

1 **Supplements:**

2 **Fault slip potential induced by fluid injection in the**
3 **Matouying EGS field, Tangshan seismic region, North**
4 **China**

5 **Chengjun Feng^{1,2}, Guangliang Gao^{3,4}, Shihuai Zhang⁵, Dongsheng Sun^{1,2}, Siyu**
6 **Zhu¹, Chengxuan Tan^{1,2}, Xiaodong Ma⁵**

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8 ¹Institute of Geomechanics, Chinese Academy of Geological Sciences, Beijing, 100081, China

9 ²Key Laboratory of Active Tectonics and Geological Safety, Ministry of Natural Resources, Beijing,
10 100081, China

11 ³China University of Petroleum, Qingdao, 266580, China

12 ⁴Jidong Oilfield Company, PetroChina, Tangshan, 063000, China

13 ⁵Department of Earth Sciences, ETH Zürich, Zürich, 8092, Switzerland

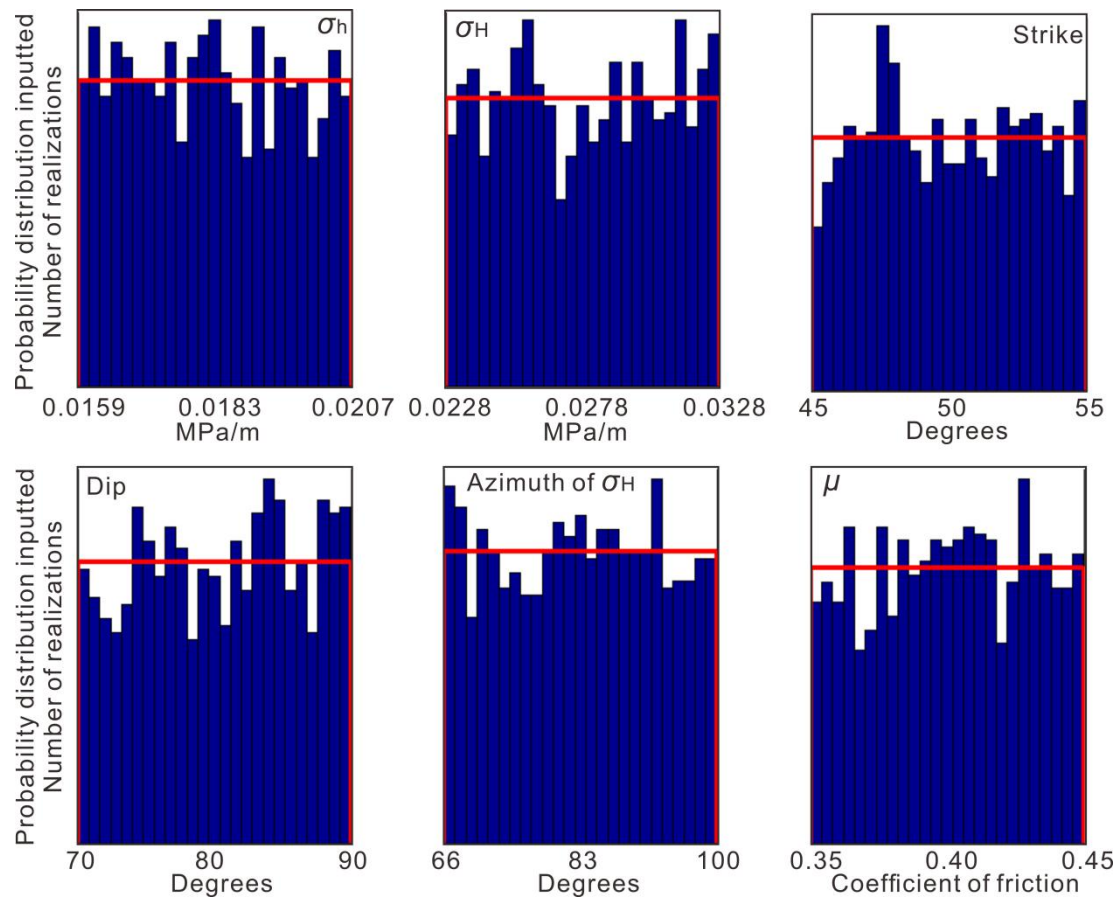
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15 **Correspondence:** Chengjun Feng (feng2010618@aliyun.com)

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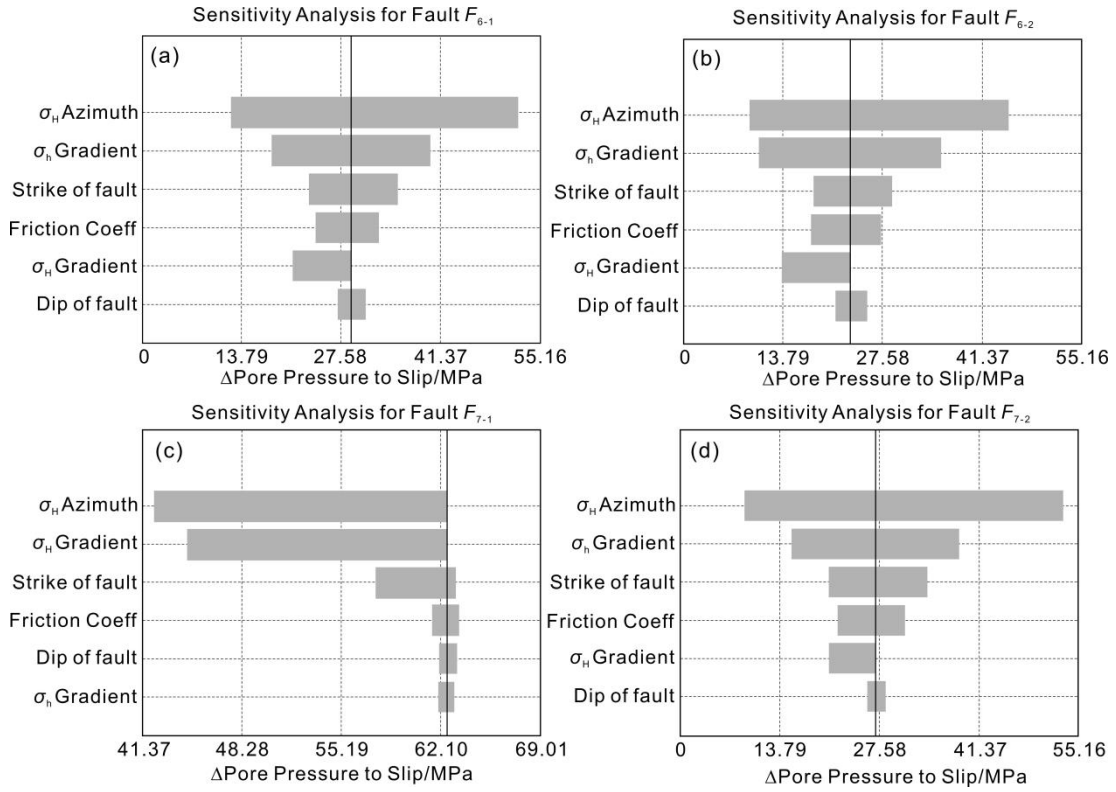
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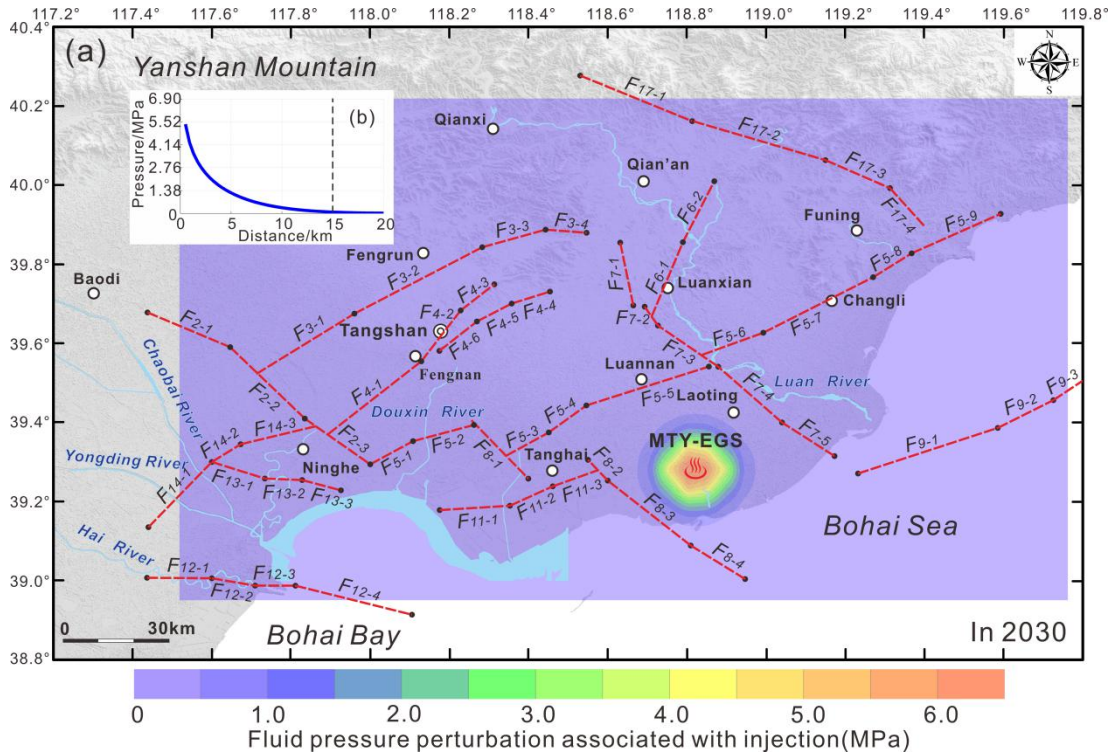
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Figure S1. Probability distributions inputted of the initial in situ stress field and the characteristic parameters of the mapped fault F_{4-1} of the Tangshan fault belt. σ_H and σ_h denote the maximum and minimum horizontal principal stresses, respectively.



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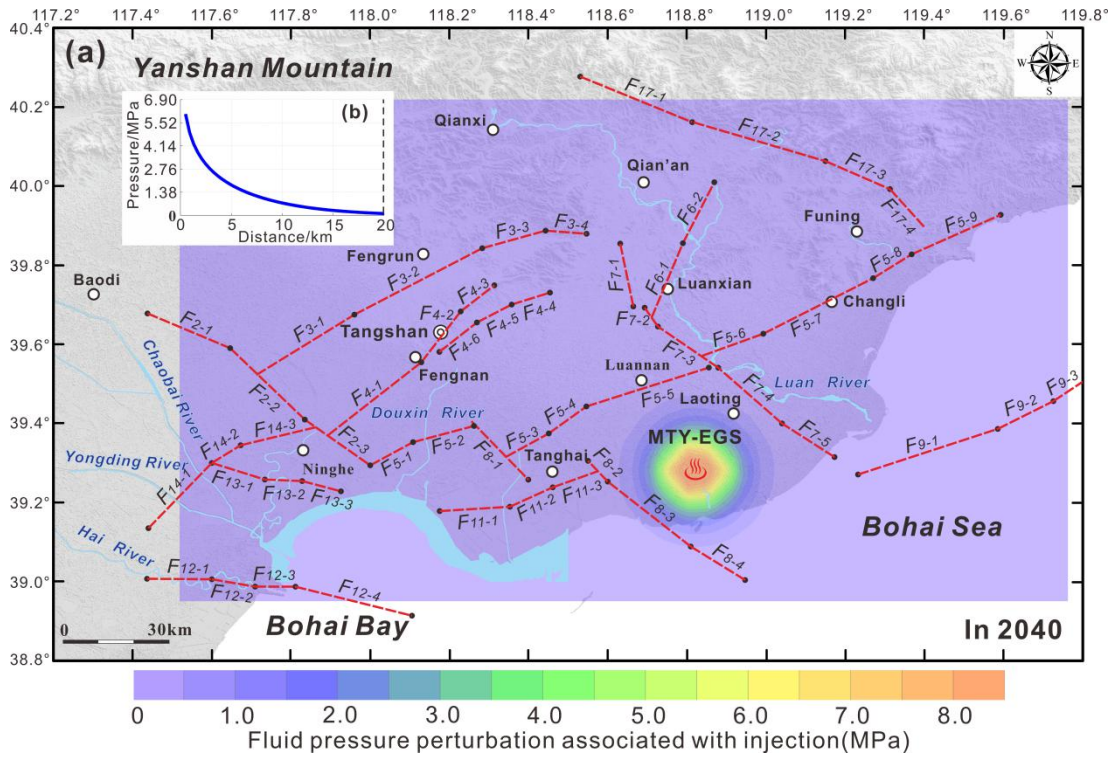
Figure S2. Sensitivity of the fault slip potential (FSP) on the mapped faults to uncertainties in various input parameters. (a) A case of fault F_{6-1} , (b) a case of fault F_{6-2} , (c) a case of fault F_{7-1} , and (d) a case of fault F_{7-2} .



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Figure S3. (a) Estimated fluid pressure perturbation in 2030 in response to fluid injection at five hypothetical wells in the MTY EGS field. (b) Estimated decay of the fluid pressure perturbation with distance in the MTY EGS field in 2030.

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Figure S4. (a) Estimated fluid pressure perturbation in 2040 in response to fluid injection at five hypothetical wells in the MTY EGS field. (b) Estimated decay of the fluid pressure perturbation with distance in the MTY EGS field in 2040.

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Table S1. Results of a deterministic geomechanical assessment of fault pore pressure to slip on the mapped faults in Tangshan seismic region in the present ambient stress field.

Name of fault	Segment	Length, km	Delta P_0 to fault slip, MPa
Jiyunhe fault (F_2)	F_{2-1}	25.37	3.70
	F_{2-2}	29.37	14.99
	F_{2-3}	22.25	7.03
Yejituo fault (F_3)	F_{3-1}	32.04	5.47
	F_{3-2}	40.50	5.44
	F_{3-3}	18.69	6.93
	F_{3-4}	12.02	6.15
Tangshan fault belt (F_4)	F_{4-1}	33.38	2.58
	F_{4-2}	18.47	5.95
	F_{4-3}	12.02	2.85
	F_{4-4}	11.57	16.38
	F_{4-5}	11.13	5.40
	F_{4-6}	13.80	2.58
Changli-Ninghe fault (F_5)	F_{5-1}	13.80	5.82
	F_{5-2}	17.80	13.55
	F_{5-3}	13.57	4.93
	F_{5-4}	13.13	3.25
	F_{5-5}	36.05	12.38
	F_{5-6}	18.47	9.22
	F_{5-7}	34.71	5.82
	F_{5-8}	12.91	4.93
	F_{5-9}	27.59	7.41
Lulong fault (F_6)	F_{6-1}	22.92	24.49

	F_{6-2}	19.58	18.04
Luanxian-Laoting fault (F_7)	F_{7-1}	18.25	62.50
	F_{7-2}	6.68	27.03
	F_{7-3}	20.69	7.03
	F_{7-4}	24.03	10.45
	F_{7-5}	17.80	6.00
Baigezhuang fault (F_8)	F_{8-1}	22.70	18.86
	F_{8-2}	8.46	17.80
	F_{8-3}	29.37	10.04
	F_{8-4}	18.25	6.00
Qinbei fault (F_9)	F_{9-1}	41.39	6.39
	F_{9-2}	17.80	5.41
	F_{9-3}	9.79	5.41
Xi'nanzhuang fault (F_{11})	F_{11-1}	20.03	20.56
	F_{11-2}	13.35	7.92
	F_{11-3}	13.35	12.78
Haihe fault (F_{12})	F_{12-1}	18.25	10.70
	F_{12-2}	12.46	6.67
	F_{12-3}	11.13	10.70
	F_{12-4}	33.82	4.90
Hangu fault (F_{13})	F_{13-1}	15.58	4.52
	F_{13-2}	10.68	19.54
	F_{13-3}	11.57	6.19
Cangdong fault (F_{14})	F_{14-1}	25.81	16.89
	F_{14-2}	9.79	10.22
	F_{14-3}	21.81	8.47

Lengkou fault (F_{17})	F_{17-1}	34.27	4.49
	F_{17-2}	39.16	4.72
	F_{17-3}	20.03	4.54
	F_{17-4}	14.24	22.23

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Table S2. Probability of fault slip potential on the mapped faults in Tangshan seismic region (beyond a range of 45 km away from the injection wells) in response to the fluid injection at five hypothetical wells in the MTY EGS field.

Name of fault	Segment	Probability of fault slip potential			
		in 2020	in 2030	in 2040	in 2050
Jiyunhe fault (F_2)	F_{2-1}	39%	39%	39%	39%
	F_{2-2}	19%	19%	19%	19%
	F_{2-3}	27%	27%	27%	27%
Yejituo fault (F_3)	F_{3-1}	29%	29%	29%	29%
	F_{3-2}	30%	30%	30%	30%
	F_{3-3}	30%	30%	30%	30%
	F_{3-4}	30%	30%	30%	30%
Tangshan fault belt (F_4)	F_{4-1}	38%	38%	38%	38%
	F_{4-2}	30%	30%	30%	30%
	F_{4-3}	40%	40%	40%	40%
	F_{4-4}	14%	14%	14%	14%
	F_{4-5}	35%	35%	35%	35%
	F_{4-6}	40%	40%	40%	40%
Changli-Ninghe fault (F_5)	F_{5-1}	30%	30%	30%	30%
	F_{5-2}	15%	15%	15%	15%
	F_{5-3}	35%	35%	35%	35%

	F_{5-4}	37%	37%	37%	38%
	F_{5-5}	18%	18%	18%	19%
	F_{5-6}	25%	25%	25%	25%
	F_{5-7}	31%	31%	31%	31%
	F_{5-8}	32%	32%	32%	32%
	F_{5-9}	28%	28%	28%	28%
Lulong fault (F_6)	F_{6-1}	3%	3%	3%	3%
	F_{6-2}	7%	7%	7%	7%
Luanxian-Laoting fault (F_7)	F_{7-1}	1%	1%	1%	1%
	F_{7-2}	4%	4%	4%	4%
	F_{7-3}	30%	30%	30%	30%
	F_{7-4}	26%	26%	26%	27%
	F_{7-5}	32%	32%	33%	33%
Baigezhuang fault (F_8)	F_{8-1}	11%	11%	11%	11%
	F_{8-2}	12%	12%	12%	13%
	F_{8-3}	23%	24%	25%	26%
	F_{8-4}	28%	28%	28%	29%
Qinbei fault (F_9)	F_{9-1}	30%	30%	30%	30%
	F_{9-2}	31%	31%	31%	31%
	F_{9-3}	31%	31%	31%	31%
Xi'nanzhuang fault (F_{11})	F_{11-1}	6%	6%	6%	6%
	F_{11-2}	27%	27%	27%	27%
	F_{11-3}	20%	20%	20%	20%
Haihe fault (F_{12})	F_{12-1}	21%	21%	21%	21%
	F_{12-2}	27%	27%	27%	27%
	F_{12-3}	21%	21%	21%	21%

	F_{12-4}	33%	33%	33%	33%
Hangu fault (F_{13})	F_{13-1}	34%	34%	34%	34%
	F_{13-2}	10%	10%	10%	10%
	F_{13-3}	30%	30%	30%	30%
	F_{14-1}	7%	7%	7%	7%
Cangdong fault (F_{14})	F_{14-2}	17%	17%	17%	17%
	F_{14-3}	20%	20%	20%	20%
	F_{17-1}	33%	33%	33%	33%
Lengkou fault (F_{17})	F_{17-2}	32%	32%	32%	32%
	F_{17-3}	36%	36%	36%	36%
	F_{17-4}	7%	7%	7%	7%

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Table S3. Probability of fault slip potential on the boundary faults near the MTY EGS field (within a range of 15 km away from the injection wells) in response to the fluid injection at five hypothetical wells in the MTY EGS field.

Tectonic unit	Segment	Length, km	Probability of fault slip potential			
			in 2020	in 2030	in 2040	in 2050
Between II and I	F_{b1}	3.85	2.0%	2.2%	2.8%	3.6%
	F_{b2}	3.21	0.1%	0.2%	0.3%	0.3%
	F_{b3}	5.64	0.1%	0.1%	0.1%	0.1%
	F_{b4}	1.28	8.1%	14.4%	20.2%	25.0%
	F_{b5}	4.36	14.6%	20.7%	26.5%	30.5%
	F_{b6}	7.56	16.1%	17.3%	20.0%	21.7%
Between II and III	F_{b7}	16.67	35.7%	38.4%	43.9%	47.5%
Between III and IV	F_{b8}	3.08	9.7%	10.3%	11.2%	12.6%
	F_{b9}	3.33	31.0%	32.3%	35.0%	38.1%

	F_{b10}	4.23	12.0%	13.5%	15.8%	18.4%
Between II and IV	F_{b11}	6.15	38.5%	49.2%	55.6%	59.5%
	F_{b12}	3.72	29.5%	46.9%	55.1%	59.7%
	F_{b13}	8.21	11.1%	27.7%	31.5%	35.1%
	F_{b14}	5.77	37.9%	42.9%	49.1%	52.8%
	Southwestern II	F_{b15}	4.87	17.4%	18.0%	19.6%
Between IV and V	F_{b16}	3.85	8.0%	8.6%	9.3%	10.0%
	F_{b17}	2.69	17.0%	17.9%	19.1%	21.1%
	F_{b18}	9.10	11.3%	12.5%	15.1%	18.0%
	F_{b19}	3.85	37.6%	40.4%	43.4%	46.2%
	F_{b20}	3.08	21.7%	22.6%	24.4%	26.9%

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Table S4. The net monthly injection volume used for estimating the maximum magnitude of injection-related earthquakes in the MTY EGS field.

Fluid injected rate, L/s	Monthly injection volume, m ³	Fluid loss	The net injected volume, m ³
1	2.59×10 ³		2.59×10 ²
10	2.59×10 ⁴		2.59×10 ³
20	5.18×10 ⁴		5.18×10 ³
30	7.78×10 ⁴		7.78×10 ³
40	1.04×10 ⁵		1.04×10 ⁴
50	1.30×10 ⁵	10%	1.30×10 ⁴
60	1.56×10 ⁵		1.56×10 ⁴
70	1.81×10 ⁵		1.81×10 ⁴
80	2.07×10 ⁵		2.07×10 ⁴
90	2.33×10 ⁵		2.33×10 ⁴
100	2.59×10 ⁵		2.59×10 ⁴

110	2.85×10^5		2.85×10^4
120	3.11×10^5		3.11×10^4
1	2.59×10^3		5.18×10^2
10	2.59×10^4		5.18×10^3
20	5.18×10^4		1.036×10^4
30	7.78×10^4		1.556×10^4
40	1.04×10^5		2.08×10^4
50	1.30×10^5		2.60×10^4
60	1.56×10^5	20%	3.12×10^4
70	1.81×10^5		3.62×10^4
80	2.07×10^5		4.14×10^4
90	2.33×10^5		4.66×10^4
100	2.59×10^5		5.18×10^4
110	2.85×10^5		5.70×10^4
120	3.11×10^5		6.22×10^4
1	2.59×10^3		7.77×10^2
10	2.59×10^4		7.77×10^3
20	5.18×10^4		1.554×10^4
30	7.78×10^4		2.334×10^4
40	1.04×10^5		3.12×10^4
50	1.30×10^5	30%	3.90×10^4
60	1.56×10^5		4.68×10^4
70	1.81×10^5		5.43×10^4
80	2.07×10^5		6.21×10^4
90	2.33×10^5		6.99×10^4
100	2.59×10^5		7.77×10^4

110	2.85×10^5		8.55×10^4
120	3.11×10^5		9.33×10^4
1	2.59×10^3		1.036×10^3
10	2.59×10^4		1.036×10^4
20	5.18×10^4		2.072×10^4
30	7.78×10^4		3.112×10^4
40	1.04×10^5		4.16×10^4
50	1.30×10^5		5.20×10^4
60	1.56×10^5	40%	6.24×10^4
70	1.81×10^5		7.24×10^4
80	2.07×10^5		8.28×10^4
90	2.33×10^5		9.32×10^4
100	2.59×10^5		1.036×10^5
110	2.85×10^5		1.140×10^5
120	3.11×10^5		1.244×10^5

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