## Supplementary data

Table S1 TOC values in Figure 14 and data sources.

| Well ZK43-6 | Data Source：Ma et al., 2019 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrected depth (m) | 151.7 | 152.4 | 153.1 | 153.8 | 154.5 | 155.2 | 155.9 | 156.6 | 157.3 | 158 | 158.7 | 159.4 |
| TOC (wt%) | 3.21 | 3.61 | 3.54 | 2.36 | 2.89 | 7.62 | 3.11 | 9.72 | 1.86 | 1.7 | 2.19 | 4.35 |

| Well ZK0408 | Data Source：Ai et al., 2020a, b; Ai et al., 2021 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrected depth (m) | 138.8 | 147.1 | 149.2 | 150 | 150.8 | 152.9 | 153.6 | 154.4 | 154.9 | 154.9 | 155.4 | 155.6 | 157.7 | 157.9 | 158.3 | 159.1 | 159.6 | 160.6 | 161 | 161.4 |
| TOC (wt%) | 0.56 | 2.1 | 1.9 | 1.8 | 2.1 | 2.3 | 2.6 | 2.9 | 2.7 | 2.69 | 2.7 | 2.94 | 2.8 | 3.1 | 3.4 | 2.7 | 2.8 | 3.9 | 3.9 | 4.5 |
| Corrected depth (m) | 161.7 | 161.8 | 162.3 | 162.7 | 163 | 163.5 | 163.6 | 164.2 | 164.8 | 165.3 | 165.6 | 166 | 166.5 | 166.8 | 167.8 | | | | | |
| TOC (wt%) | 4.4 | 4.38 | 3.5 | 4.3 | 1.5 | 3.3 | 4 | 1.9 | 1.6 | 1.37 | 1.4 | 0.55 | 2.1 | 0.83 | 2.2 | | | | | |

| Well ZK105 | Data Source：Zhang et al., 2015 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrected depth (m) | 125.3 | 135.3 | 151.3 | 160.3 | 168.3 | 176.3 | 178.3 | 182.3 | 184.3 | 192.3 | 193.3 | 199.3 | 203.3 | 206.3 | 209.3 | 211.3 | 214.3 | 218.3 | 219.3 | 220.3 | 222.3 | 225.3 |
| TOC (wt%) | 0.2 | 0.49 | 0.18 | 0.22 | 0.02 | 0.14 | 0.37 | 0.32 | 1.34 | 3.31 | 3.9 | 1.76 | 2.84 | 3.21 | 4.59 | 2.72 | 1.87 | 6.35 | 2.73 | 1.45 | 3.3 | 2.48 |

| Daotuo Section | Data Source：Wei et al., 2020 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrected depth (m) | 13.84 | 16.4 | 22.19 | 30.14 | 37.12 | 46.85 | 60.65 | 68.34 | 77.66 | 88.69 | 98.42 | 106.9 | 115.4 | 123.7 | 130.4 | 140.5 | 149.7 | 159.5 | 166.9 | 174.4 |
| TOC (wt%) | 0.23 | 0.21 | 0.23 | 0.17 | 0.12 | 0.22 | 0.11 | 0.11 | 0.17 | 0.13 | 0.4 | 0.12 | 0.12 | 0.1 | 0.09 | 0.09 | 0.09 | 0.17 | 0.18 | 0.42 |
| Corrected depth (m) | 183.3 | 191 | 199.5 | 206.5 | 212.3 | 218.2 | 225 | 229.7 | 234.7 | 238 | 242.5 | 244.4 | 246.3 | 247.9 | 250.1 | 251.8 | 253.5 | 254.4 | 256.1 | 256.8 |
| TOC (wt%) | 0.24 | 0.18 | 0.17 | 0.17 | 0.13 | 0.49 | 0.86 | 0.46 | 0.8 | 2 | 1.19 | 2.87 | 3.73 | 4.26 | 3.86 | 2.44 | 2.59 | 2.76 | 2.61 | 3.03 |
| Corrected depth (m) | 257.8 | 258.7 | 260 | 261.1 | 262 | 262.7 | 264 | 264.4 | 268.7 | 272.6 | 275.5 | 281.6 | 285 | | | | | | | |
| TOC (wt%) | 2.92 | 2.78 | 3.29 | 3.15 | 1.5 | 2.18 | 2 | 0.62 | 1.76 | 2.29 | 0.28 | 0.63 | 0.12 | | | | | | | |

| Well ZK4207 | Data Source：Yu et al., 2016 | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrected depth (m) | 354.1 | 357.6 | 359.9 | 362 | 364.2 | 365.7 | 366.6 | 367 | 367.5 | 367.9 | 368.3 | 368.8 | 369.3 | 369.7 | 370.2 | 370.5 | 371 | 371.4 | 371.9 |
| TOC (wt%) | 2.7 | 2.9 | 2.41 | 2.38 | 3.49 | 3.44 | 2.27 | 1.91 | 2.26 | 2.53 | 2.02 | 2.72 | 2.33 | 2.17 | 1.44 | 1.66 | 1.63 | 2.22 | 2.61 |
| Corrected depth (m) | 372.7 | 373.3 | 373.9 | 374.5 | 374.9 | 375.4 | 375.7 | 376.1 | 376.6 | 377.2 | 377.8 | 378.1 | 378.6 | 379.2 | 379.5 | 380 | | | |
| TOC (wt%) | 2.19 | 1.67 | 1.74 | 1.51 | 1.64 | 1.47 | 2.29 | 2.06 | 1.98 | 1.95 | 1.98 | 2.21 | 3.46 | 1.61 | 2.78 | 1.75 | | | |

Table S2 Statistics of source rock conditions of the Datangpo, Doushantuo, Dengying, and Qiongzhusi formations, including thickness, TOC and equivalent vitrinite reflectance, etc.

| System | Formation | Location | Sample source | Strata thickness (m) | Source rock thickness (m) | TOC range (wt%) (sample numbers) | Average TOC (wt%) | Requ (%) (sample numbers) | Conversion equation or method | Data sources |
|---|---|---|---|---|---|---|---|---|---|---|
| Cambrian | Qiongzhusi Fm. | Sichuan Basin | Core samples, drilling cuttings and field outcrops | 60-500 | 60-300 | 0.09 - 6.12 (176) | 1.94 | 1.83 - 3.90 | Liu et al., 2009 | Zou et al., 2014 |
| Ediacaran | Dengying Fm. | Sichuan Basin | Core samples, drilling cuttings and field outcrops | 0-30 | 0-30 | 0.08 - 7.4 (31) | 1.43 | 3.16-3.21 | Liu et al., 2009 | Zou et al., 2014 |
| | Doushantuo Fm. | Sichuan Basin | Core samples, drilling cuttings and field outcrops | 0-40 | 0-40 | 0.11-4.64 (50) | 1.69 | 2.08-3.82 | Liu et al., 2009 | Zou et al., 2014 |
| Cryogenian | Datangpo Fm. | Songtao, Guizhou Province | Core samples （Well ZK105） | 230 | 51.3 | 0.18-6.35(22) | 2.3 | × | × | Zhang et al., 2015 |
| | | | Field outcrops （Datangpo） | × | × | 2-6.88 (33) | 4.02 | × | × | Tan et al., 2021 |
| | | | Field outcrops | 180 | 30 | 3.1-6.3(13) | 4.3 | 2.19-2.47(3) | Requ= 0.3364 + 0.6569 Rb; Feng and Chen, 1988 | Xie et al., 2017 |
| | | | Core samples （Well ZK4207 ） | 370 | 40 | 0.22-3.49(36) | 2.16 | × | × | Yu et al., 2016 |
| | | | Field outcrops (Yanglizhang) | × | 17 | 0.05-5.04(45) | 1.51 | 2.0-2.5 | Buchardt and Lewan, 1990 | Zhu et al., 2019 |
| | | Daotuo Section, Guizhou Province | Core samples （Well ZK105） | 230 | 51.3 | 0.18-6.35(22) | 2.3 | × | × | Zhang et al., 2015 |
| | | | Core samples (Well ZK2303) | × | 23.7 | 2.95-3.97 (5) | × | × | × | Hohl et al., 2020 |
| | | | Core samples （Well ZK2303） | × | 23.7 | 1.2-4.3(17) | 3 | × | × | Wei et al., 2016 |
| | | | Daotuo Section | 275 | 41 | 0.1-4.26(53) | 1.17 | × | × | Wei et al., 2020 |
| | | | Core samples （Well ZK2115） | × | 66.01 | × | × | × | × | Wang et al., 2020 |
| | | Xiangtan, Hunan Province | Core samples (Well ZK3603) | × | 89 | 0.42-4.8 (46) | 3.32 | × | × | Peng et al., 2019 |
| | | Minle Section,Hunan Province | Field outcrops | 220 | 33 | 1.6-4.77(21) | 2.68 | × | × | Cheng et al., 2018 |
| | | | Field outcrops | × | × | 1.9-4.7（13） | 2.56 | × | × | Li et al., 2012 |
| | | Xiaochayuan Section, Xiushan, Chongqing | Core samples (Well ZK43-6) | 150 | 27 | 1.7-9.72(12) | 3.85 | × | × | Ma et al., 2019 |
| | | | Field outcrops | 105 | 30 | 3.47-8.5(6) | 4.7 | 2.37(1) | Requ= 0.3364 + 0.6569 Rb; Feng and Chen, 1988 | Xie et al., 2017 |
| | | | Field outcrops | × | × | 0.16-3.69(18) | 1.7 | 1.54-3.23(3) | Requ=(Rb+0.2443)/1.0495; Scholoenherr et al., 2007 | Qu et al., 2020 |
| | | | Field outcrops | × | 30 | 0.02-3.46(36) | 0.99 | 2.0-2.5 | Buchardt and Lewan, 1990 | Zhu et al., 2019 |
| | | | Core samples (Well ZK0408) | 158.7 | 21.4 | 0.55-4.5(35) | × | 2.52 (1) | Requ= (0.618 × Rb) + 0.40; Jacob, 1989 | Ai et al., 2020a,b; Ai et al 2021 |
| | | Xiaoxi Section, Chongqing | Field outcrops | × | 12 | 0.05-3.69(26) | 1.61 | 2.0-2.5 | Buchardt and Lewan, 1990 | Zhu et al., 2019 |
| | | | Field outcrops | × | 16 | 1.6-3.69 (23) | × | 2.2-2.8 | Buchardt and Lewan, 1990 | Zhu et al., 2020 |
| | | Sanlian Section, Chongqing | Field outcrops | × | 24 | 0.08-3.64(31) | 1.57 | 2.0-2.5 | Buchardt and Lewan, 1990 | Zhu et al., 2019 |
| | | Qianzimen Section, Xiushan, Chongqing | Field outcrops | × | 10 | 0.4-4.47(9) | 2.2 | 2.2(1) | Requ= 0.3364 + 0.6569 Rb; Feng and Chen, 1988 | Xie et al., 2017 |
| | | Gaodongyuan Section, Chongqing | Field outcrops | × | 12 | 0.8-3.22(22) | 1.91 | 2.0-2.5 | Buchardt and Lewan, 1990 | Zhu et al., 2019 |
| | | Yangjiaping Section,Hunan Province | Field outcrops | × | × | 0.1-3.8(7) | × | × | × | Li et al., 2012 |
| | | Shennongjia Section, Hubei Province and Xiushan Section, Chongqing | Field outcrops | >100 | >50 | 0.16-3.69 (18 ) | 1.7 | 1.54-3.23 | Requ=(Rb+0.2443)/1.0495; Scholoenherr et al., 2007 | Li, 2019 |
| | | Gucheng Section, Changyang, Hubei Province | Field outcrops | × | × | 0.14-4.58(21) | 2.32 | 2.0-2.5 | Buchardt and Lewan, 1990 | Zhu et al., 2019 |

TOC means total organic carbon; Requ means equivalent vitrinite reflectance; Rb means bitumen reflectance; Fm. means Formation.

## Supplementary Table Reference


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