| **Modeling Scenarios** | | | Trap fill | Impact on charge/fill (compared to other scenarios) |
|---|---|---|---|---|
| **Faults open** | | Faults open 100-60-40 Ma | | |
| **S1 (BASE CASE)** | **Thermal base case** | Constant 33 mW/m² (Fig. 7a) | moderate | |
| **S2** | **Ridge thermal case 1** | Ridge heat peak 120 mW/m² (Fig. 7a) | moderate | S2 ⇔ S1: Insignificant |
| **S3** | **Ridge thermal case 2** | Ridge heat peak 160 mW/m² (Fig. 7a) | moderate | S3 ⇔ S1: Insignificantly positive |
| **S4** | **Hotspot thermal case 1** | Hotspot heat peak 80 mW/m² (Fig. 7a) | moderate to high | S4 ⇔ S1: Strong Positive (but more gas) |
| **S5** | **Hotspot thermal case 2** | Hotspot heat peak 100 mW/m² (Fig.7a) | high | S5 ⇔ S1: Strong positive (but more gas) |
| **Faults open (cont.)** | | Faults open 100 - 0 Ma | | |
| **S6** | **Thermal base case** | Constant 33 mW/m² (Fig. 7a) | moderate | S6 ⇔ S1: Little positive (continued charge) |
| **S7** | **Ridge thermal case 1** | Ridge heat peak 120 mW/m² (Fig. 7a) | moderate | S7 ⇔ S2: Little positive (continued charge) |
| **S8** | **Ridge thermal case 2** | Ridge heat peak 160 mW/m² (Fig. 7a) | moderate | S8 ⇔ S3: Little positive (continued charge) |
| **S9** | **Hotspot thermal case 1** | Hotspot heat peak 80 mW/m² (Fig. 7a) | moderate to high | S9 ⇔ S4: Negative (enhanced leakage) |
| **S10** | **Hotspot thermal case 2** | Hotspot heat peak 100 mW/m² (Fig. 7a) | moderate to high | S10 ⇔ S5: Strong negative (enhanced leakage) |
| **Faults closed** | | Faults closed 100-60-40 Ma | | |
| **S11** | **Thermal base case** | Constant 33 mW/m² (Fig. 7a) | none | S11 ⇔ S1: Strongly negative (no expulsion) |
| **S12** | **Ridge thermal case 1** | Ridge heat peak 120 mW/m² (Fig. 7a) | low to moderate (lower accumulations) | S12 ⇔ S2: Negative (isolated expulsion only) |
| **S13** | **Ridge thermal case 2** | Ridge heat peak 160 mW/m² (Fig. 7a) | low to moderate (lower accumulations) | S13 ⇔ S3: Negative (isolated expulsion only) |
| **S14** | **Hotspot thermal case 1** | Hotspot heat peak 80 mW/m² (Fig. 7a) | low to moderate (lower accumulations) | S14 ⇔ S4: Negative (isolated expulsion only) |
| **S15** | **Hotspot thermal case 2** | Hotspot heat peak 100 mW/m² (Fig. 7a) | high | S15 ⇔ S5: Possibly positive (less leakage) |
| **S16** | **Thermal base case** | Constant 33 mW/m² (Fig. 7a) | none | S16 ⇔ S1: Strongly negative (no expulsion)<br>S16 ⇔ S11: Insignificant |
| | **Toarcian TOC increase** | Factor 3 | | |
| **S17** | **Thermal base case** | Constant 33 mW/m² (Fig. 7a) | none to possibly low | S17 ⇔ S1: Strongly negative (no expulsion)<br>S17 ⇔ S11: Insignificantly positive |
| | **Toarcian kinetic lower activation energy** | - 3 kcal/mol | | |
| **S18** | **Thermal base case** | Constant 33 mW/m² (Fig. 7a) | none | S18 ⇔ S1: Strongly negative (no expulsion)<br>S18 ⇔ S11: Insignificant |
| | **Toarcian kinetic gas enrichment** | Factor 3 | | |

*Table 2: Modeling scenarios overview.*