | -4.55536 |
| 372.5 | -4.64973 |
| 377.5 | -4.55536 |
| 382.5 | -4.51955 |
| 387.5 | -4.66693 |
| 392.5 | -4.66257 |
| 397.5 | -4.59811 |
| 402.5 | -4.59069 |
| SZK06~09  Burial depth is 100m  Main lithology are sandstone, argillaceous siltstone, mudstone/ without fault crossing | 7 | -5.29581 |
| 9.5 | -5.04928 |
| 14 | -5.04048 |
| 17.5 | -5.13616 |
| 20 | -4.928 |
| 22 | -4.79418 |
| 22.5 | -4.64171 |
| 25 | -4.66114 |
| 27.5 | -4.72096 |
| 27.5 | -4.86707 |
| 30 | -4.75934 |
| 30 | -4.91892 |
| 32.5 | -4.70652 |
| 32.5 | -4.87494 |
| 35 | -4.70926 |
| 35 | -4.67686 |
| 37.5 | -4.75529 |
| 37.5 | -4.70572 |
| 50 | -4.52806 |
| 53 | -4.44156 |
| 54 | -5.91735 |
| 56.5 | -5.80656 |
| 59 | -5.5892 |
| 60.6 | -4.54746 |
| 61.5 | -5.53299 |
| 64 | -5.48798 |
| 66.5 | -5.52301 |
| 69.2 | -5.55559 |
| 90 | -5.26185 |
| 93 | -5.2294 |
| 95 | -5.30985 |
| 97.5 | -5.29325 |
| 112.5 | -5.08247 |
| 115 | -5.17167 |
| 127.5 | -4.87331 |
| 130 | -4.99555 |
| 132.5 | -5.04814 |
| 135 | -5.04674 |
| 137.5 | -5.07048 |
| 150 | -5.02278 |
| 152.5 | -5.05402 |
| 155 | -5.10204 |
| SZK10  Burial depth is 580m  Main lithology are phyllite, limestone/with F6 fault crossing | 8 | -3.10031 |
| 16 | -3.027 |
| 24.7 | -3.79857 |
| 34 | -4.20396 |
| 47.7 | -4.2173 |
| 65 | -4.29192 |
| 86 | -4.27137 |
| 102.1 | -4.25647 |
| 120 | -3.65683 |
| 142 | -3.47983 |
| 165 | -2.92971 |
| 180 | -3.3303 |
| 199.6 | -3.65812 |
| 220 | -3.48515 |
| 241 | -3.72566 |
| 263 | -3.90361 |
| 285 | -4.60896 |
| 300 | -4.14936 |
| 319.1 | -4.19691 |
| 351.7 | -4.60473 |
| 358.9 | -4.54919 |
| 366.8 | -5.01966 |
| 382 | -5.01325 |
| 397 | -4.96994 |
| 411.1 | -5.03581 |
| 427.4 | -4.98011 |
| 439.6 | -5.14985 |
| 453 | -4.97658 |
| 468 | -5.01823 |
| 487.2 | -5.01463 |
| 503.6 | -4.43615 |
| 512.5 | -3.53579 |
| 517.5 | -5.06051 |
| 522.5 | -5.20017 |
| 527.5 | -5.06051 |
| 532.5 | -4.9636 |
| 537.5 | -4.97237 |
| 542.5 | -4.89172 |
| 547.5 | -4.76494 |
| 552.5 | -4.76494 |
| 557.5 | -4.66257 |
| 562.5 | -5.18545 |
| 567.5 | -5.06051 |
| 572.5 | -4.88442 |
| 577.5 | -4.81747 |
| SZK13  Burial depth is 980m  Main lithology are sandstone, conglomerate/ with F3 fault crossing | 6.3 | -3.32902 |
| 23 | -3.88572 |
| 41 | -4.18675 |
| 58 | -3.98016 |
| 75 | -4.18091 |
| 91.9 | -4.08649 |
| 103 | -4.0231 |
| 117 | -3.96984 |
| 136.4 | -3.46929 |
| 146 | -3.68518 |
| 164 | -3.56558 |
| 183.9 | -3.59356 |
| 212.4 | -3.01731 |
| 238 | -3.92552 |
| 264 | -4.40384 |
| 290 | -4.54415 |
| 310.4 | -4.82471 |
| 343 | -4.99308 |
| 360 | -5.04542 |
| 382 | -4.9612 |
| 400.3 | -4.56886 |
| 412.2 | -5.13164 |
| 427 | -5.09076 |
| 445.3 | -5.17722 |
| 490.5 | -5.06517 |
| 535.7 | -5.22719 |
| 591.3 | -5.01199 |
| 622.6 | -4.42421 |
| 636.1 | -4.35475 |
| 654 | -4.12449 |
| 668.3 | -5.15153 |
| 683 | -4.27814 |
| 700.7 | -4.02399 |
| 747.1 | -4.74147 |
| 760.6 | -4.85811 |
| 780 | -4.25123 |
| 802.4 | -4.11018 |
| 833.5 | -4.66261 |
| 846.5 | -4.58685 |
| 871.4 | -4.71216 |
| 905 | -4.5769 |
| 912.5 | -4.31232 |
| 917.5 | -4.27696 |
| 922.5 | -4.46667 |
| 927.5 | -4.87018 |
| 932.5 | -4.39306 |
| 937.5 | -4.61725 |
| 942.5 | -4.87724 |
| 947.5 | -4.99047 |
| 952.5 | -5.23121 |
| 957.5 | -4.97237 |
| 962.5 | -5.04979 |
| 967.5 | -5.04979 |
| 972.5 | -4.81131 |
| 977.5 | -5.01912 |
| SZK18  Burial depth is 910m  Main lithology are sandstone, conglomerate, mudstone/ with F5 fault crossing | 15 | -4.291 |
| 30.4 | -4.28613 |
| 39 | -4.62542 |
| 58 | -4.0581 |
| 77 | -4.13857 |
| 96 | -4.44729 |
| 115 | -4.34728 |
| 124 | -3.59754 |
| 144 | -3.12263 |
| 163 | -4.34966 |
| 184 | -4.01858 |
| 202 | -4.3458 |
| 220 | -4.29064 |
| 243 | -4.71119 |
| 265 | -4.62796 |
| 280 | -4.75437 |
| 300 | -4.53998 |
| 325.5 | -4.50662 |
| 346 | -4.92395 |
| 370 | -5.07046 |
| 396 | -4.86189 |
| 420 | -4.89564 |
| 446 | -4.98083 |
| 470 | -4.93811 |
| 496 | -5.0282 |
| 520 | -5.06661 |
| 548 | -4.91881 |
| 570 | -4.90523 |
| 589.4 | -5.03884 |
| 607 | -4.18836 |
| 625 | -5.0168 |
| 640 | -5.07178 |
| 655.3 | -4.54538 |
| 673 | -4.22455 |
| 690 | -5.00681 |
| 708 | -5.03729 |
| 725.7 | -4.8588 |
| 746 | -4.76777 |
| 765 | -4.09975 |
| 786 | -4.76087 |
| 824 | -4.99507 |
| 824 | -4.99507 |
| 842.5 | -4.27308 |
| 847.5 | -4.29295 |
| 852.5 | -4.2107 |
| 857.5 | -4.02155 |
| 862.5 | -4.11624 |
| 867.5 | -4.05229 |
| 872.5 | -4.10531 |
| 877.5 | -4.08195 |
| 882.5 | -4.47368 |
| 887.5 | -4.03461 |
| 892.5 | -4.37398 |
| 897.5 | -4.40634 |
| 902.5 | -4.36298 |
| 907.5 | -4.33158 |
| SZK27  Burial depth is 162m  Main lithology are sandstone, argillaceous siltstone, mudstone/ without fault crossing | 44.5 | -4.40556 |
| 50 | -4.29669 |
| 55.5 | -4.17105 |
| 60.5 | -4.16102 |
| 65.5 | -4.17721 |
| 72.5 | -4.19978 |
| 77.5 | -4.19978 |
| 82.5 | -4.22974 |
| 87.5 | -4.42163 |
| 92.5 | -4.44645 |
| 97.5 | -4.44137 |
| 102.5 | -4.37587 |
| 107.5 | -4.21151 |
| 112.5 | -4.42163 |
| 117.5 | -4.42163 |
| 122.5 | -4.42163 |
| 127.5 | -4.30399 |
| 132.5 | -4.33448 |
| 137.5 | -4.33448 |
| 142.5 | -4.47278 |
| SZK30  Burial depth is 600m  Main lithology is granodiorite/ without fault crossing | 6 | -3.48122 |
| 15 | -3.03758 |
| 23.4 | -2.93782 |
| 38 | -3.13659 |
| 40 | -3.75339 |
| 55 | -3.52453 |
| 65.7 | -3.66513 |
| 74.8 | -4.09014 |
| 91.7 | -3.96511 |
| 116.6 | -3.27173 |
| 144.5 | -3.17903 |
| 173.4 | -2.9048 |
| 178.2 | -2.82744 |
| 200 | -3.79609 |
| 224.4 | -3.66109 |
| 253 | -3.67221 |
| 279 | -3.65064 |
| 308 | -2.88294 |
| 336 | -4.03973 |
| 365 | -3.64937 |
| 393 | -3.40449 |
| 424 | -3.65871 |
| 452 | -3.59755 |
| 480 | -3.94735 |
| 508 | -3.96765 |
| 530 | -4.02534 |
| 532.5 | -4.2734 |
| 537.5 | -3.86392 |
| 542.5 | -3.8653 |
| 547.5 | -4.28966 |
| 552.5 | -4.05834 |
| 557.5 | -4.13752 |
| 562.5 | -4.06051 |
| 567.5 | -4.05619 |
| 572.5 | -4.28599 |
| 577.5 | -4.4073 |
| 582.5 | -4.2476 |
| 587.5 | -3.9474 |
| 592.5 | -4.30084 |
| 597.5 | -4.26812 |
| GDH13,15,17  Burial depth is 100m  Main lithology is argillaceous sandstone/ without fault crossing | 3 | -4.16025 |
| 6 | -4.09836 |
| 10 | -4.38029 |
| 10.3 | -4.20706 |
| 10.6 | -3.53169 |
| 24 | -3.64567 |
| 25 | -4.72198 |
| 32.55 | -4.59007 |
| 37 | -4.68503 |
| 37.1 | -4.32057 |
| 38 | -3.76862 |
| 42.3 | -4.8041 |
| 45 | -4.55523 |
| 47.85 | -4.91009 |
| 52.5 | -3.84466 |
| 52.6 | -5.05948 |
| 54 | -4.51512 |
| 57.5 | -3.8962 |
| 60 | -5.11861 |
| 62.5 | -3.93554 |
| 62.5 | -4.74854 |
| 67.5 | -3.93554 |
| 69.2 | -5.17456 |
| 72.5 | -3.98177 |
| 80 | -4.76929 |
| 90 | -5.69404 |
| 100 | -5.01328 |
| 103.1 | -5.50169 |
| 108.9 | -5.42946 |
| 114.3 | -5.4698 |
| 120 | -5.47756 |
| 125 | -5.31966 |
| 128.75 | -5.31605 |

1. **Datasets collected from other literature**

In the paper, the database is divided into the following datasets: igneous dataset, metamorphic dataset, sedimentary(sandstone) dataset, sedimentary(mudstone) dataset, stable dataset, unstable dataset, faulted dataset, non-faulted dataset. Meanwhile, in order to verify the characteristics of the two models, dataset 1 and dataset 2 were extracted from the igneous dataset and metamorphic dataset. The numerical code used to generate all above datasets is available at:

https://github.com/crush856/hydraulic-conductivity-depth-model-supporting-information.git