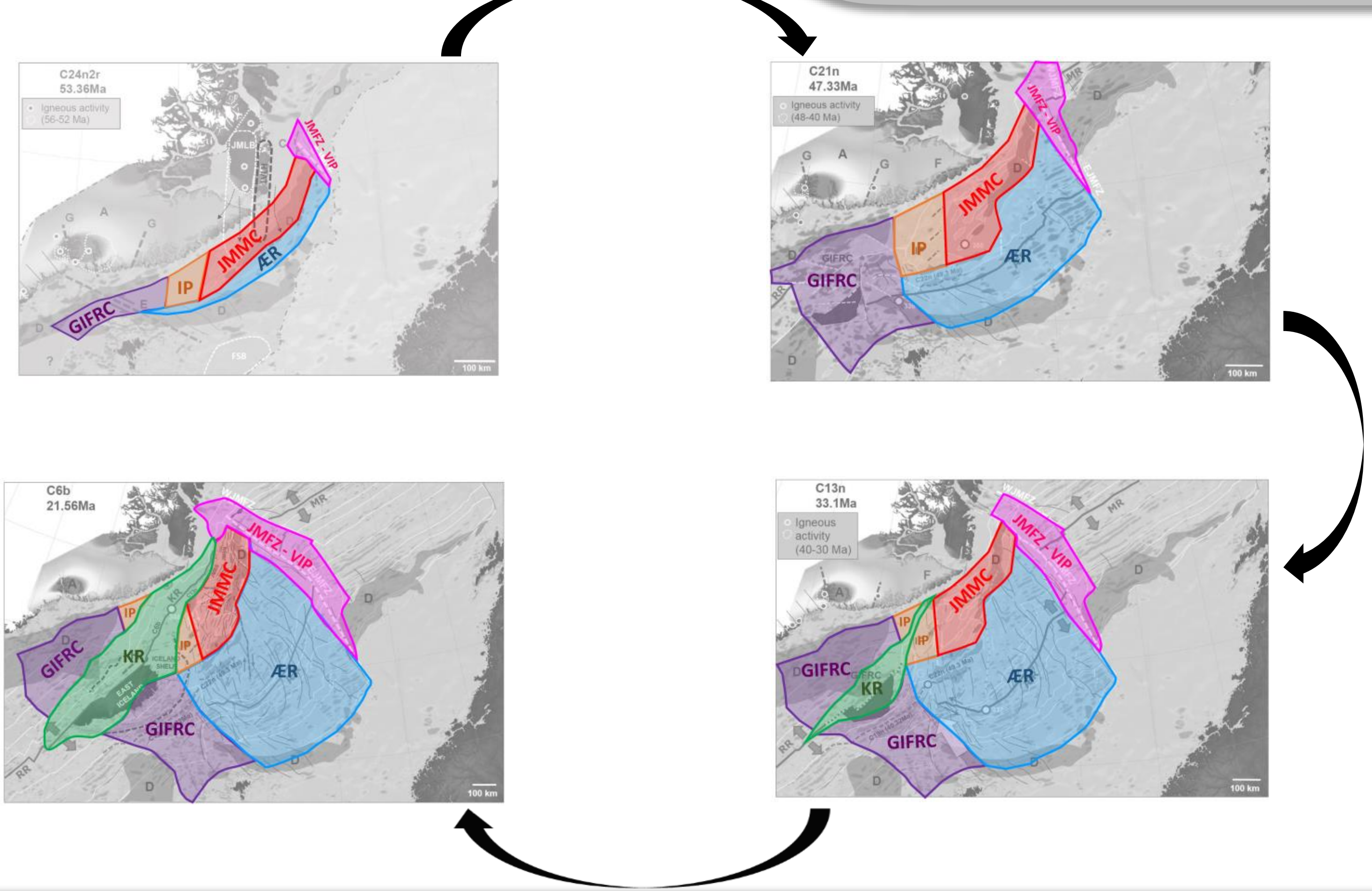
Heat Flow, Uplift and Maturity model of the JMMC

Project review meeting

Reykjavik

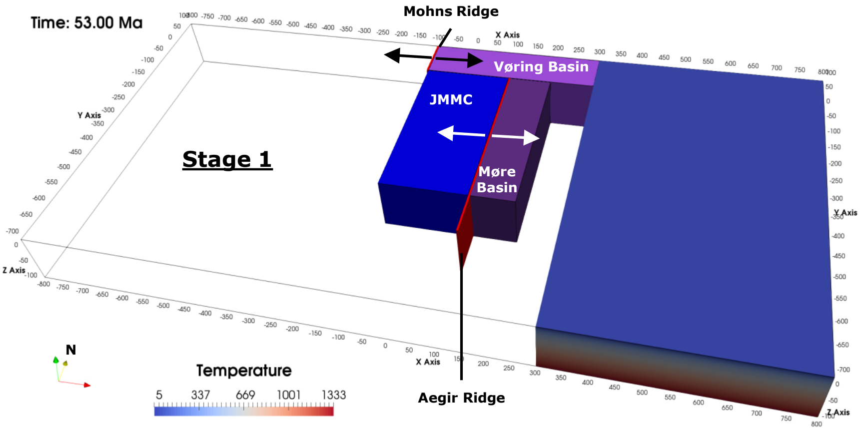
karthik.iyer@geomodsol.com

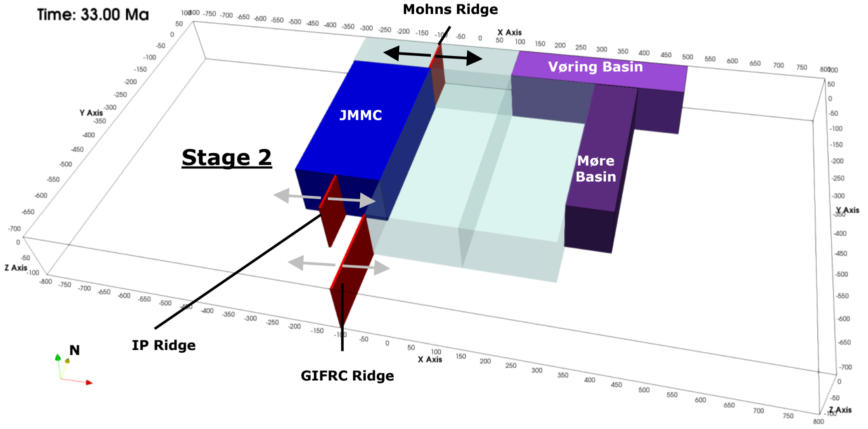
Evolution of the JMMC and nearby regions

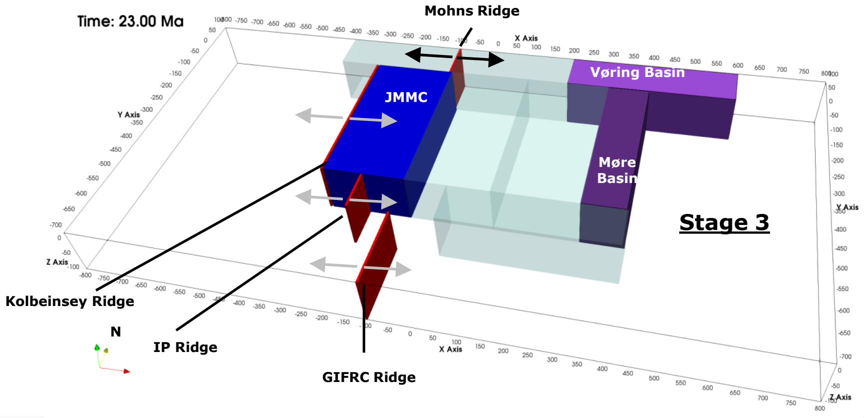


3D JMMC Models

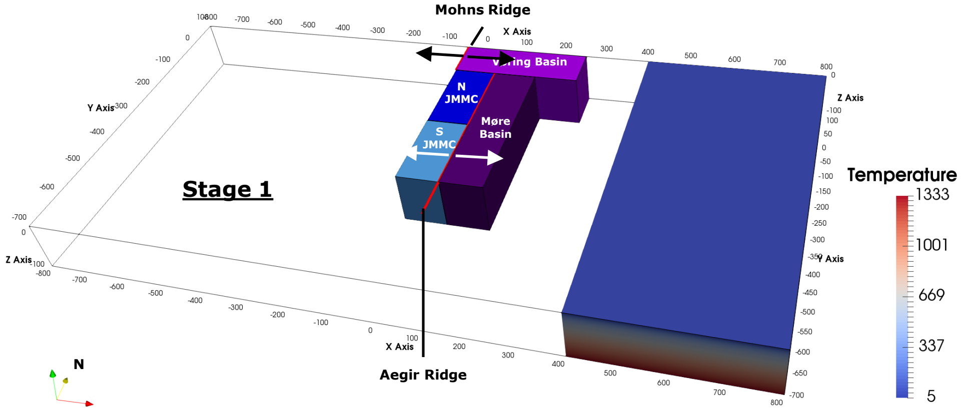
Run 1: Simplified Geometry

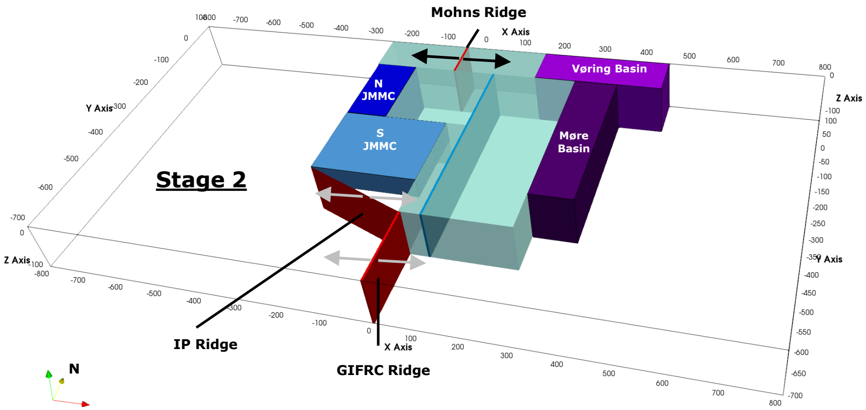


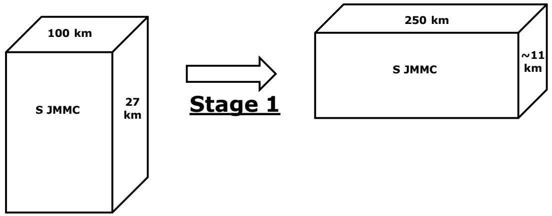


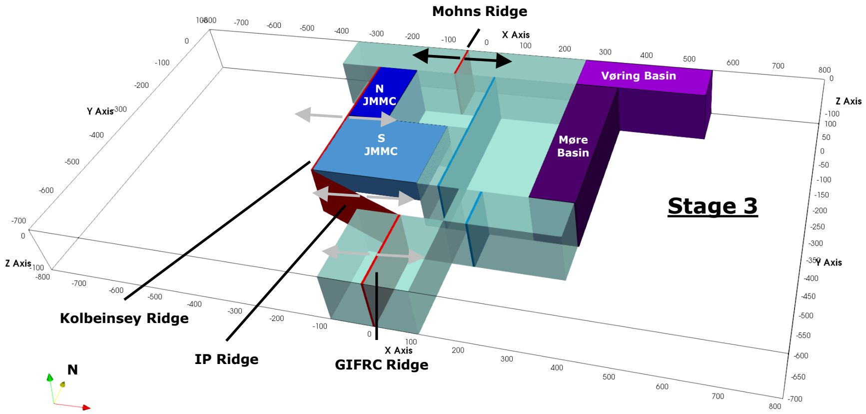


Run 2: Complex Geometry 1

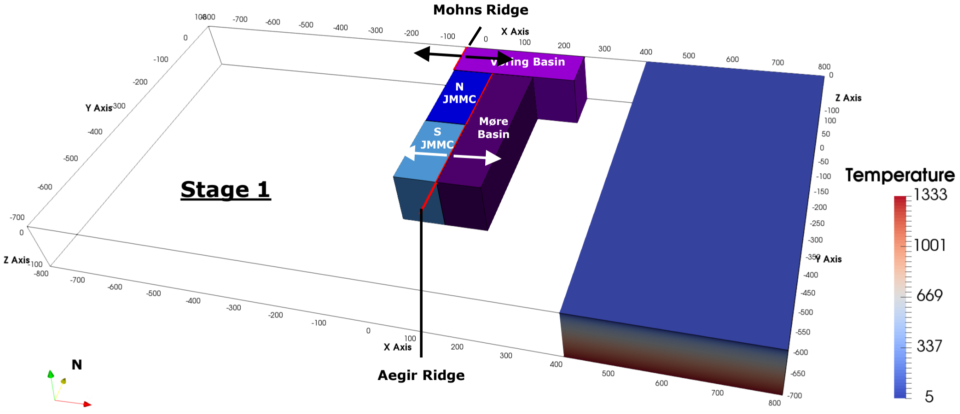


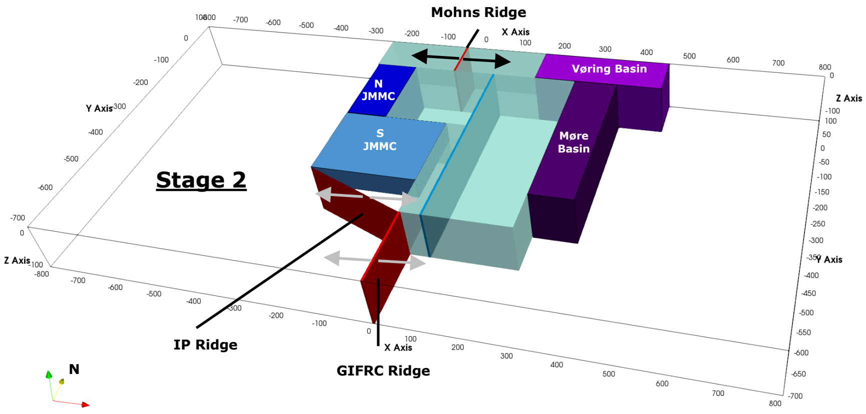


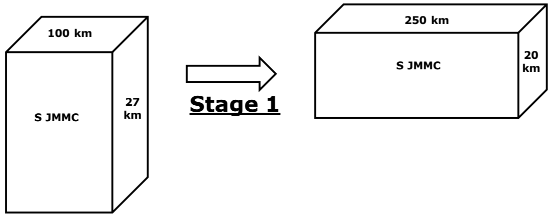


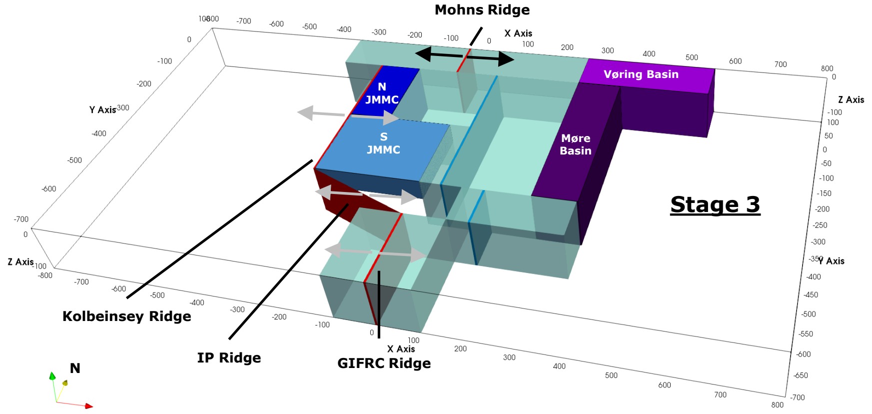


Run 3: Complex Geometry 2

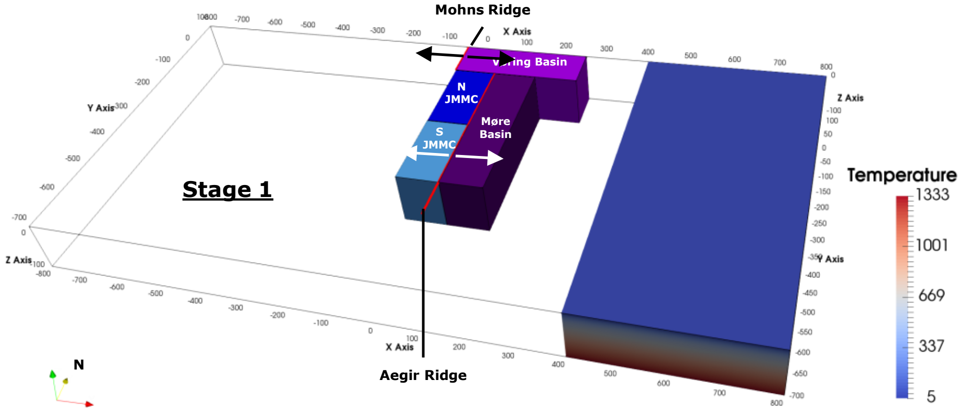


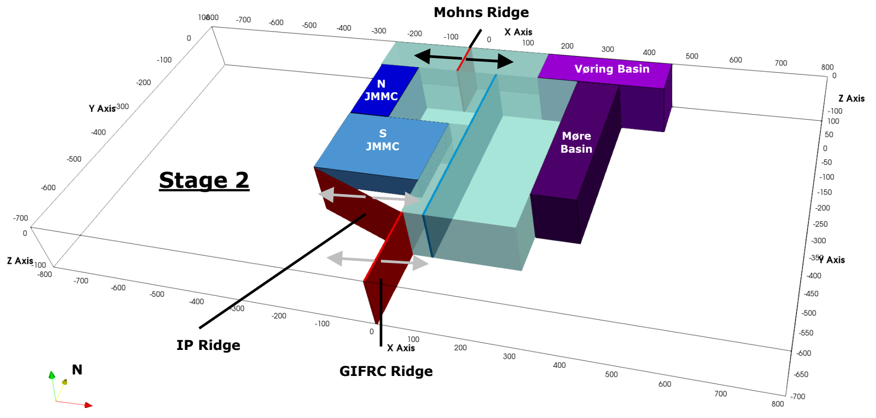


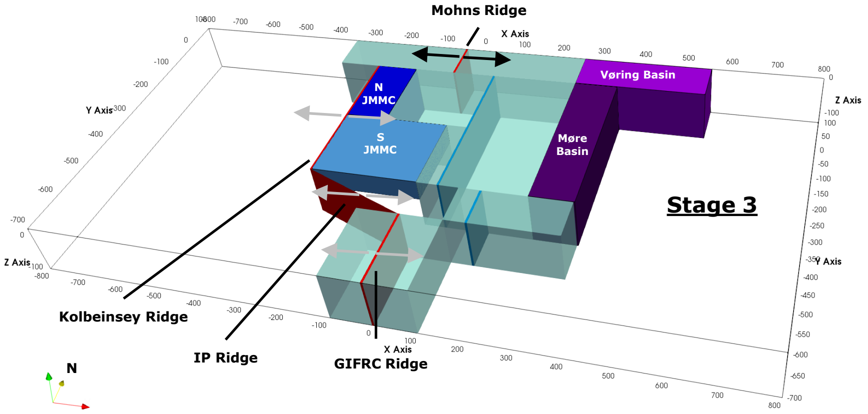


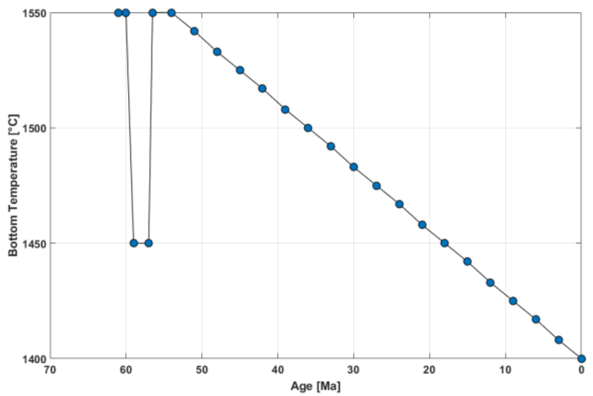


Run 4: Complex Geometry 1 + T BC





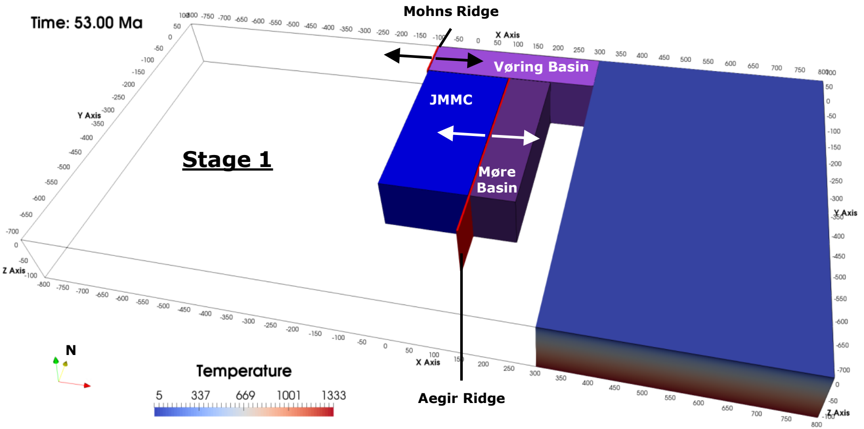


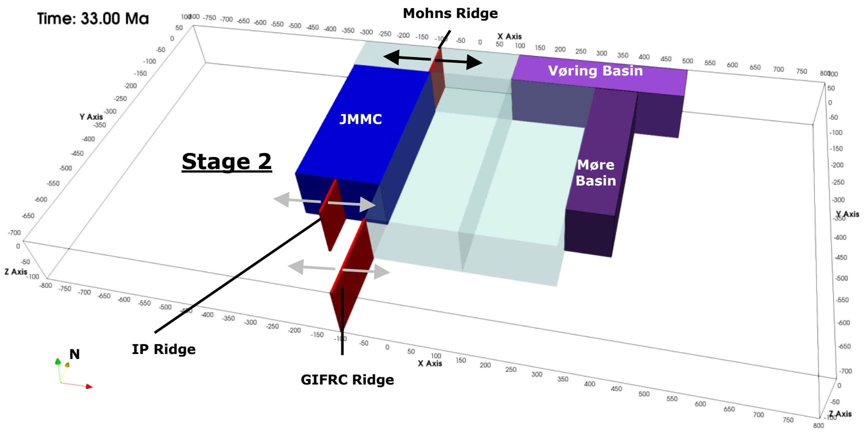


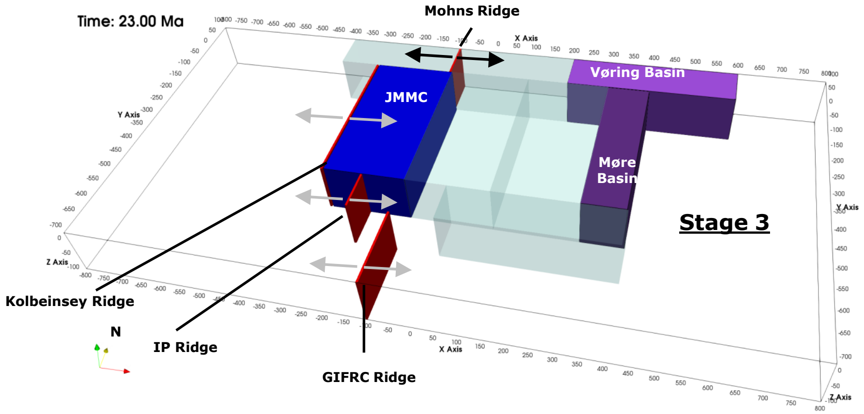
3D JMMC Model

Run 1

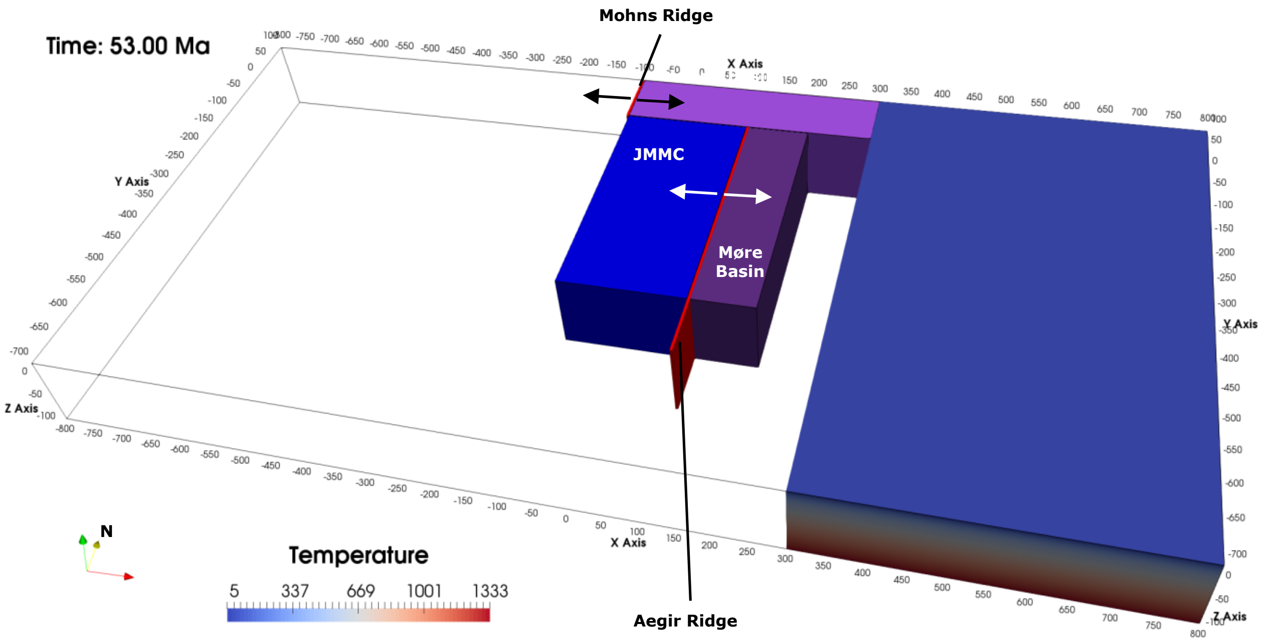
Run 1: Setup


Time: 53.00 Ma
Mohns Ridge
Vøring Basin
JMMC
Møre Basin
Stage 1
Aegir Ridge
N
Temperature
5 337 669 1001 1333


Time: 33.00 Ma
Mohns Ridge
Vøring Basin
JMMC
Møre Basin
Stage 2
IP Ridge
GIFRC Ridge
N

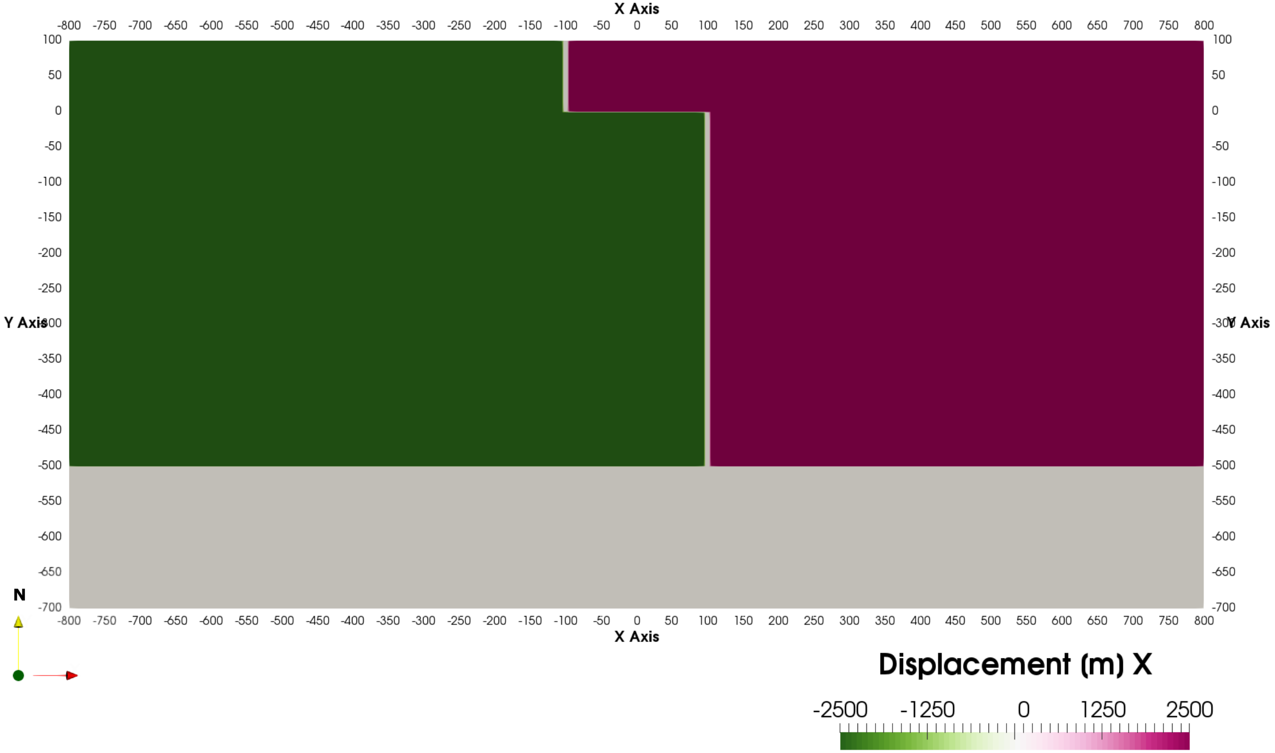

Time: 23.00 Ma
Mohns Ridge
Vøring Basin
JMMC
Møre Basin
Stage 3
Kolbeinsey Ridge
IP Ridge
GIFRC Ridge
N

Stage 1 - Initial Configuration (53.25 Ma)

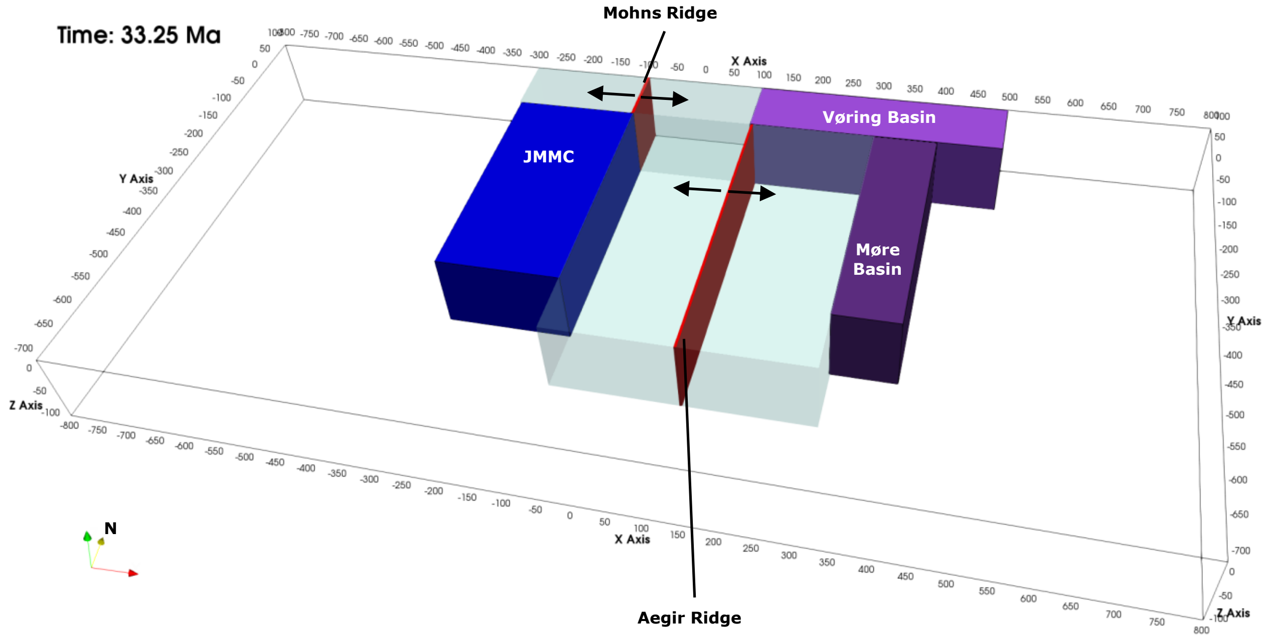


- Initialized to continental lithosphere everywhere and steady-state temperature. Top surface set to 5°C and bottom boundary to 1333°C. Ridges are emplaced at 1333°C and are 5 km wide.
- The width of the JMMC is 200 km. The sediment cover is 6 km deep and the Moho is at a depth of 27 km.
- The Mohns and Aegir Ridges spread symmetrically at 1 cm/yr (half-spreading rate). Time step during this stage is 0.25 Myr.

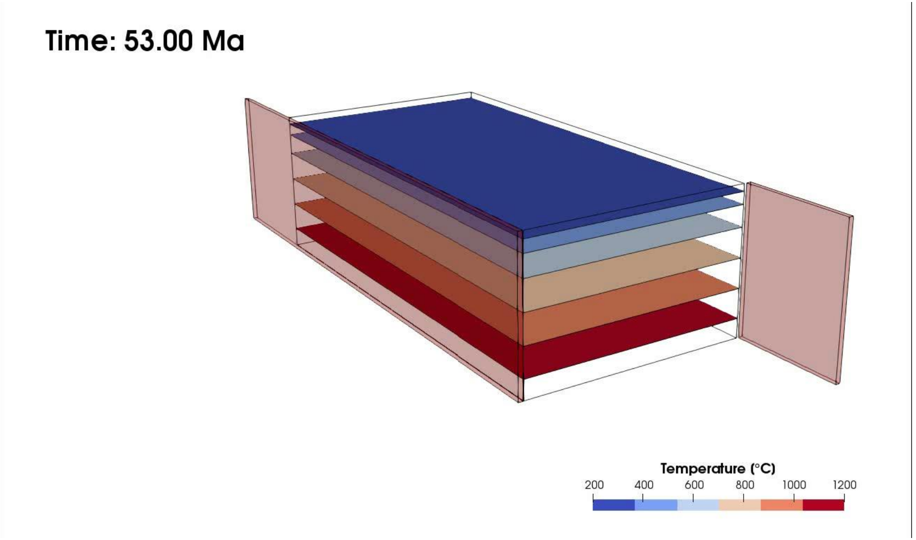
Stage 1 – Total Displacement (X) / Time Step

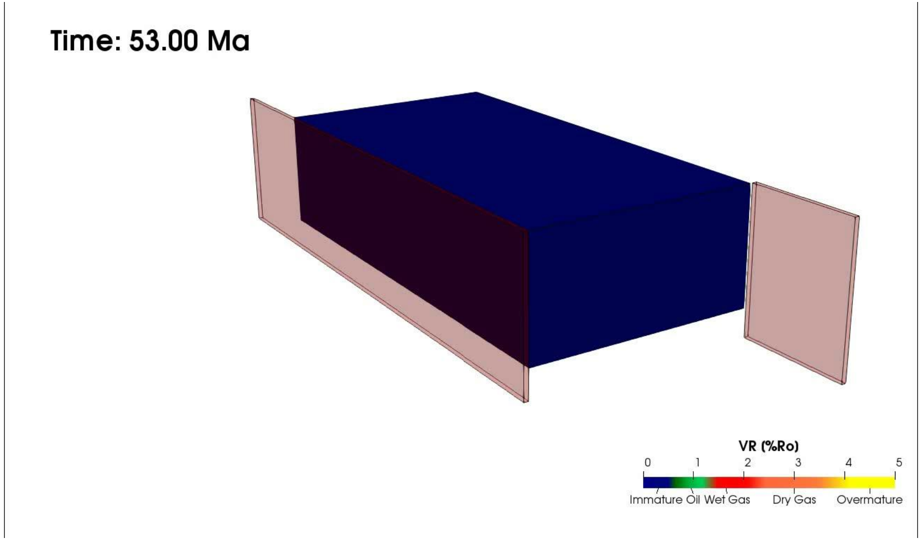


Stage 1– End Configuration (33.25 Ma)



Stage 1 – JMMC Temperature & Maturity

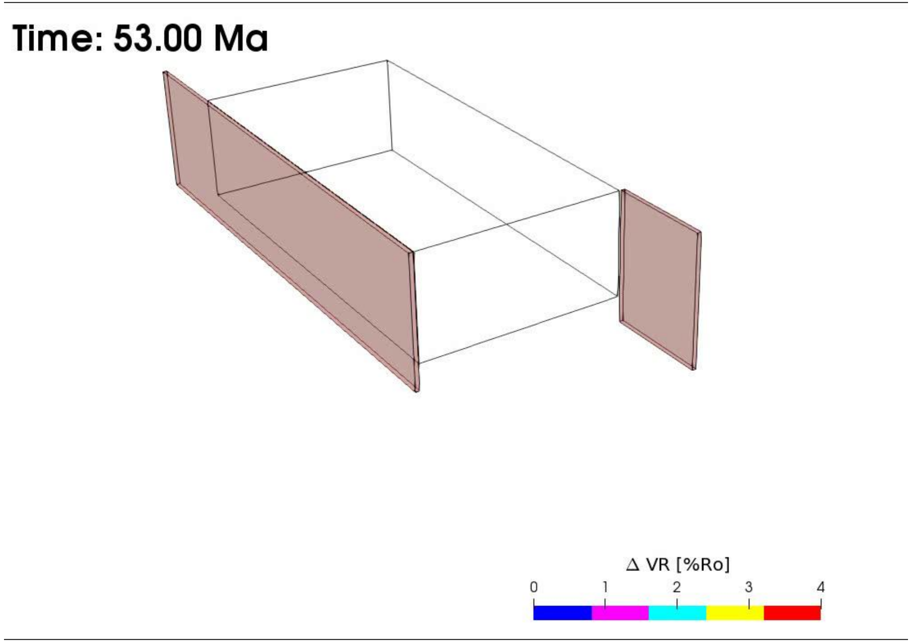


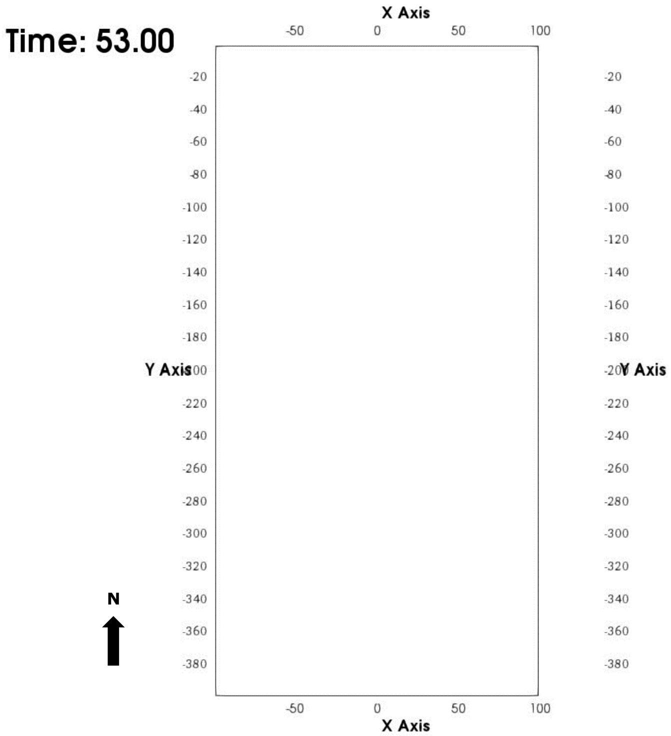


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The JMMC receives heat from the Aegir Ridge at its eastern edge. The influence of the Aegir Ridge on the JMMC decrease as the JMMC moves away and is abutted by increasingly colder and older oceanic lithosphere.
- The JMMC also receives heat via its northern edge as it passes the Mohns Ridge.
- Maturity increases significantly and quickly to the maximum at the edges of the JMMC that are in contact with the hot ridge. Maturity of sediments inwards from the edges increases gradually as the thermal effects of the ridges propagates into the microcontinent.

Stage 1 – JMMC Differential Maturity

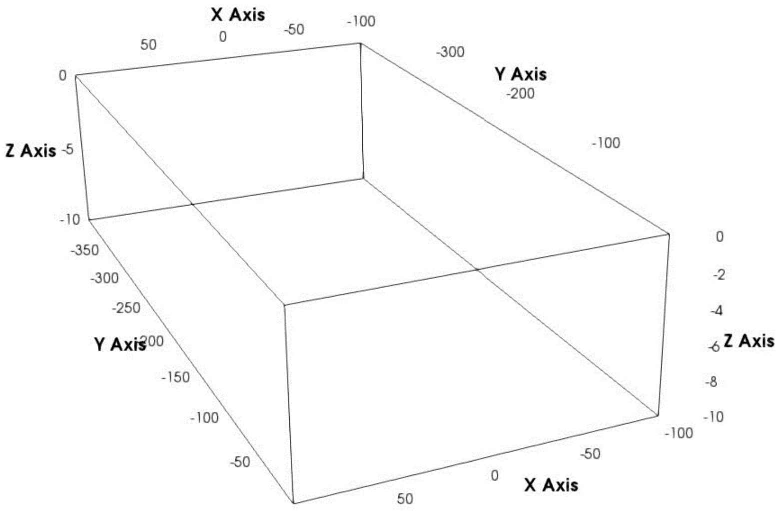




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values in the JMMC is observed ~56 km inwards from, both, the eastern edge (Aegir Ridge influence) and the northern edge (Mohns Ridge influence).

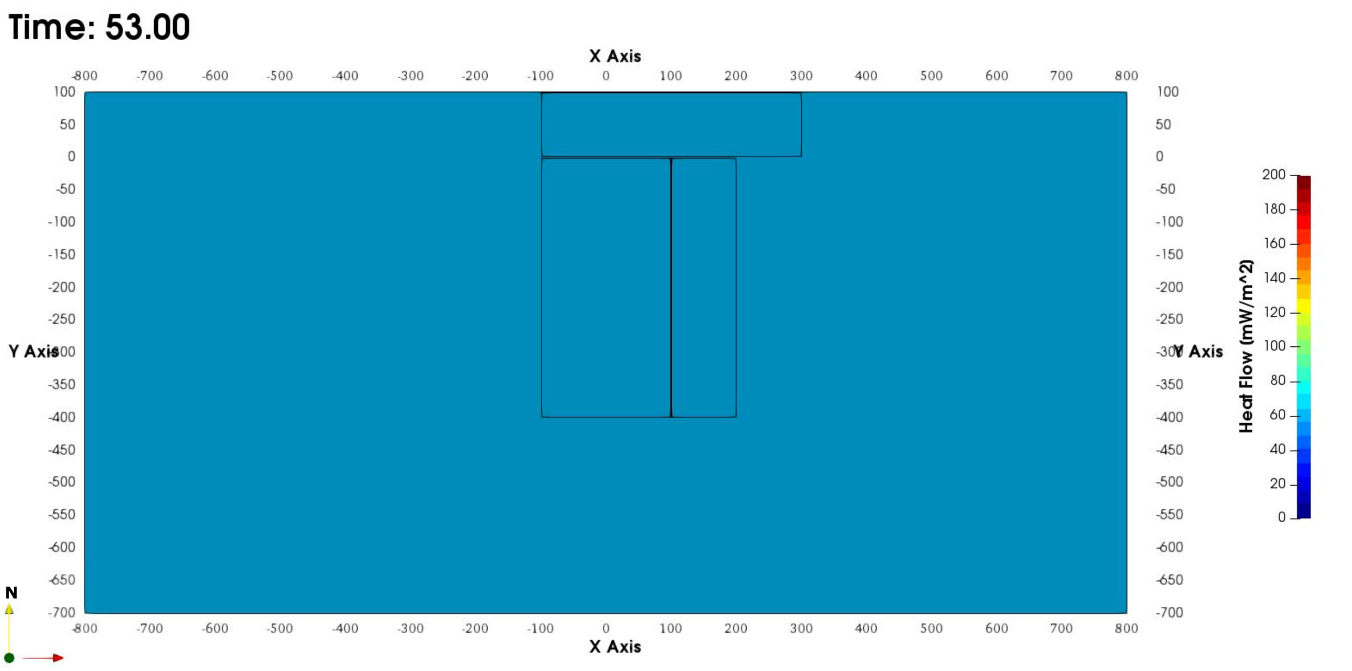
Stage 1 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

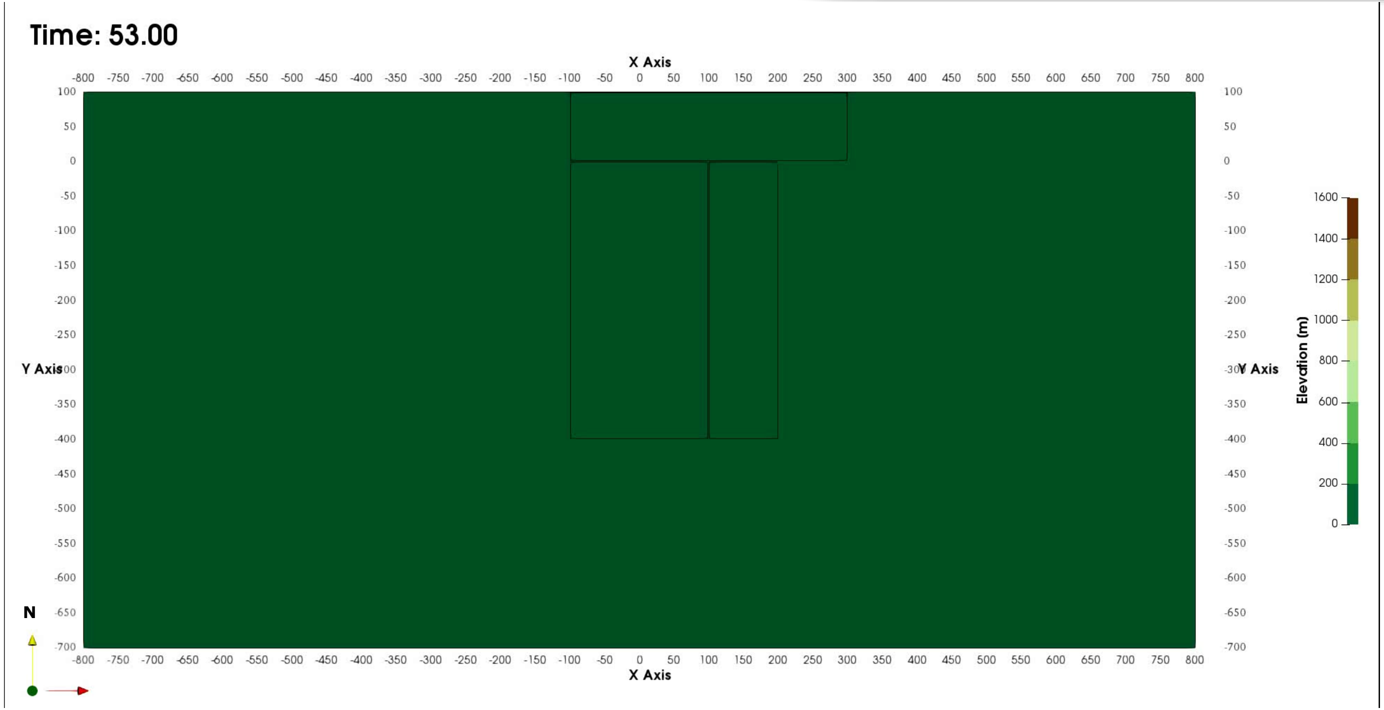
- The initial oil and gas window tops (background values) are at ~3 and 5.5 km, respectively.
- These windows are very shallow close to edges in contact with ridges and are raised up within the microcontinent as heat is progressively transferred into the JMMC during this stage.

Stage 1 – Heat Flow



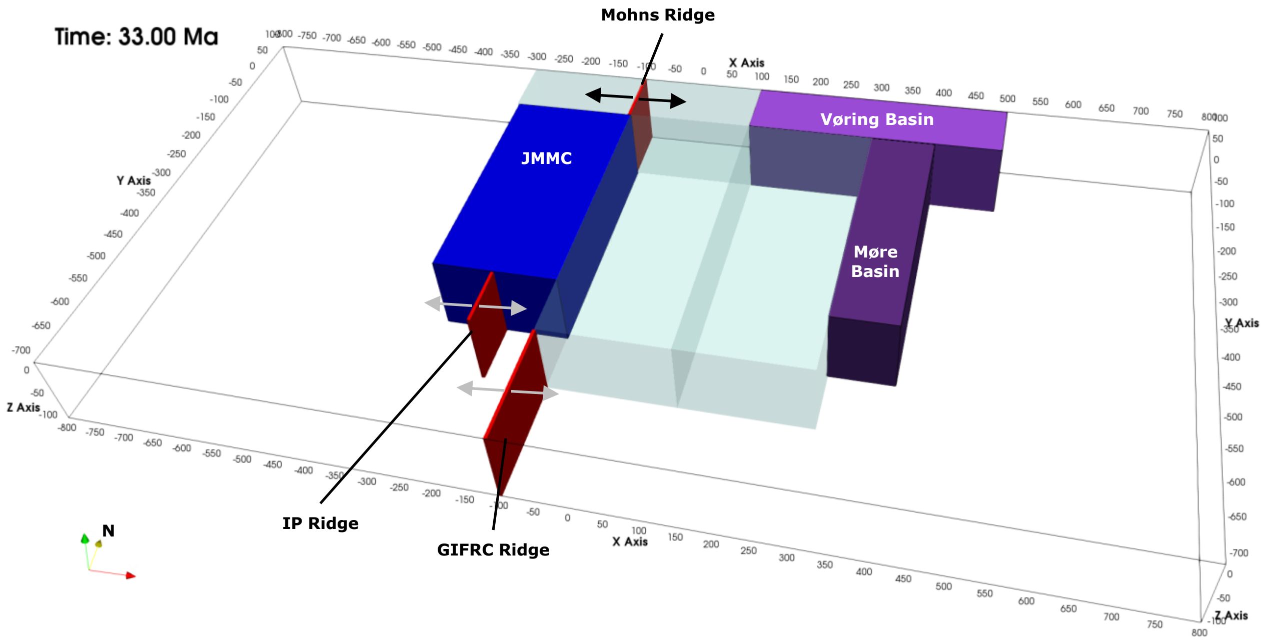
- Maximum heat flow values (~200 mW/m^2) occur within the continent close to the contact with the ridge where it is the hottest and spreads out away from there. Heat flow values decrease as the continent moves away from the spreading centers.
- An asymmetry develops in the regions with increased heat flow as they move away from the ridges during ocean spreading.
- An increase in heat flow (~65 mW/m^2) relative to the background value (59 mW/m^2) is measured ~40 and 30 km into the JMMC from the northern and eastern edges, respectively, at the end of Stage 1. Highest values are present near the Mohns Ridge at the northeastern corner.
- Contour values are between 50 and 200 mW/m^2 in steps of 25 mW/m^2.

Stage 1 - Uplift



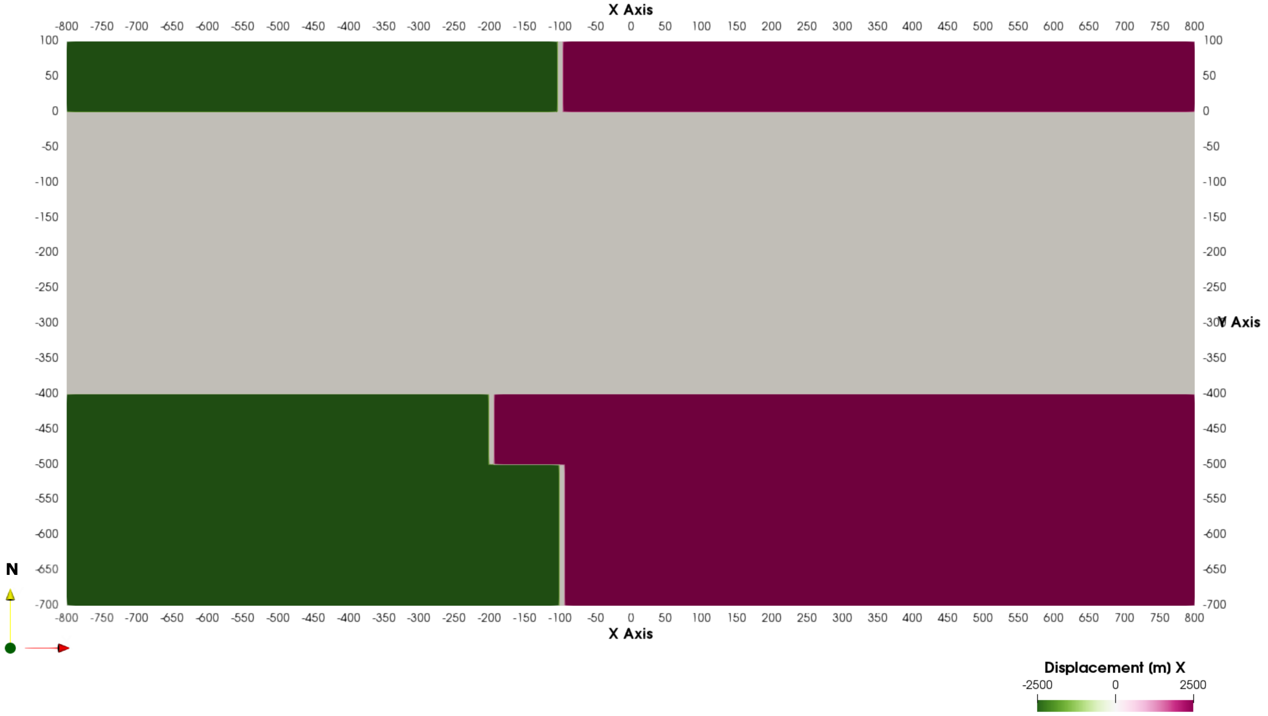
- Continental uplift/subsidence is calculated based on the principle of local isostasy relative to the initial continental lithosphere.
- Maximum uplift (~1600m) occurs within the continent close to the contact with the ridge where it is the hottest and spreads out away from there.
- Uplift decreases as the continents move away from the spreading centers and cool.
- An asymmetry develops in the uplifted continental lithosphere as they move away from the ridges during ocean spreading.
- Uplift (50 m) is detected ~60 km into the JMMC from, both the eastern and northern edges, respectively, at the end of Stage 1. Contour values are between 200 and 1600 m with a stepping of 200m and an additional contour at 50m.

Stage 2 - Initial Configuration (33 Ma)

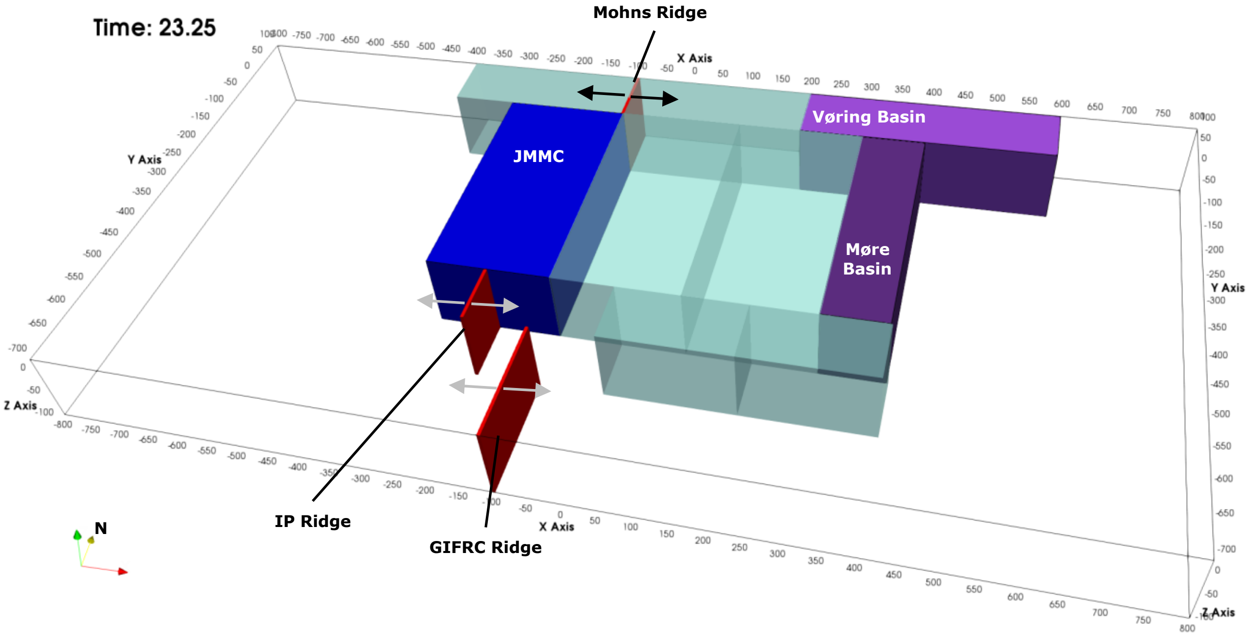


- Aegir Ridge is extinct during this stage.
- The IP and GIFRC Ridges split the Icelandic Plateau and the GIFRC, respectively. Spreading occurs symmetrically with a rate of 1cm/yr.
- Time step during this stage is 0.25 Myr.

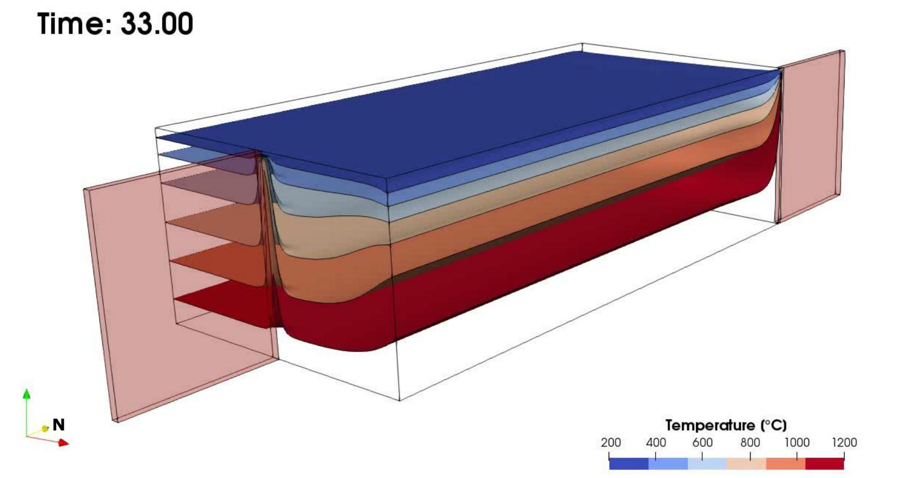
Stage 2 – Total Displacement (X) / Time Step

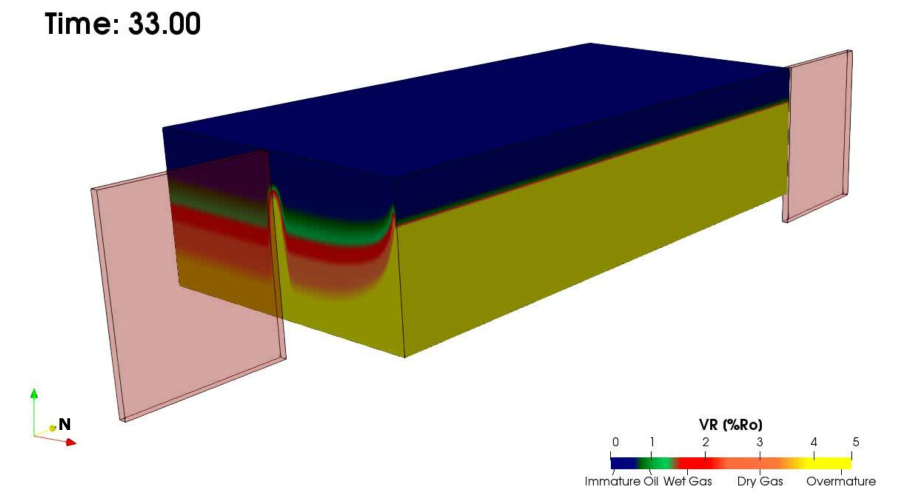


Stage 2 – End Configuration (23.25 Ma)



Stage 2 – JMMC Temperature & Maturity

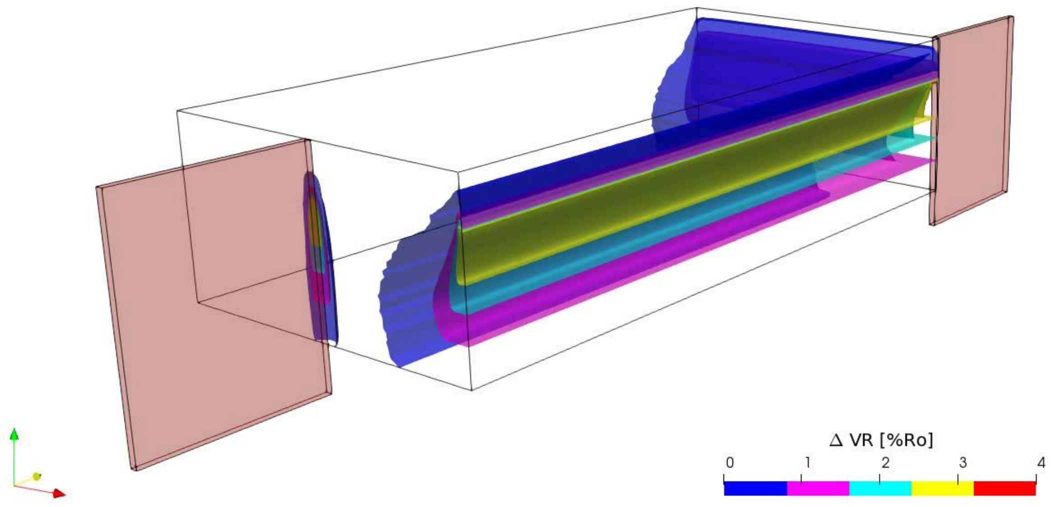


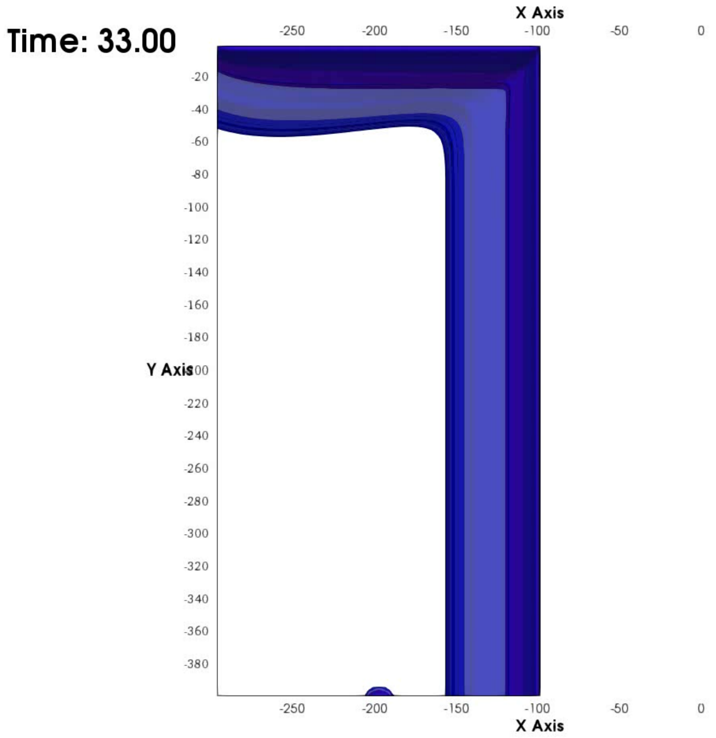


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The JMMC does not move w.r.t the spreading centers during this stage.
- The JMMC is heated constantly from the northeastern edge by the Mohns Ridge and the center of the southern edge by the Kolbeinsey (IP) Ridge.
- Maturity increases where the JMMC is in contact with the Kolbeinsey (IP) Ridge and increases gradually around it as the microcontinent is further heated.

Stage 2 – JMMC Differential Maturity

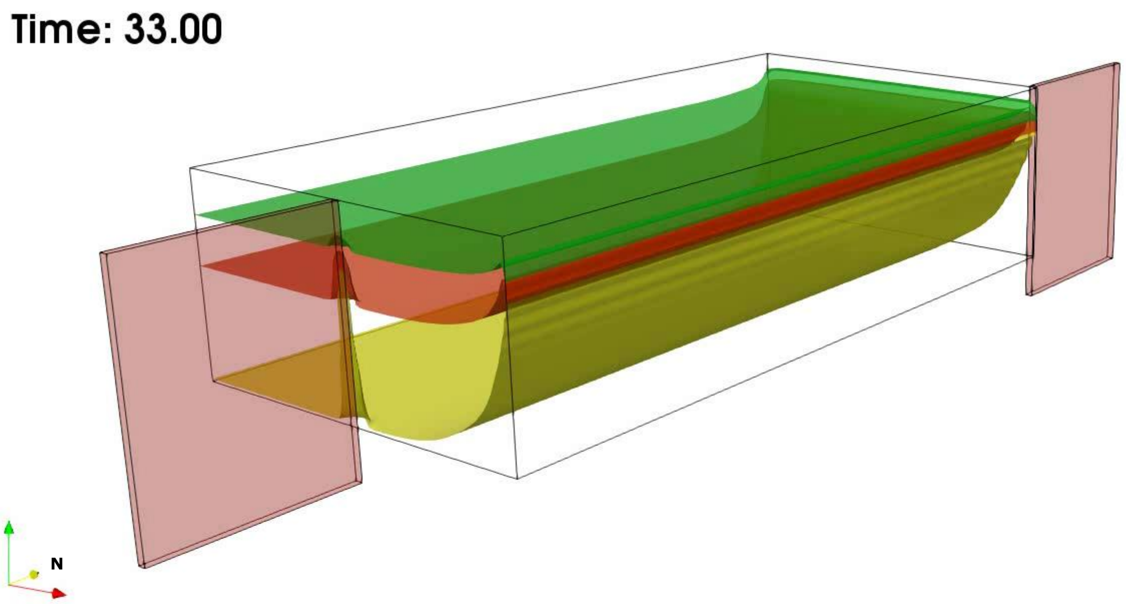




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The perturbation in maturity levels (Δ=0.1 %Ro) w.r.t. to background values has not moved much moved further into the JMMC at the northern and eastern edges during this stage. There is a slight perturbation at the southern edge where the IPR is present.

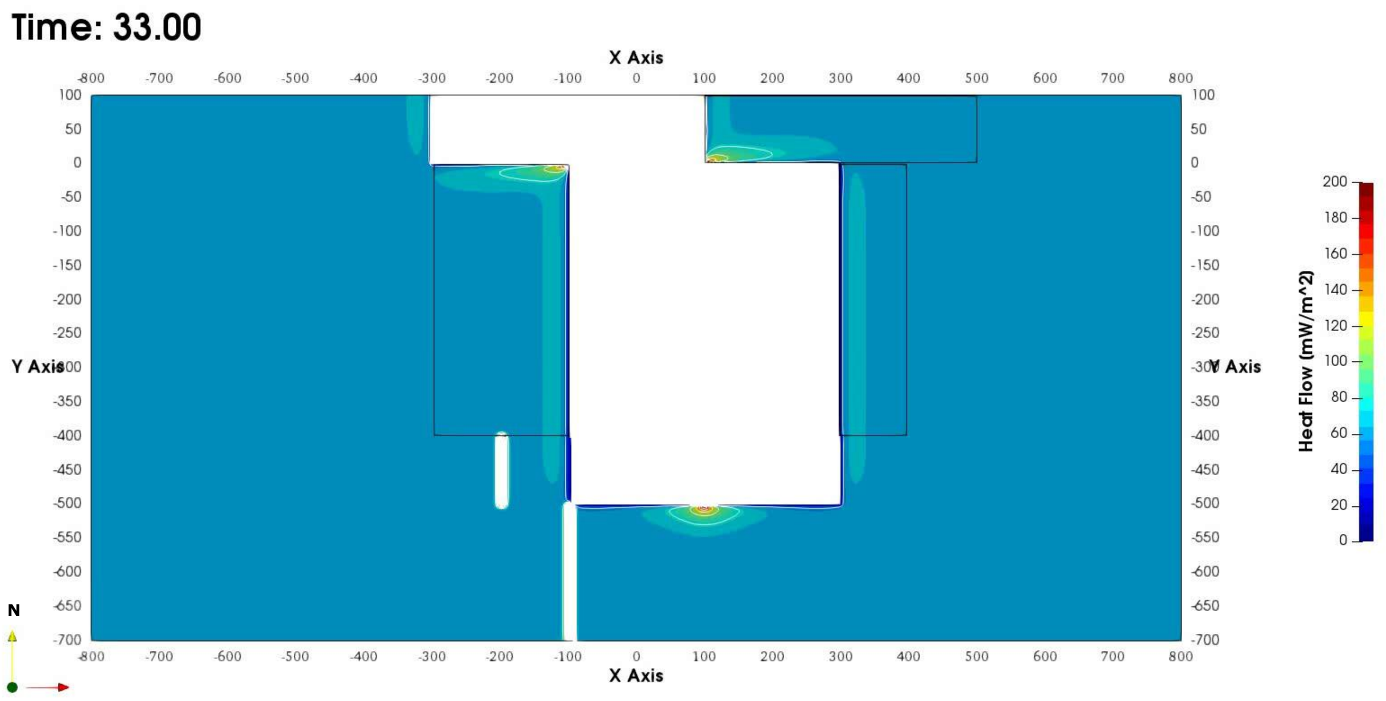
Stage 2 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

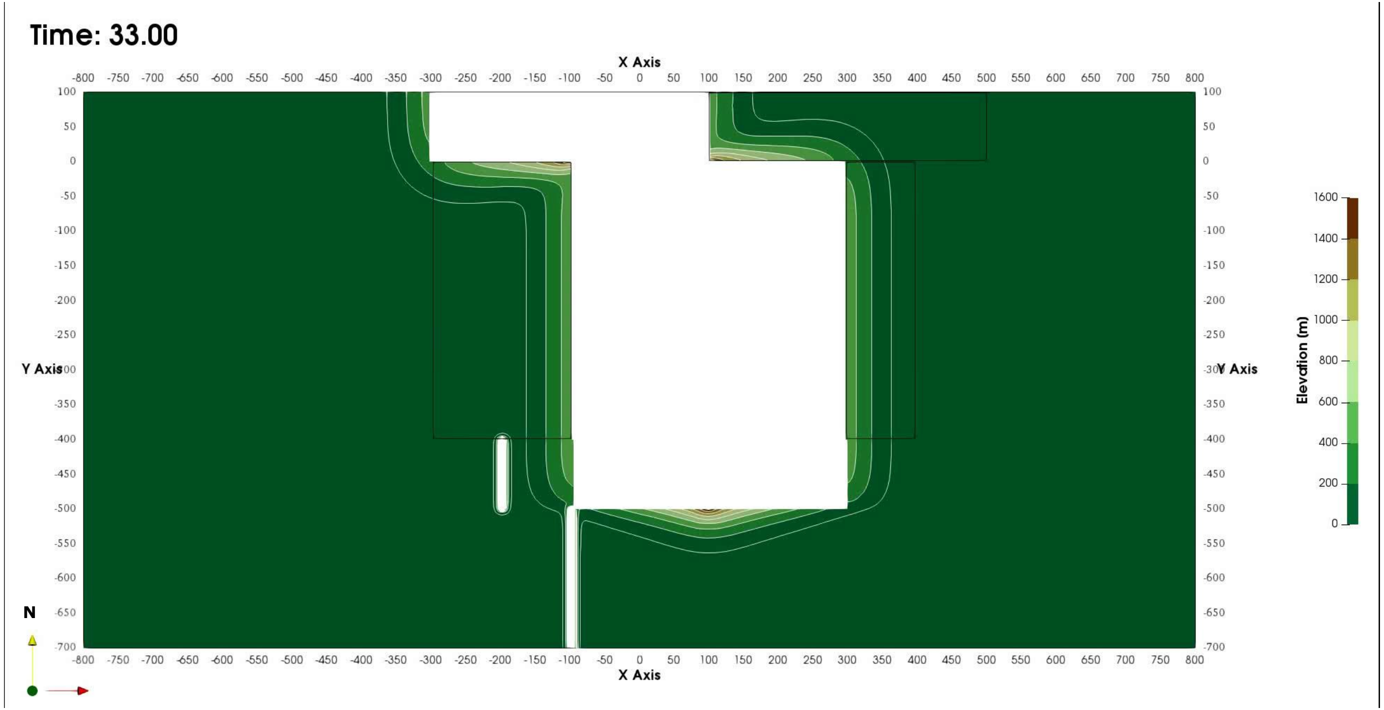
- The oil and gas windows close to the region near the Kolbeinsey and the Kolbeinsey (IP) Ridges become shallower in time and propagate into the JMMC.

Stage 2 – Heat Flow



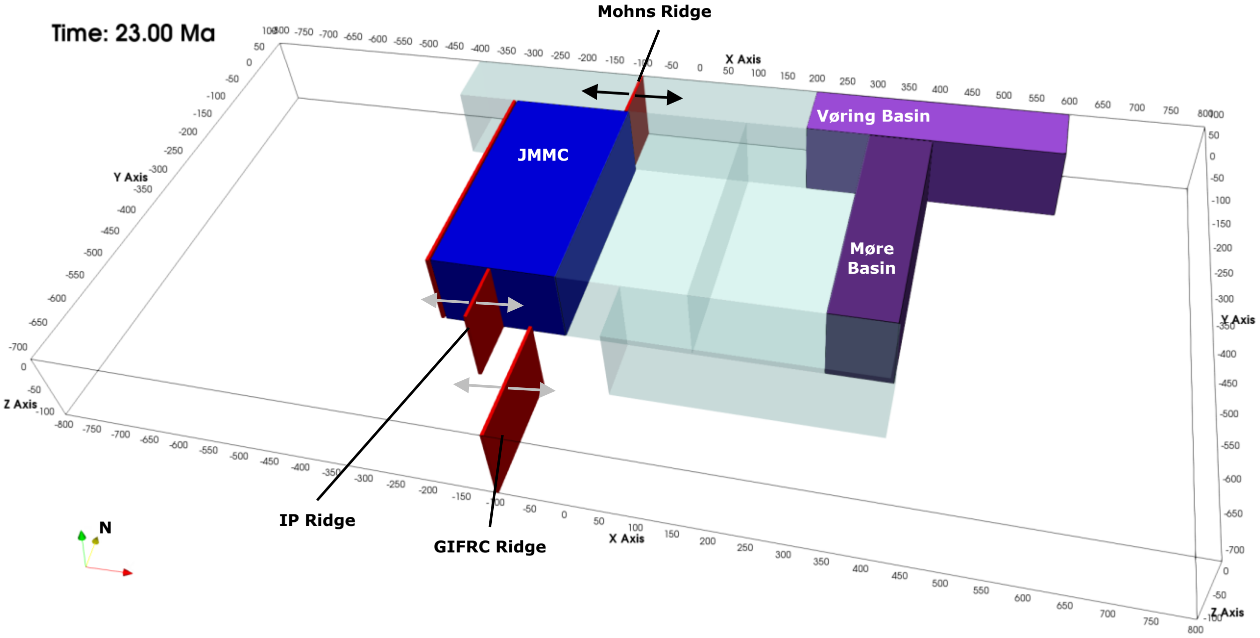
- Heat flow values decrease at the eastern edge of the JMMC as there is no further influence of the Aegir Ridge on the microcontinent. Heat flow values in the northwestern part of the JMMC also gradually decrease as the Mohns Ridge is relatively far away at the northwestern edge.
- Heat flow values increase outwards from the center of the southern edge due to the Kolbeinsey (IP) Ridge.
- An increase in heat flow (~65 mW/m^2) relative to the background value (59 mW/m^2) is measured ~52 and 41 km into the JMMC from the northern and eastern edges, respectively, at the end of Stage 2. Maximum values are present near the Mohns Ridge and the Kolbeinsey (IP) Ridge in the northeast and southcentral regions, reepectively.

Stage 2 - Uplift



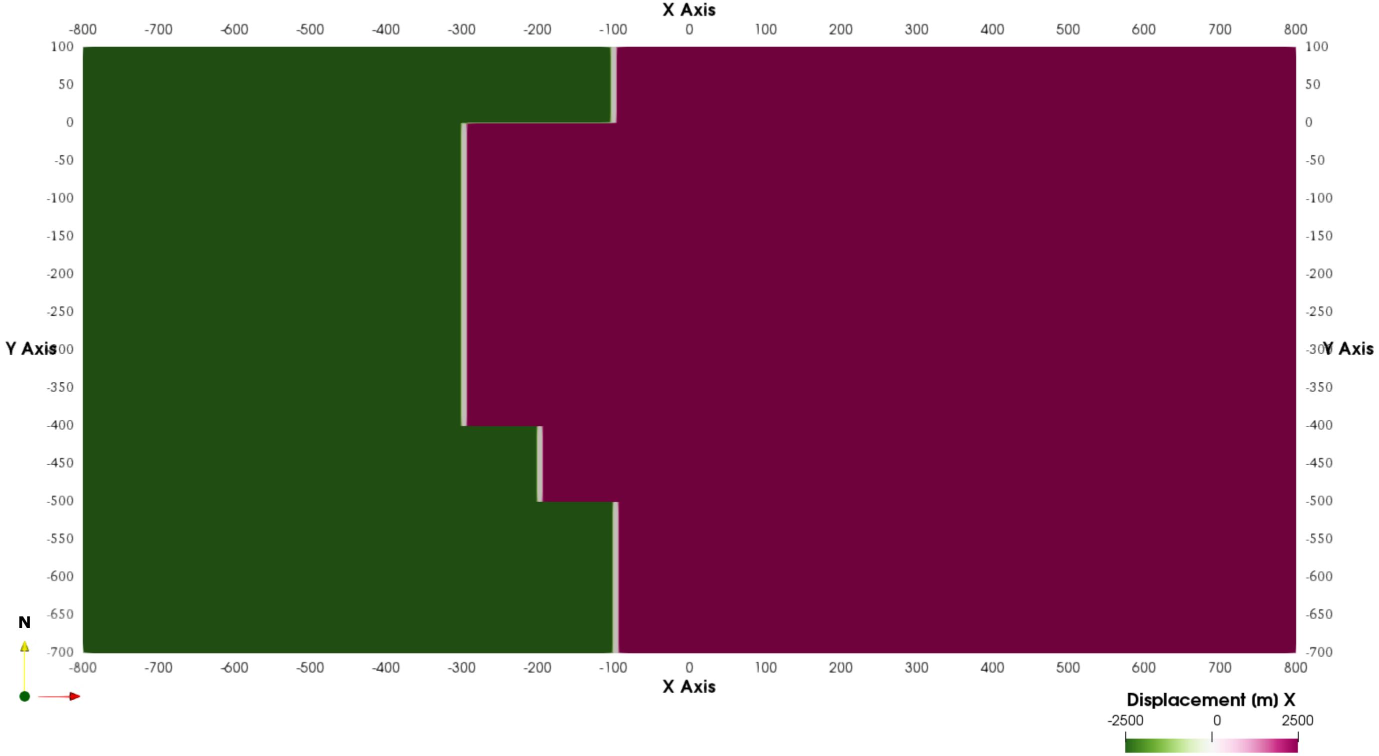
- More of the interior part of the JMMC is uplifted as the thermal perturbation moves inwards.
- Sever uplift is also experienced by the JMMC where the Kolbeinsey (IP) Ridge is in contact at the southern edge.
- Uplift (5 m) is predicted ~72 km into the JMMC from, both the eastern and northern edges, respectively, and ~50 km into the JMMC from the southern edge at the end of Stage 2.

Stage 3 - Initial Configuration (23 Ma)

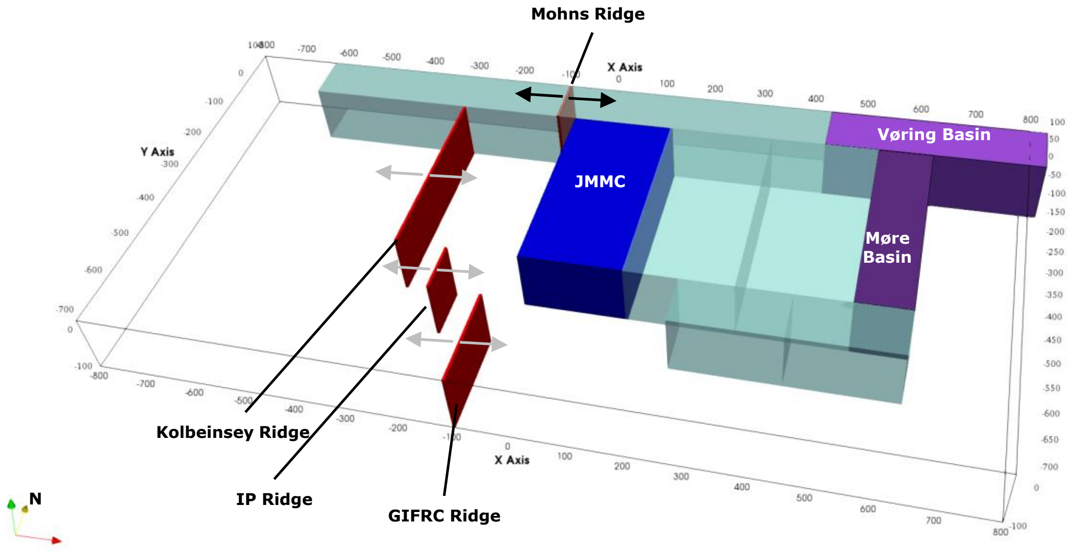


- The Kolbeinsey Ridge starts spreading at a velocity of 1 cm/yr at the western edge of the JMMC.
- Time step during this stage is 0.25 Myr.

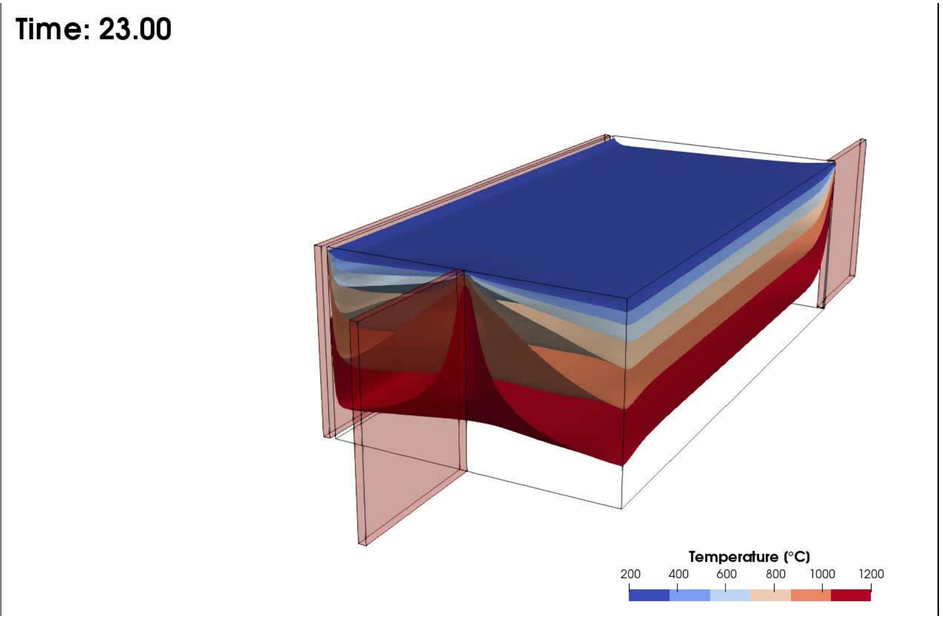
Stage 3 – Total Displacement (X) / Time Step

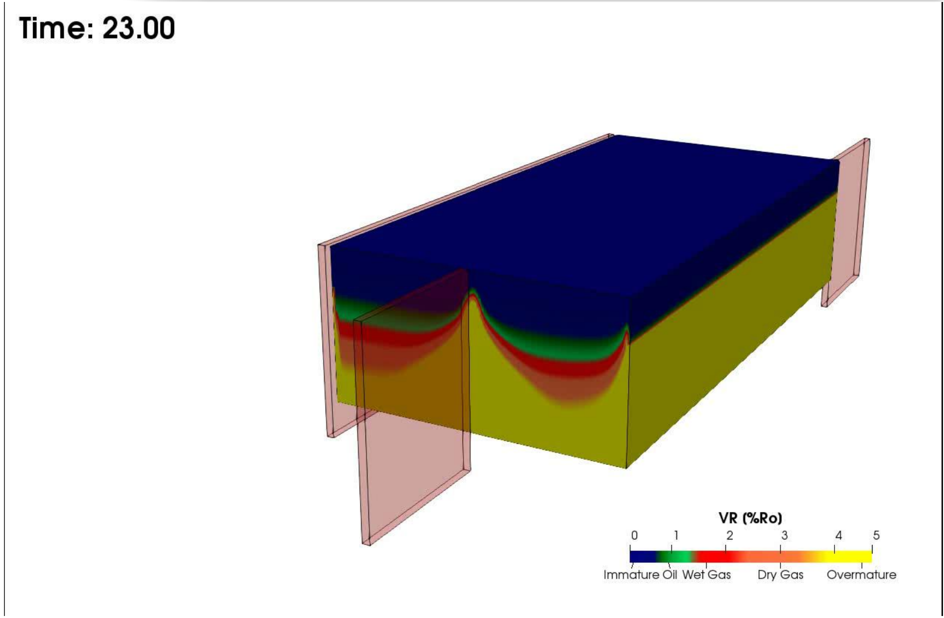


Stage 3 – End Configuration (23.25 Ma)



Stage 3 – JMMC Temperature & Maturity

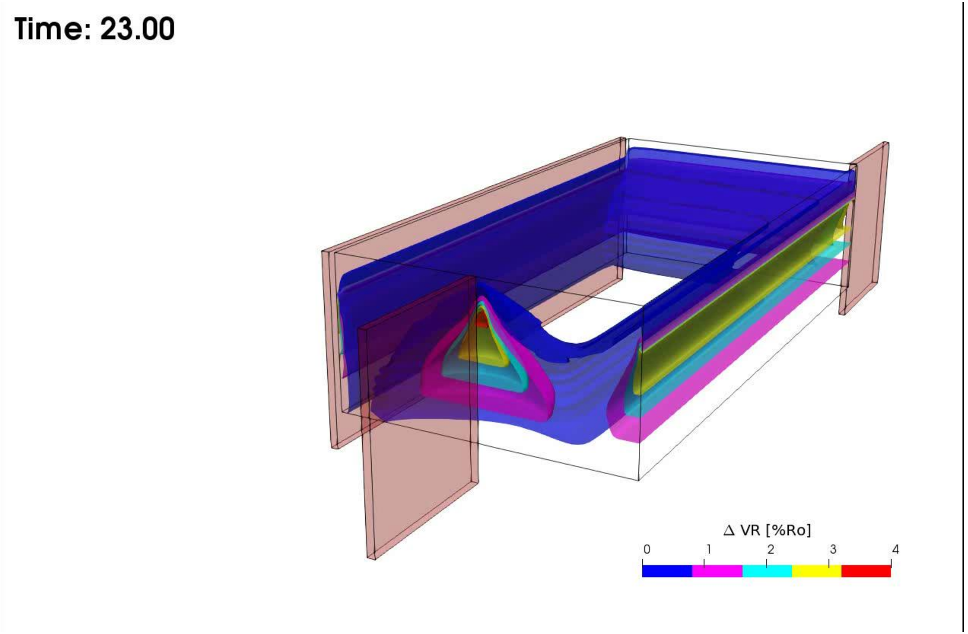


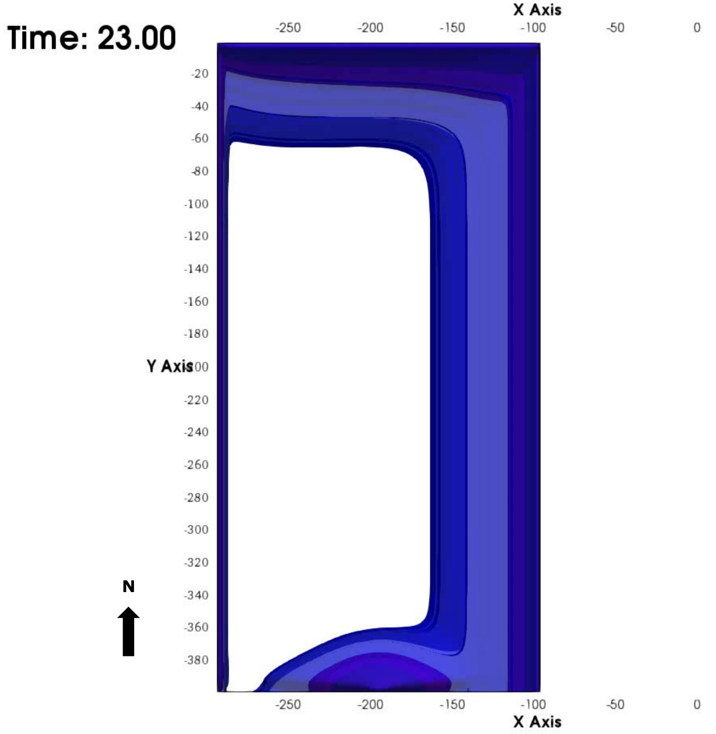


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The Kolbeinsey Ridge at the western edge of the JMMC is active during this stage. The JMMC moves eastwards as oceanic lithosphere is formed at the Kolbeinsey Ridge.
- The JMMC is heated from the northern, western and southern edge by the Mohns, the Kolbeinsey and the Kolbeinsey (IP) Ridges, respectively. It later cools down as it moves away from the influence of the spreading centers
- Maturity increases dramatically where the JMMC is in contact with the Kolbeinsey Ridge and also at the western part of the southern edge as the Kolbeinsey (IP) Ridge moves across it.

Stage 3 – JMMC Differential Maturity

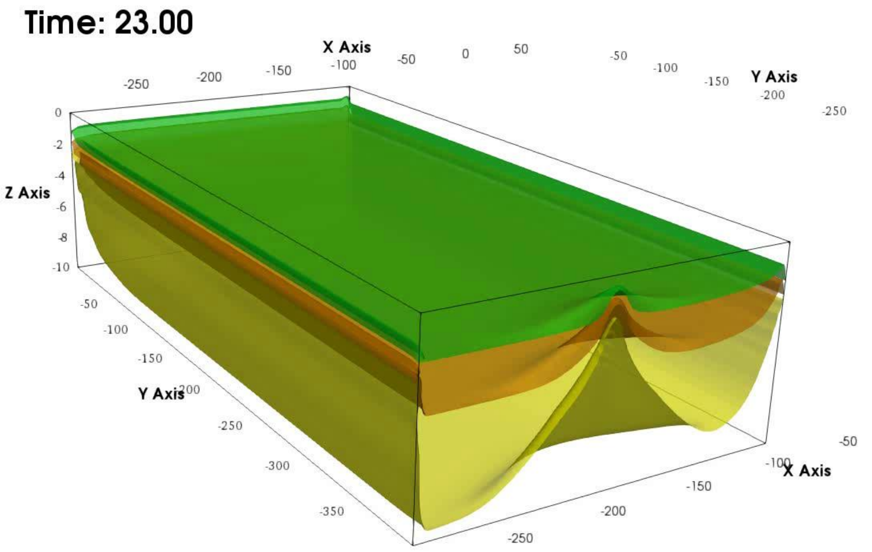




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values in the JMMC has moved further into the JMMC during this stage. It is ~65 km away from the northern and eastern edges and ~41 km from the southern edge.

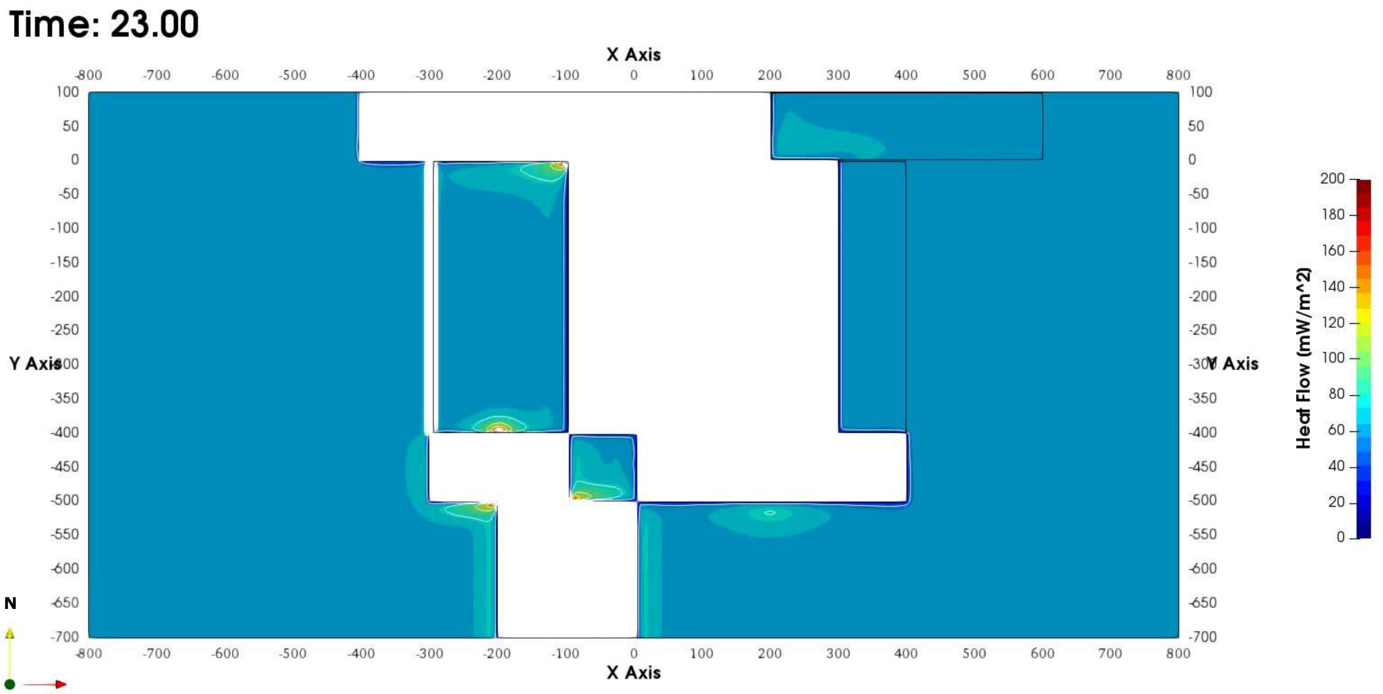
Stage 3 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

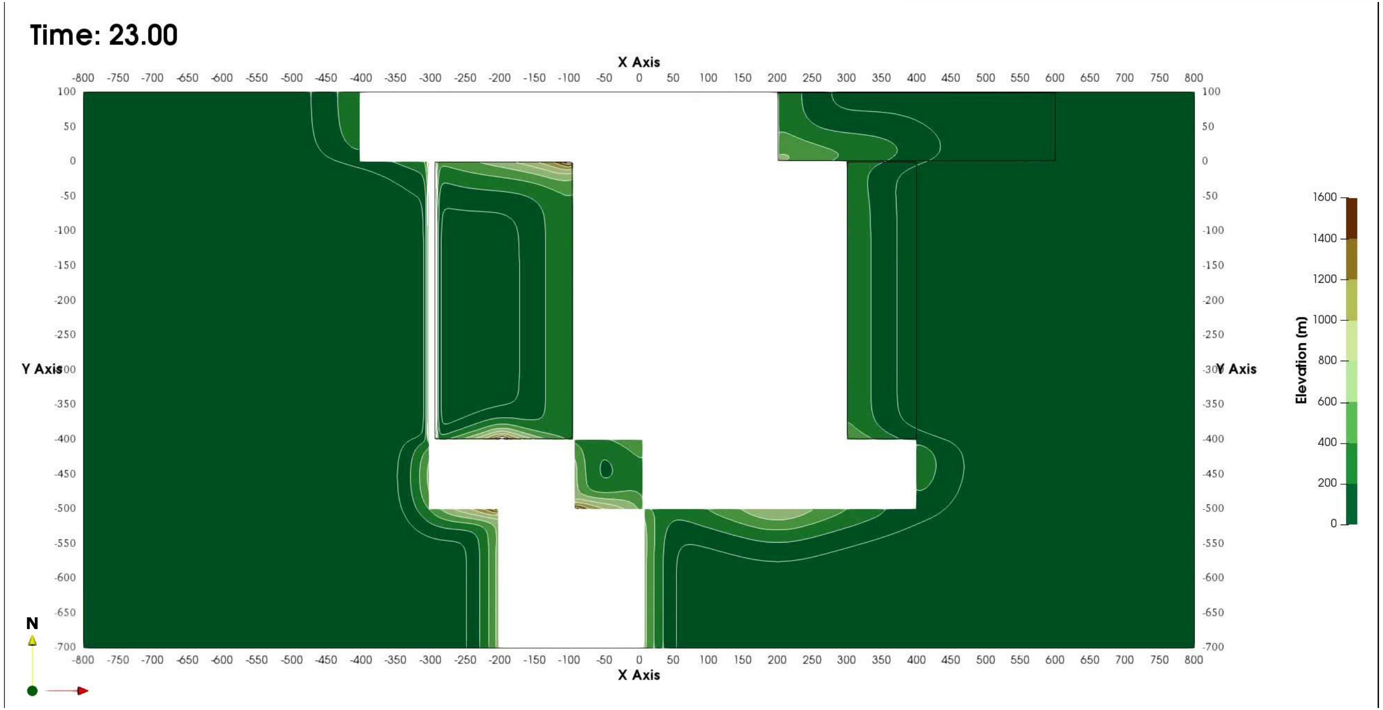
- The oil and gas windows close to the region near the Kolbeinsey and Kolbeinsey (IP) Ridges become shallower in time and propagate into the JMMC.

Stage 3 – Heat Flow



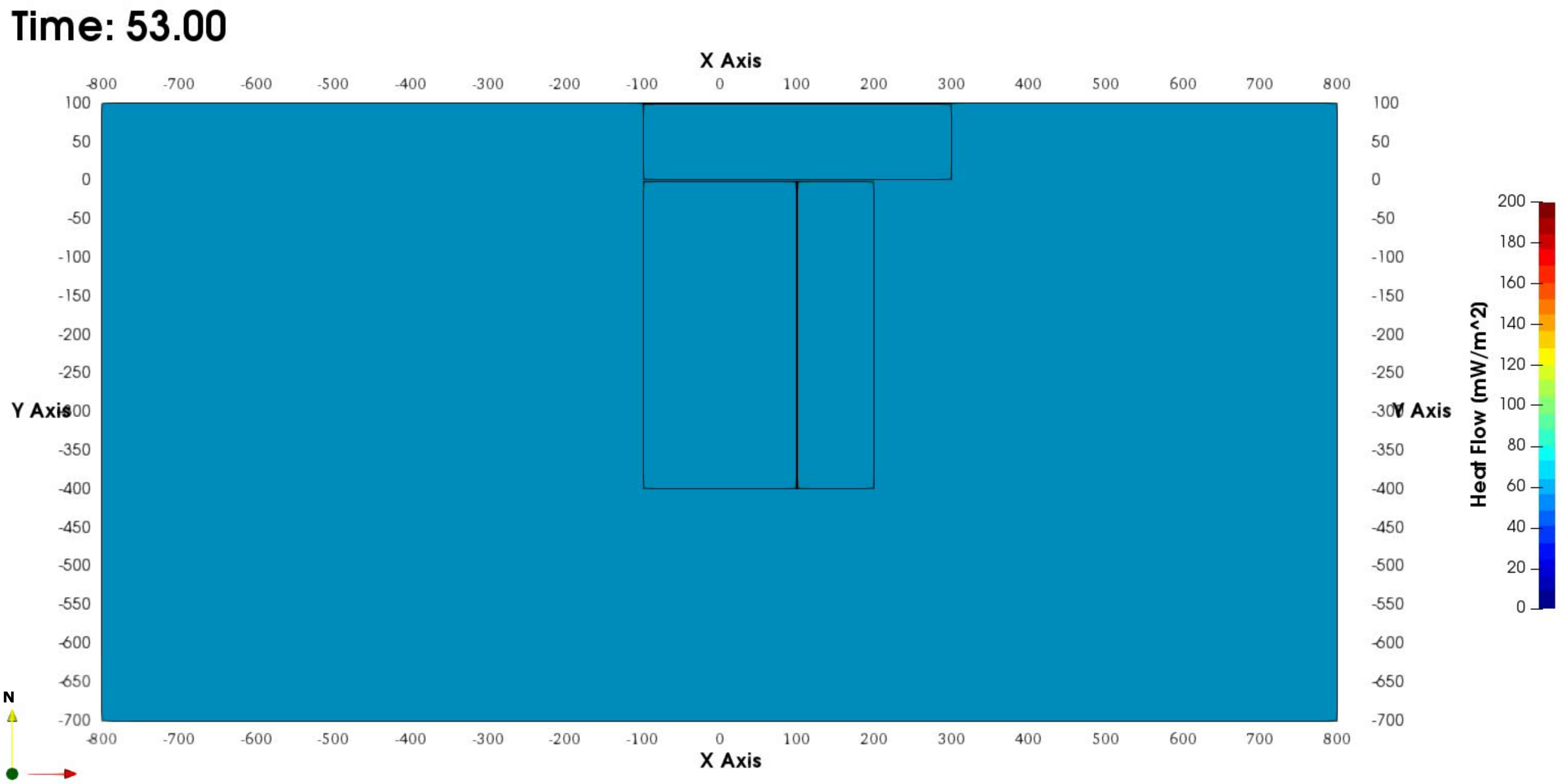
- Heat flow values increase from the western edge of the JMMC inwards due to the influence of the Kolbeinsey Ridge. Heat flow values in the northern part of the JMMC also increase as the Mohns Ridge traverses the northern edge again but in the opposite direction.
- Heat flow values in the JMMC gradually decrease as the microcontinent moves away from the ridges with elevated values predicted along the northern, western and southern edges at present day. The highest heat flow values (~90 mW/m^2) are predicted at the northwestern edge of the JMMC at present day conditions.
- An increase in heat flow (~65 mW/m^2) relative to the background value (59 mW/m^2) is measured ~60 km from the northern and southern edges and ~20 km into the JMMC from the western edge at present day. Maximum values (~90 mW/m^2) are observed at the northwestern corner of the JMMC.

Stage 3 - Uplift

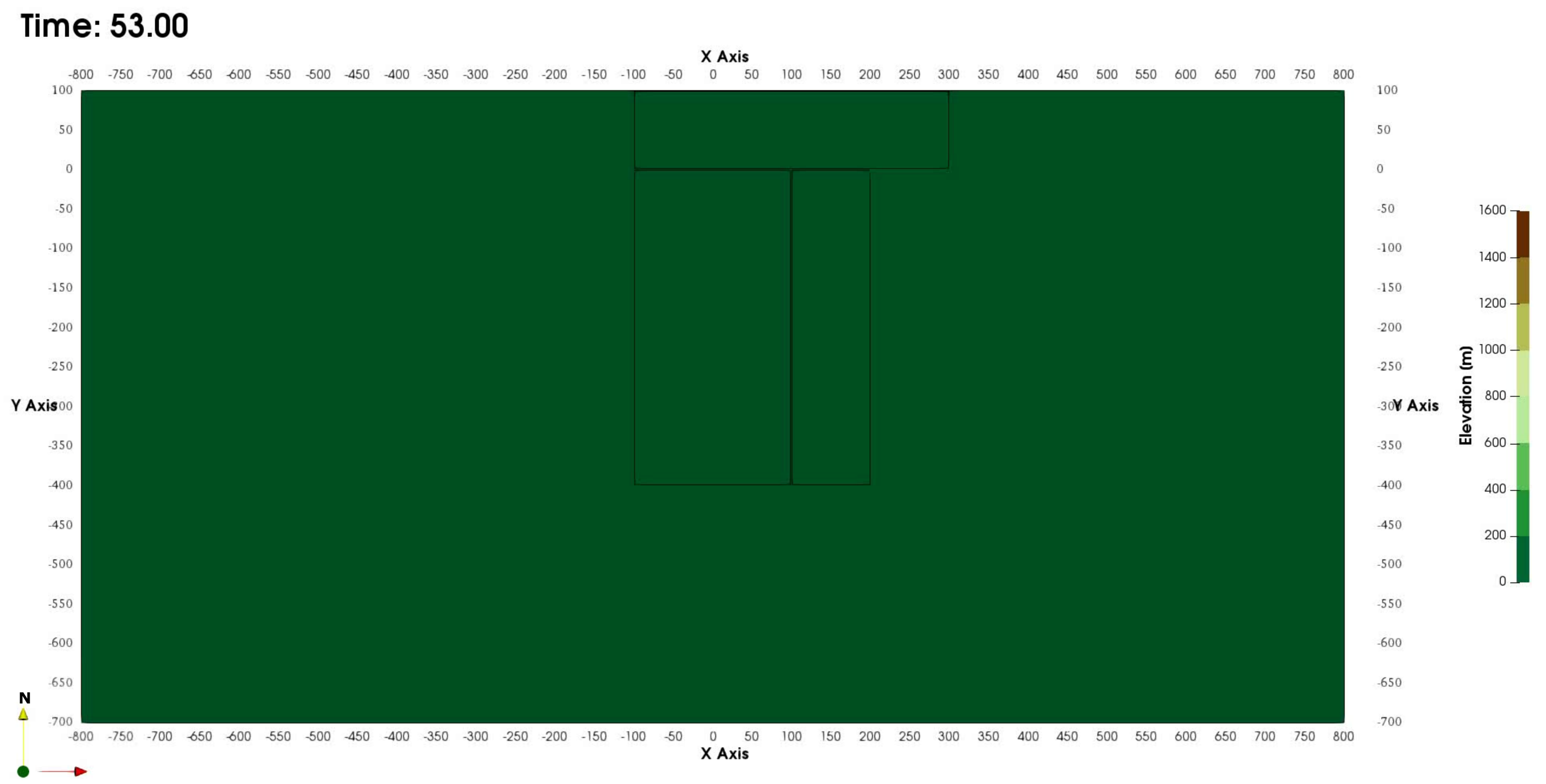


- Uplift is also generated by heat input from the Kolbeinsey Ridge along the western edge of the JMMC during Stage 3.
- The entire microcontinent has experienced uplift at present day with high values at the north- and southwestern edges (~1200 and 800 m, respectively).

Heat Flow


Time: 53.00
X Axis
-800
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
600
700
800
Y Axis
100
50
0
-50
-100
-150
-200
-250
-300
-350
-400
-450
-500
-550
-600
-650
-700
N
Heat Flow (mW/m^2)
200
180
160
140
120
100
80
60
40
20
0

Uplift

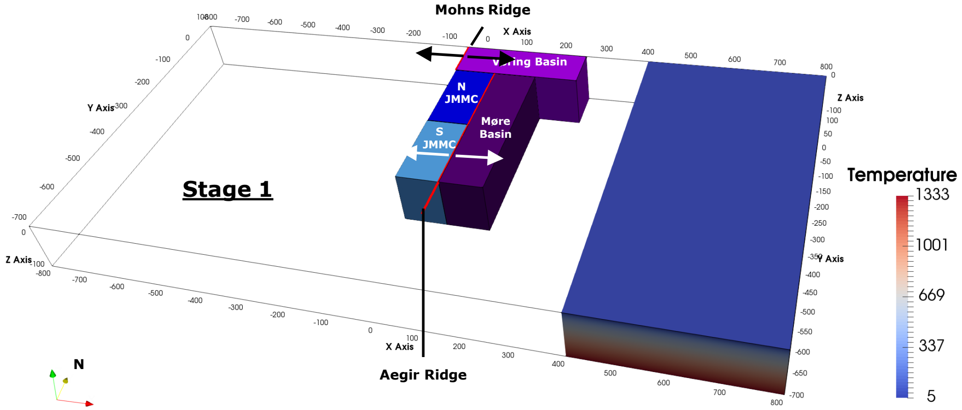

Time: 53.00
X Axis
Y Axis
Elevation (m)
1600
1400
1200
1000
800
600
400
200
0
N

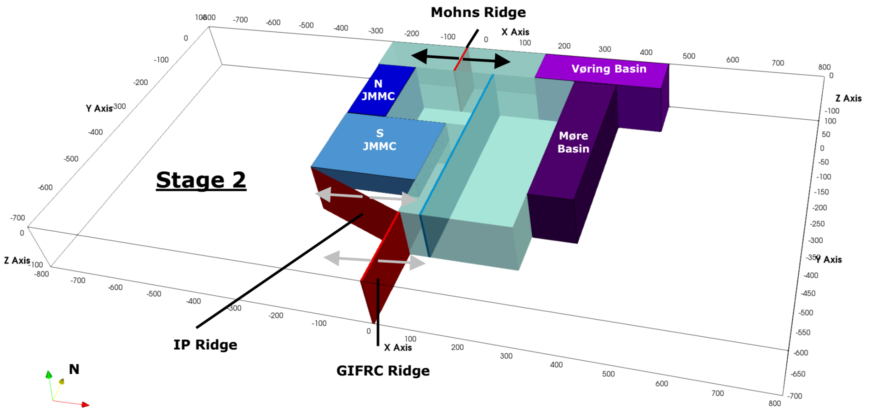
3D JMMC Model

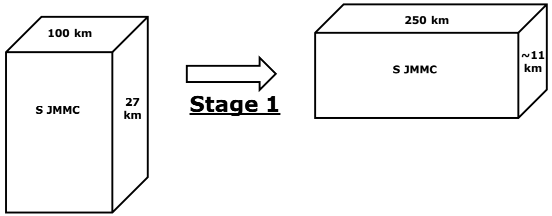
Run 2

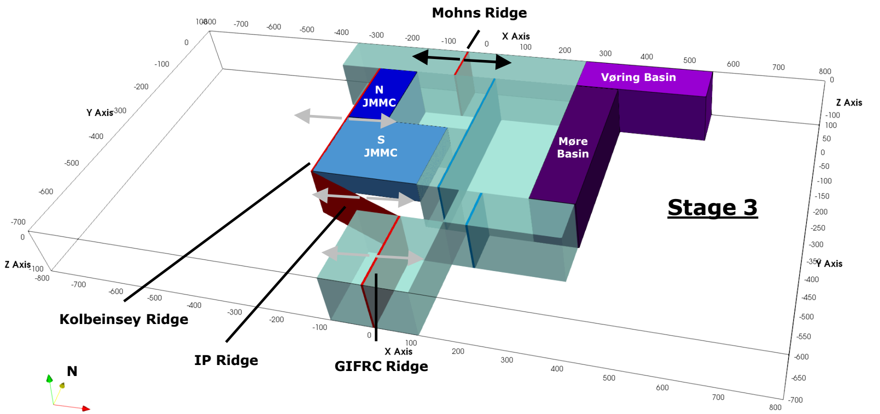
karthik.iyer@geomodsol.com

Run 2: Setup

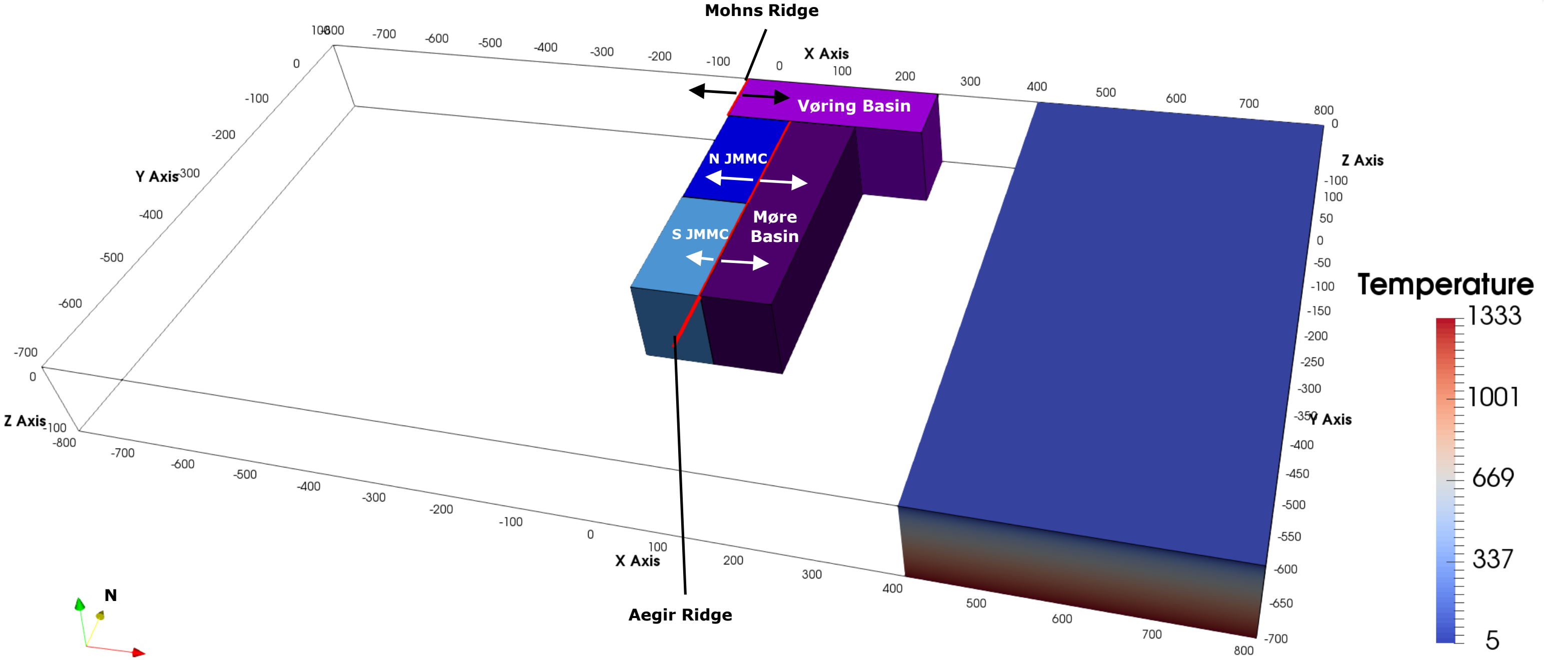

Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 1
Aegir Ridge
X Axis
Y Axis
Z Axis
N
Temperature
1333
1001
669
337
5


Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 2
IP Ridge
GIFRC Ridge
X Axis
Y Axis
Z Axis
N


100 km
S JMMC
27 km
Stage 1
250 km
S JMMC
~11 km

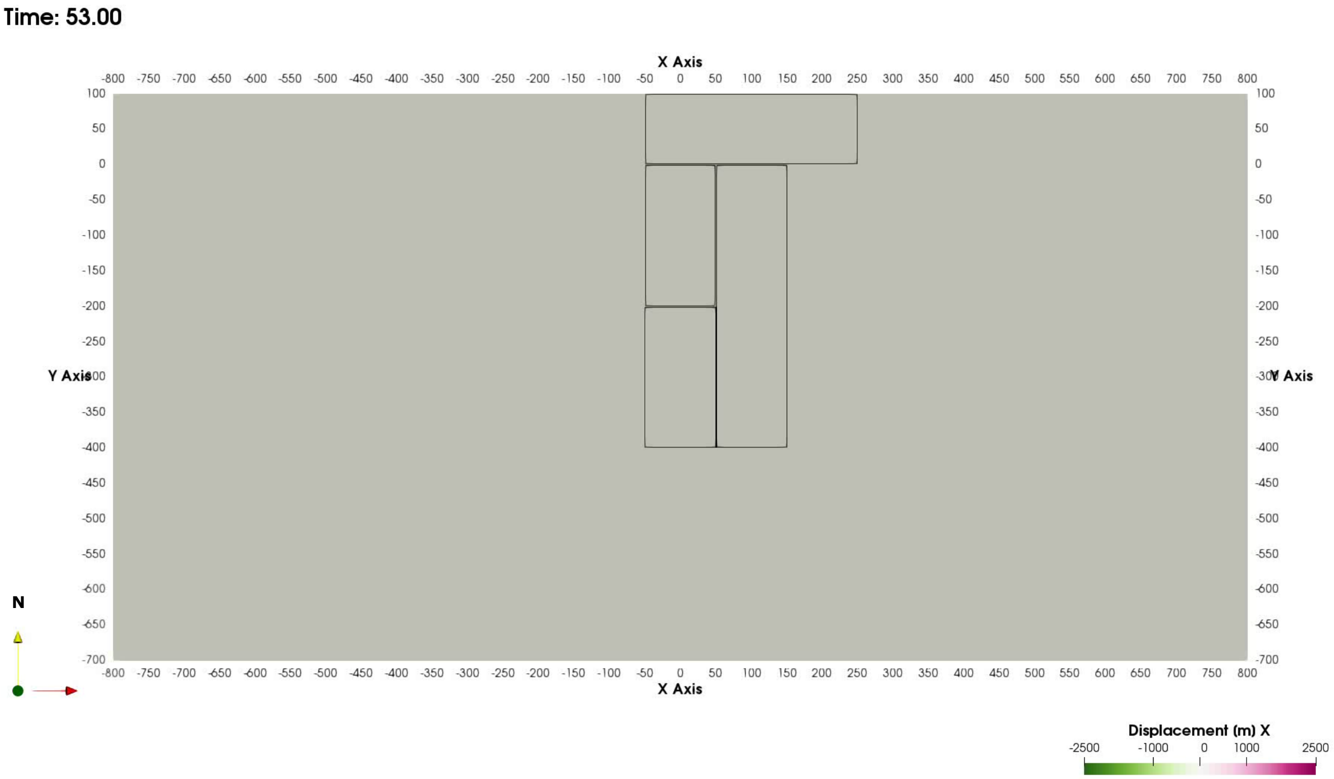

Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 3
Kolbeinsey Ridge
IP Ridge
GIFRC Ridge
X Axis
Y Axis
Z Axis
N

Stage 1 - Initial Configuration (53 Ma)

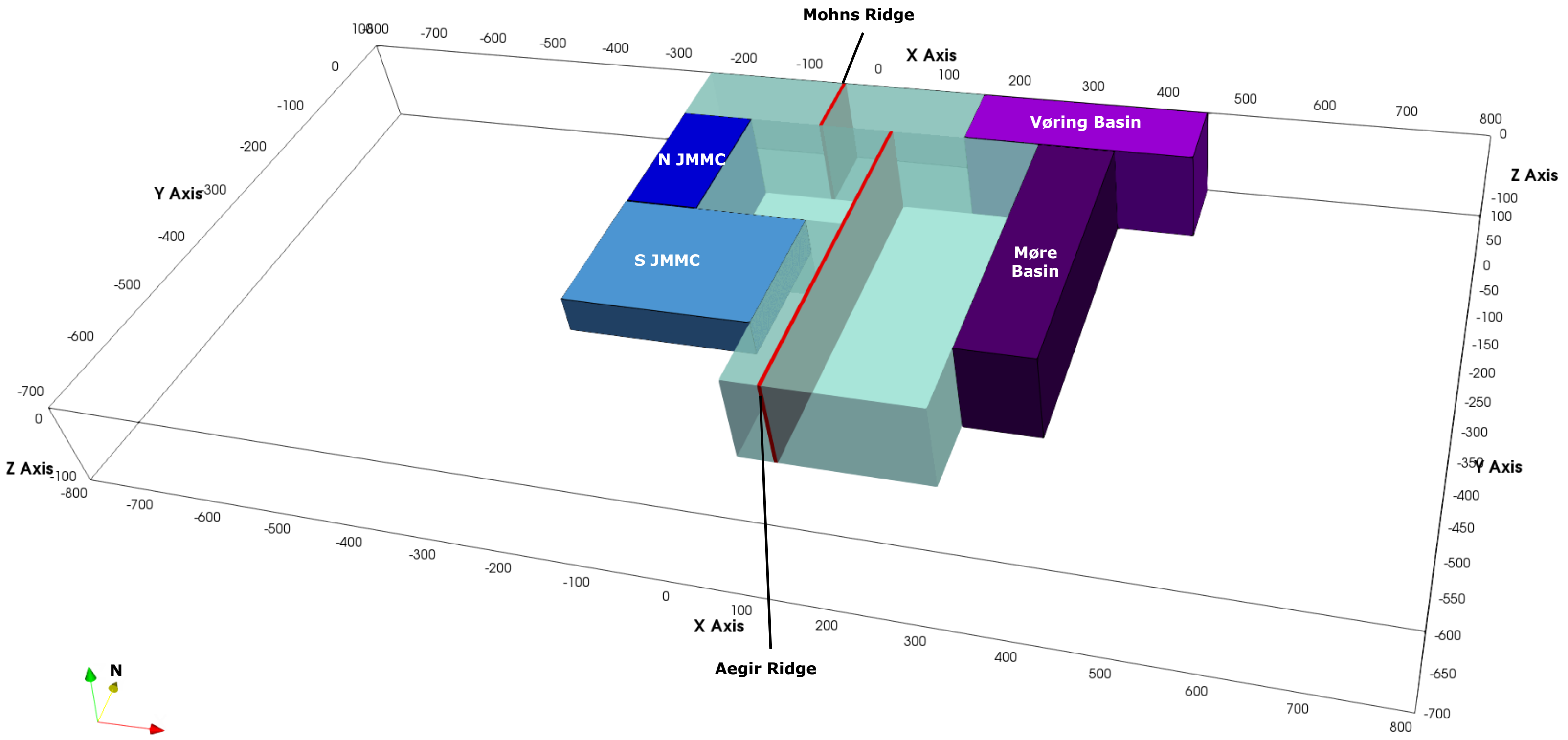


- Initialized to continental lithosphere everywhere and steady-state temperature. Top surface set to 5°C and bottom boundary to 1333°C. Ridges are emplaced at 1333°C and are 5 km wide.
- The widths of the northern and southern parts of the JMMC are 100 km initially. Initially, the sediment cover is 6 km deep and the Moho is at a depth of 27 km.
- The Mohns and the northern part of the Aegir Ridges spread symmetrically at 1 cm/yr (half-spreading rate). The southern part of the Aegir ridge spreads asymmetrically; 1 cm/yr to the east and 0.25 cm/yr to the west. The southern part of the JMMC (and the IP) undergoes rifting at the same time such that it extends in width at a rate of 0.75 cm/yr taking up the difference resulting from the asymmetrical spreading. The western edge of the N and S JMMC are therefore aligned with each other at all times. The time step during this stage is 1 Myr.
- Extension of the SJMMC and the IP is compensated by thinning of the continental crust. The final configuration of the SJMMC and IP is sediments and crust that are ~ 3 and 11 km deep, respectively.

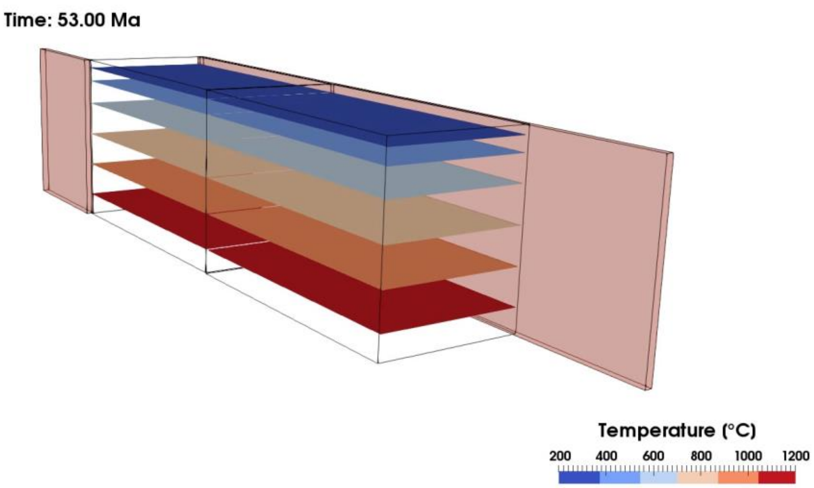
Stage 1 – Total Displacement (X) / Time Step

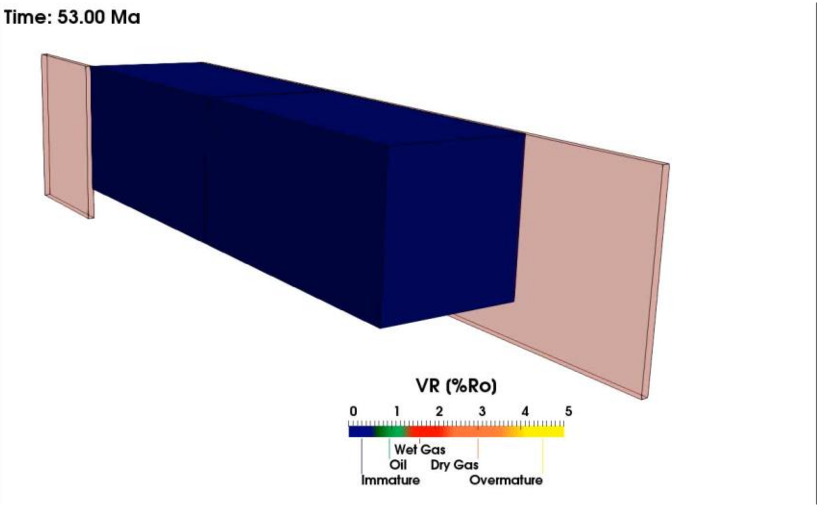


Stage 1– End Configuration (33.25 Ma)



Stage 1 – JMMC Temperature & Maturity

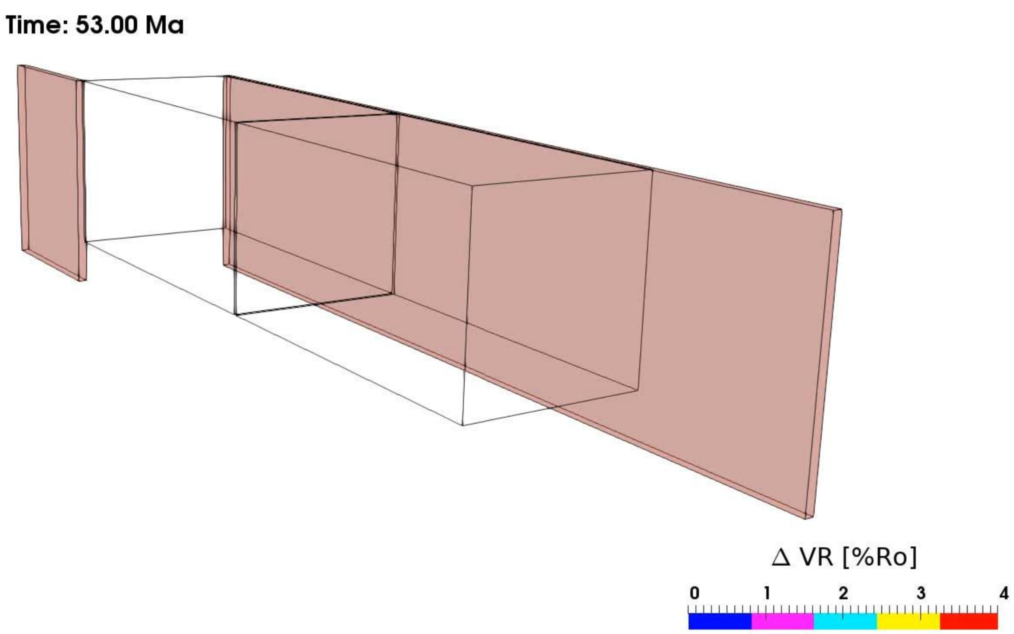


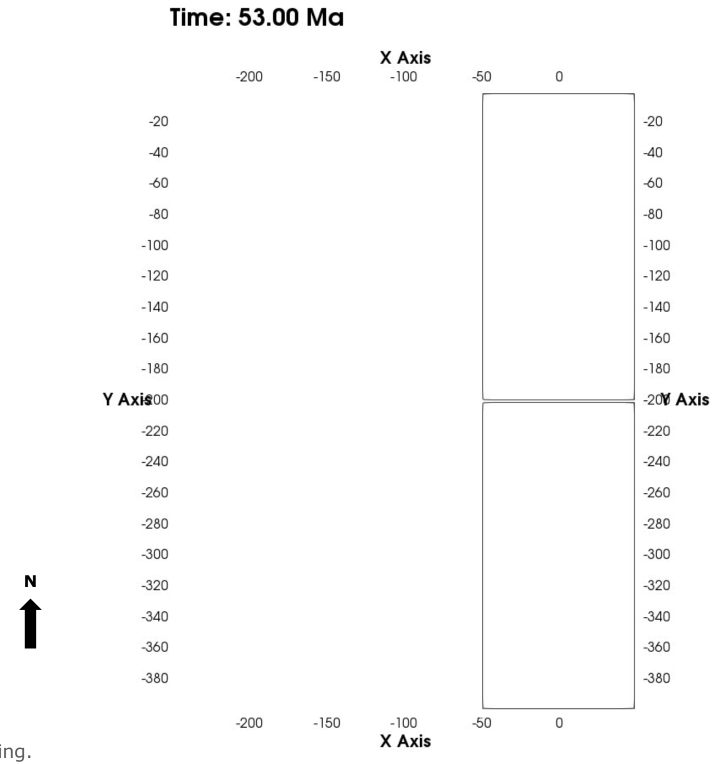


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The JMMC receives heat from the Aegir Ridge at its eastern edge. The influence of the Aegir Ridge on the JMMC decreases as the JMMC moves away and is abutted by increasingly colder and older oceanic lithosphere.
- The temperature in the S JMMC increases further as rifting progresses.
- The N JMMC also receives heat via its northern edge as it passes the Mohns Ridge.
- Maturity increases significantly and quickly to the maximum at the edges of the JMMC that are in contact with the hot ridge. Maturity of sediments inwards from the edges increases gradually as the thermal effects of the ridges propagates into the microcontinent.

Stage 1 – JMMC Differential Maturity

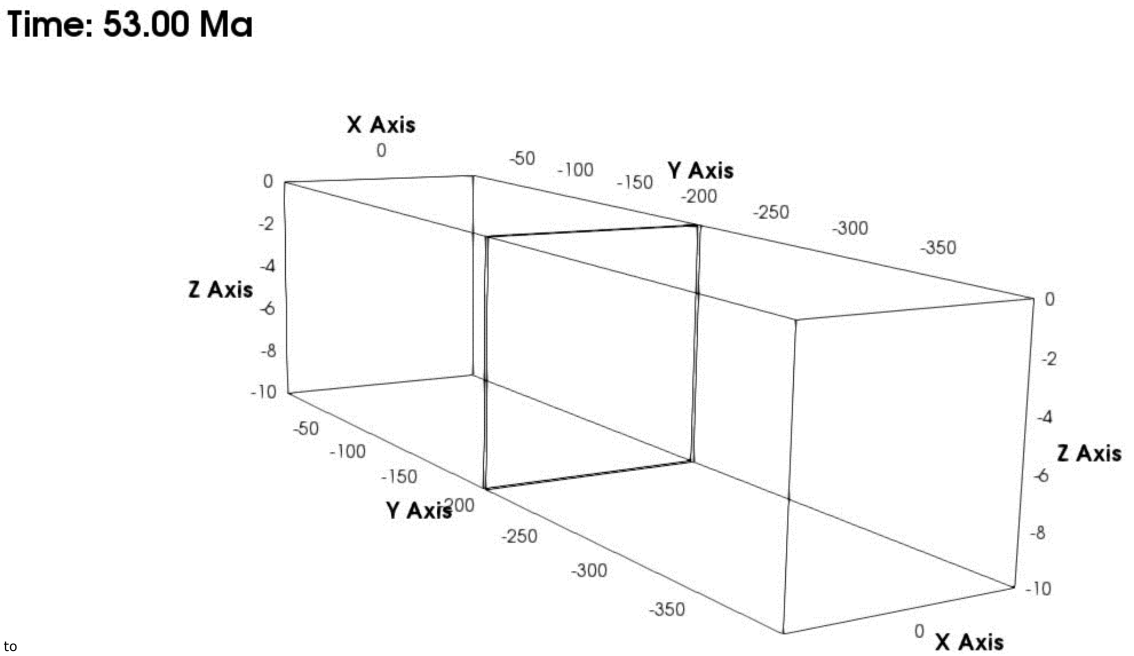




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Higher maturity levels in the S JMMC migrate up towards shallower depths as the isotherms become shallower during rifting.
- Maturity levels at the southern edge of the N JMMC are also affected by the rifting of the S JMMC and show increase in maturity.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values in the N JMMC is observed ~60 km inwards from the eastern edge (Aegir Ridge influence) and the northern edge (Mohns Ridge influence). The perturbation has also moved inwards from the southern edge of the N JMMC by ~20 km due to rifting in the S JMMC. The S JMMC shows a perturbation in maturity levels ~65 km away from the eastern edge.

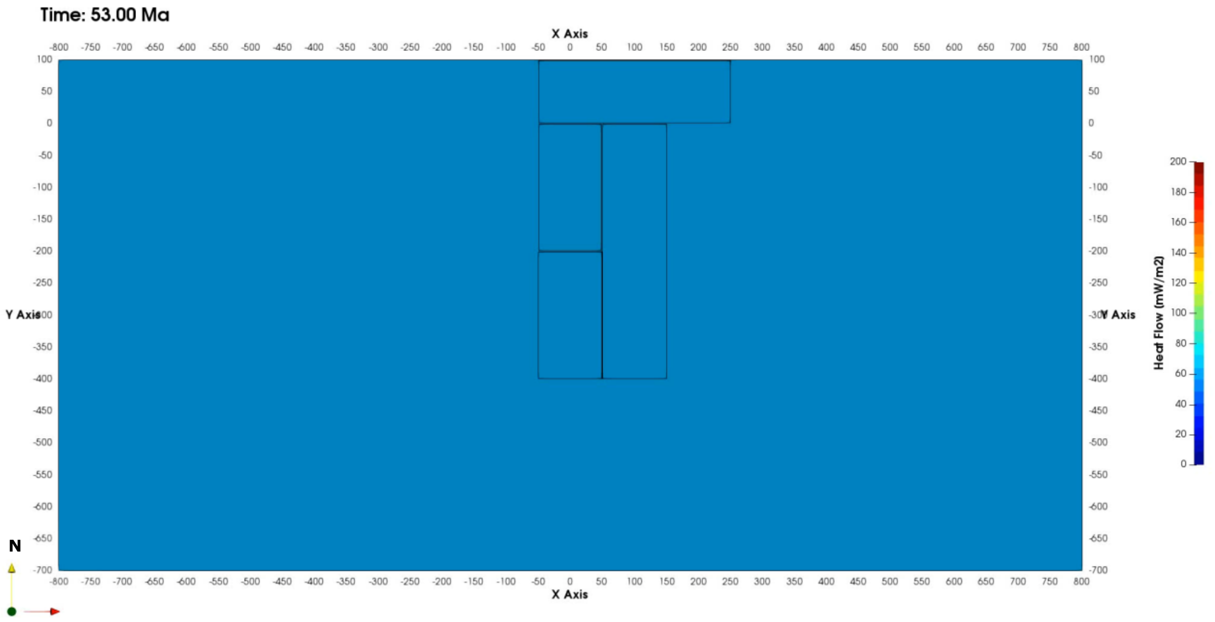
Stage 1 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The initial oil and gas window tops (background values) are at ~3 and 5.5 km, respectively.
- These windows are very shallow close to edges in contact with ridges and are raised up within the microcontinent as heat is progressively transferred into the JMMC during this stage by the ridges and by rifting of S JMMC.

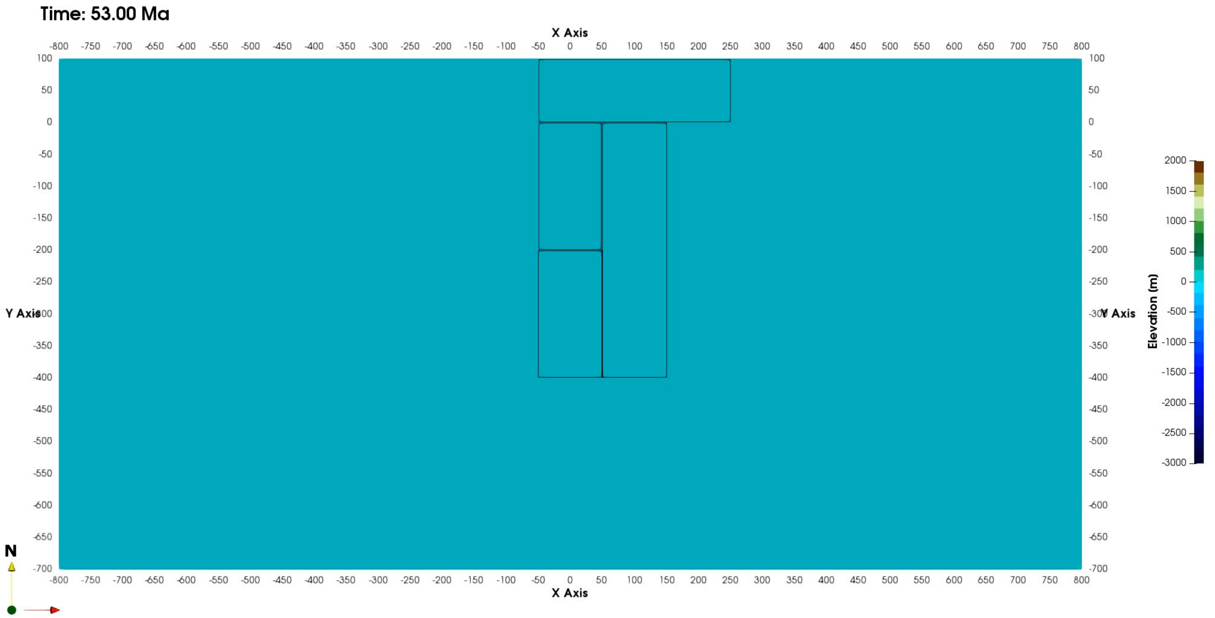
Stage 1 – Heat Flow



- Maximum heat flow values (~200 mW/m^2) occur within the continent close to the contact with the ridge where it is the hottest and spreads out away from there. Heat flow values decrease as the continent moves away from the spreading centers.
- An asymmetry develops in the regions with increased heat flow as they move away from the ridges during ocean spreading.
- The S JMMC shows heat flow values higher than the N JMMC as it is rifted.
- An increase in heat flow (~75 mW/m^2) relative to the background value (59 mW/m^2) is observed in the region around the northeastern corner of the N JMMC and in most of the S JMMC where it reaches a maximum of ~100 mW/m^2 at the end of Stage 1.
- Contour values are between 50 and 200 mW/m^2 in steps of 25 mW/m^2.

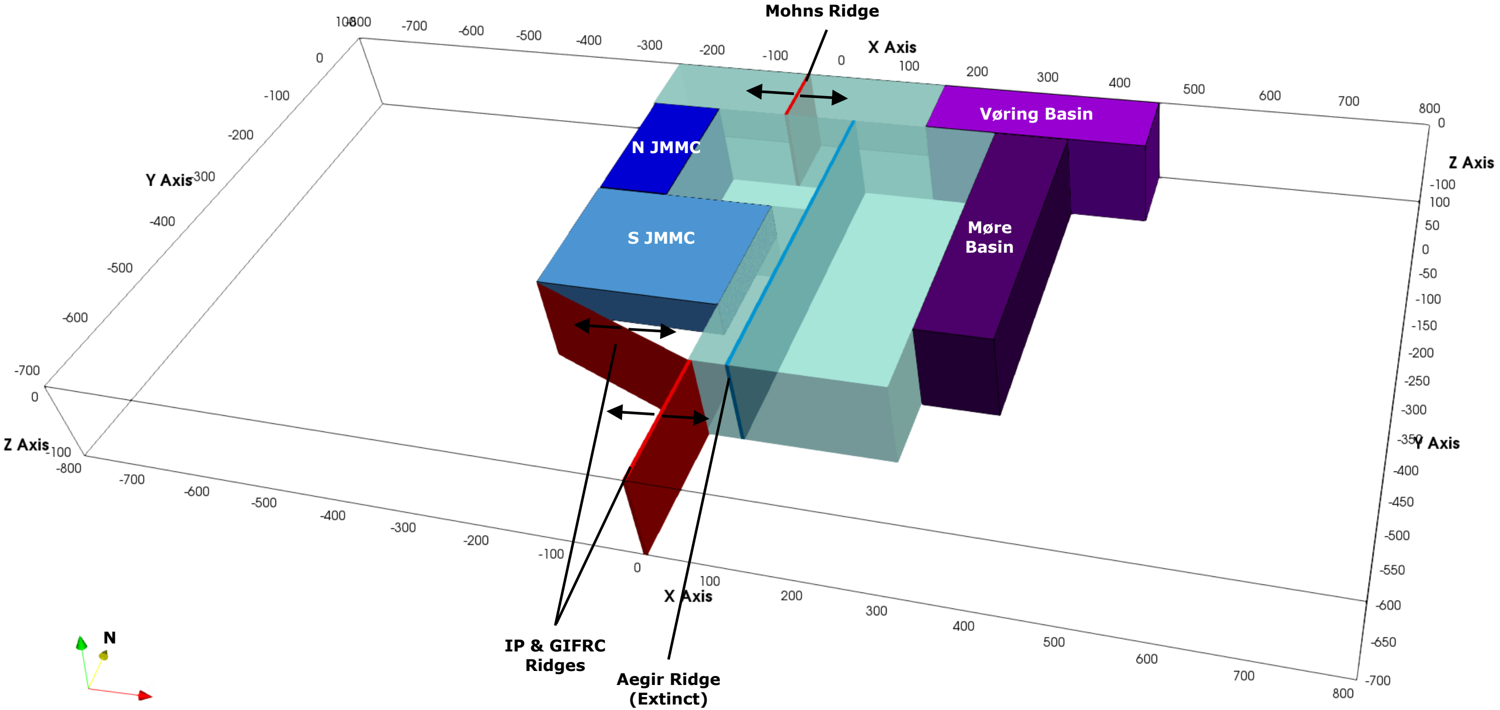
karthik.iyer@geomodsol.com

Stage 1 - Uplift



- Continental uplift/subsidence is calculated based on the principle of local isostasy relative to the initial continental lithosphere.
- Maximum uplift (~2000m) occurs within the continent close to the contact with the ridge where it is the hottest and spreads out away from there.
- Uplift decreases as the continents move away from the spreading centers and cool with an asymmetry developing in the uplifted continental lithosphere as they move away from the ridges during ocean spreading.
- The S JMMC subsides significantly (> 3000 m) as it thins bringing up hot mantle upwards resulting in a dense lithospherical column relative to the initial continental configuration.
- Most of the N JMMC has experienced uplift by the end of Stage 1 except for a small region at the western edge. Contour values for uplift are between 250 and 1750 m with a stepping of 250m and an additional contour at 50m. Contour values for subsidence are between -500 and -3000 m with a stepping of -500m.

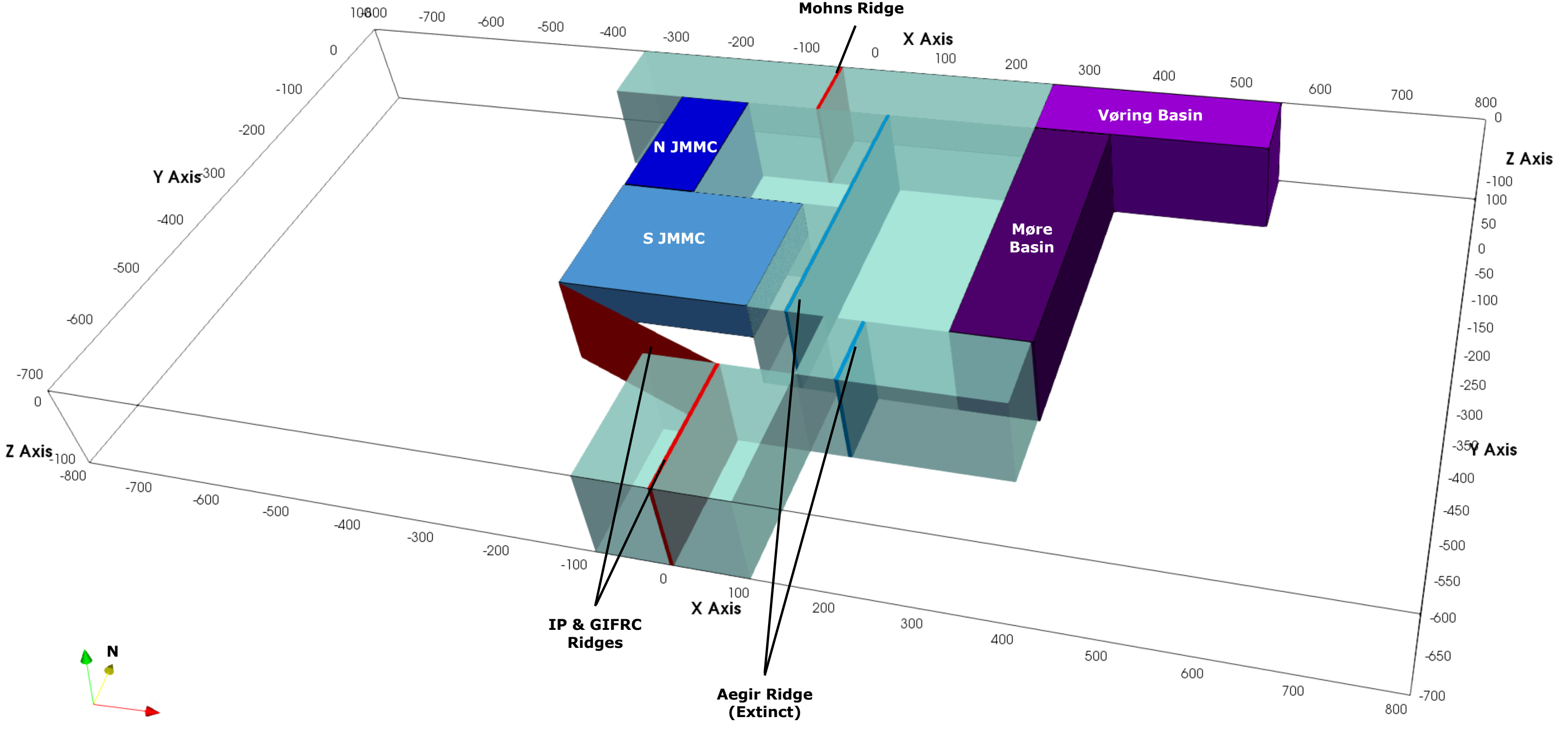
Stage 2 - Initial Configuration (33 Ma)



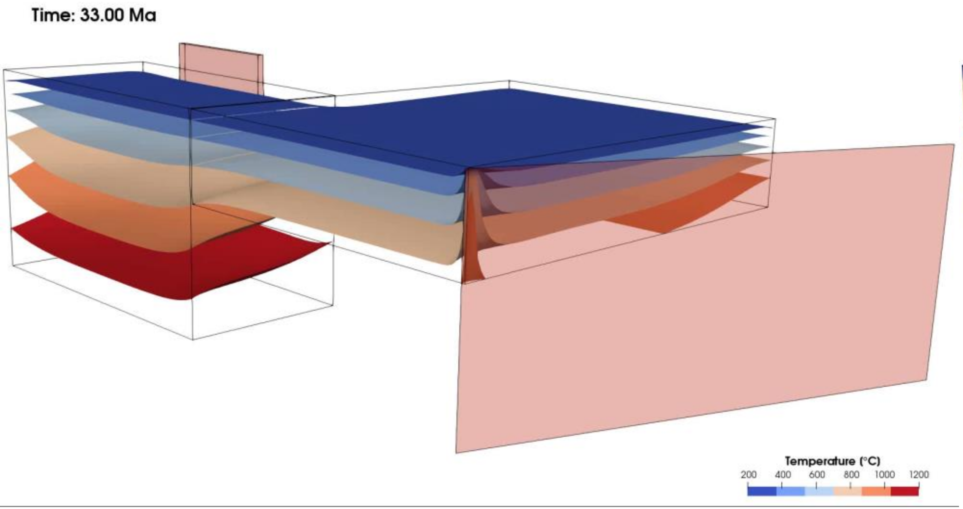
- Aegir Ridge is extinct during this stage.
- The IP and GIFRC Ridges split the Icelandic Plateau and the GIFRC, respectively. Spreading occurs symmetrically with a rate of 1cm/yr.
- Time step during this stage is 0.25 Myr.

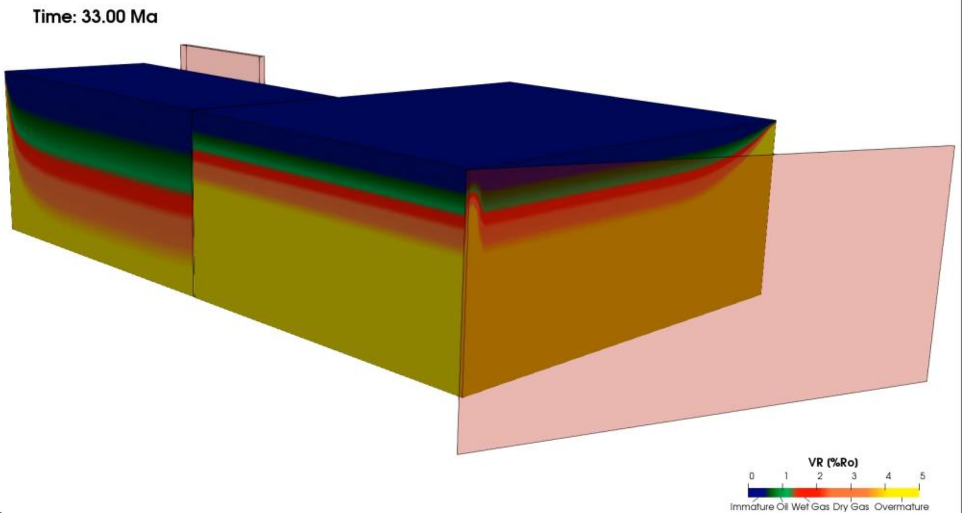
Stage 2 – Total Displacement (X) Per Time Step

Stage 2 – End Configuration (23.25 Ma)



Stage 2 – JMMC Temperature & Maturity

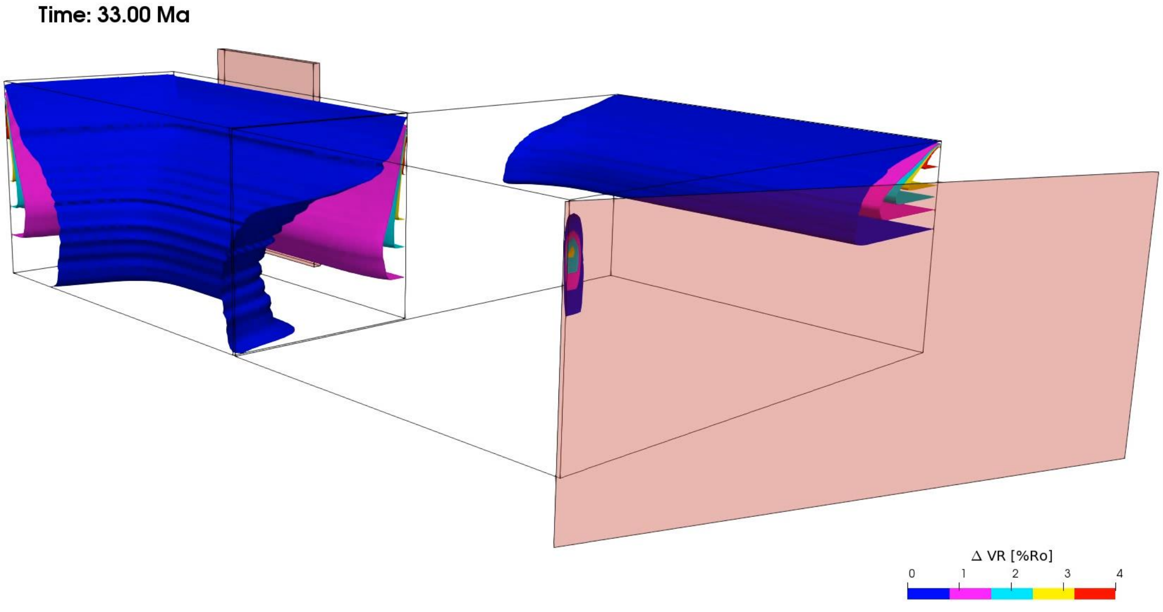


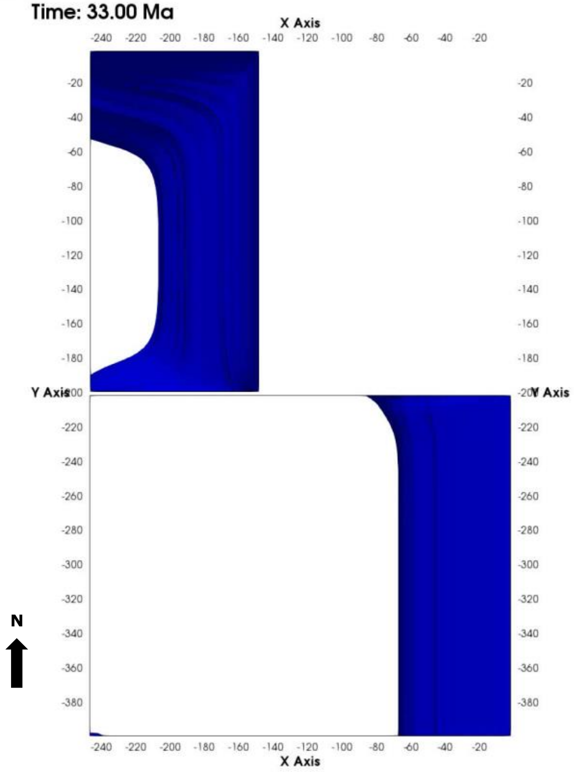


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Only the S JMMC receives heat directly from the Kolbeinsey (IP) Ridge from its southwestern corner bringing up isotherms in the region.
- The N JMMC receives some heat from its northern edge as relatively hot oceanic lithosphere formed at the Mohns Ridge moves past it.
- Maturity levels increase rapidly at and immediately around the southwestern corner of S JMMC.

Stage 2 – JMMC Differential Maturity

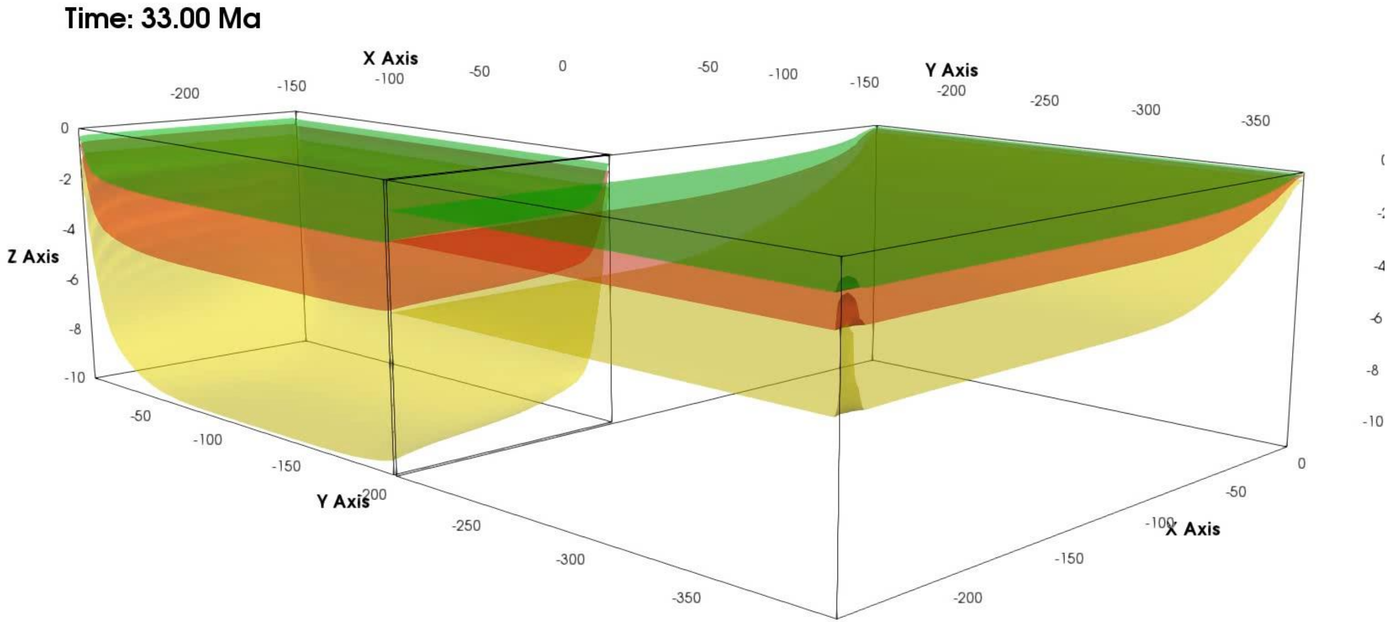




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Maturity levels increase close to the southwestern corner of the JMMC due to heat input from the Kolbeinsey (IP) Ridge.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values move into the JMMC with time. This covers most of the N JMMC during this stage. There is a small perturbation in maturity levels at the southwestern corner of the JMMC. The perturbation extends ~62 km from the eastern edge of the S JMMC showing a slight reduction in extent as compared to Stage 1.

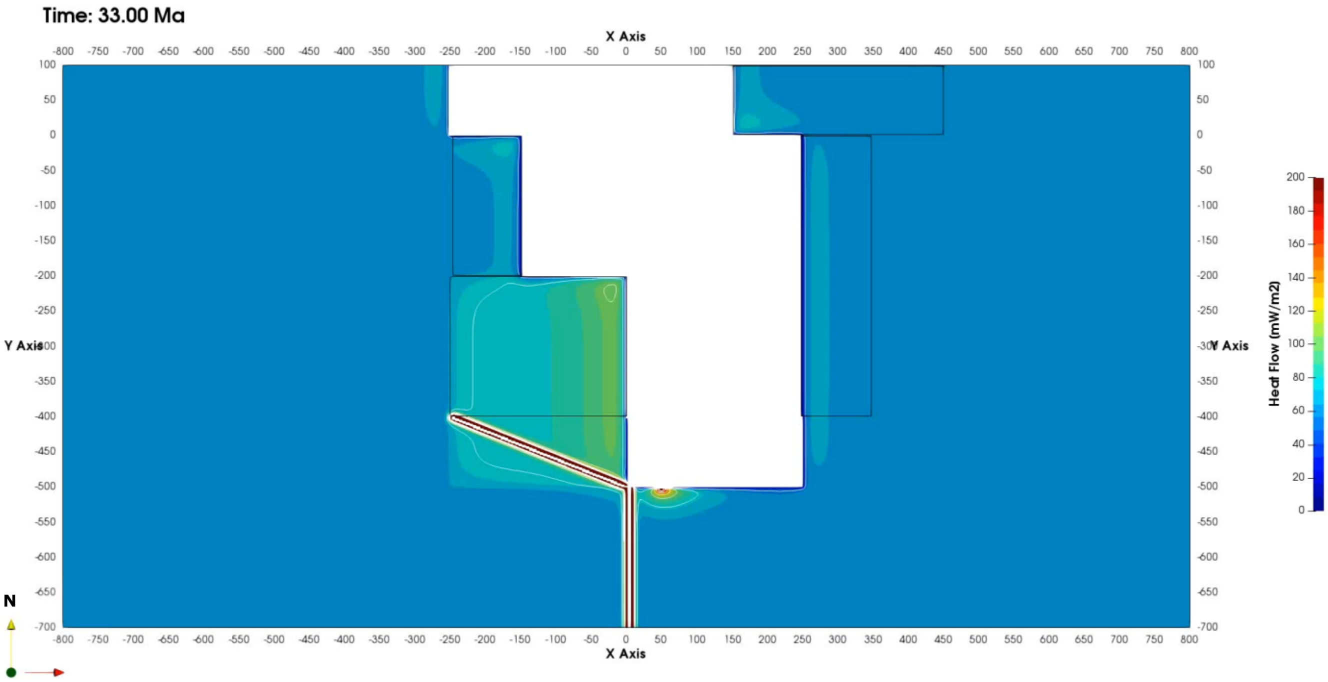
Stage 2 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

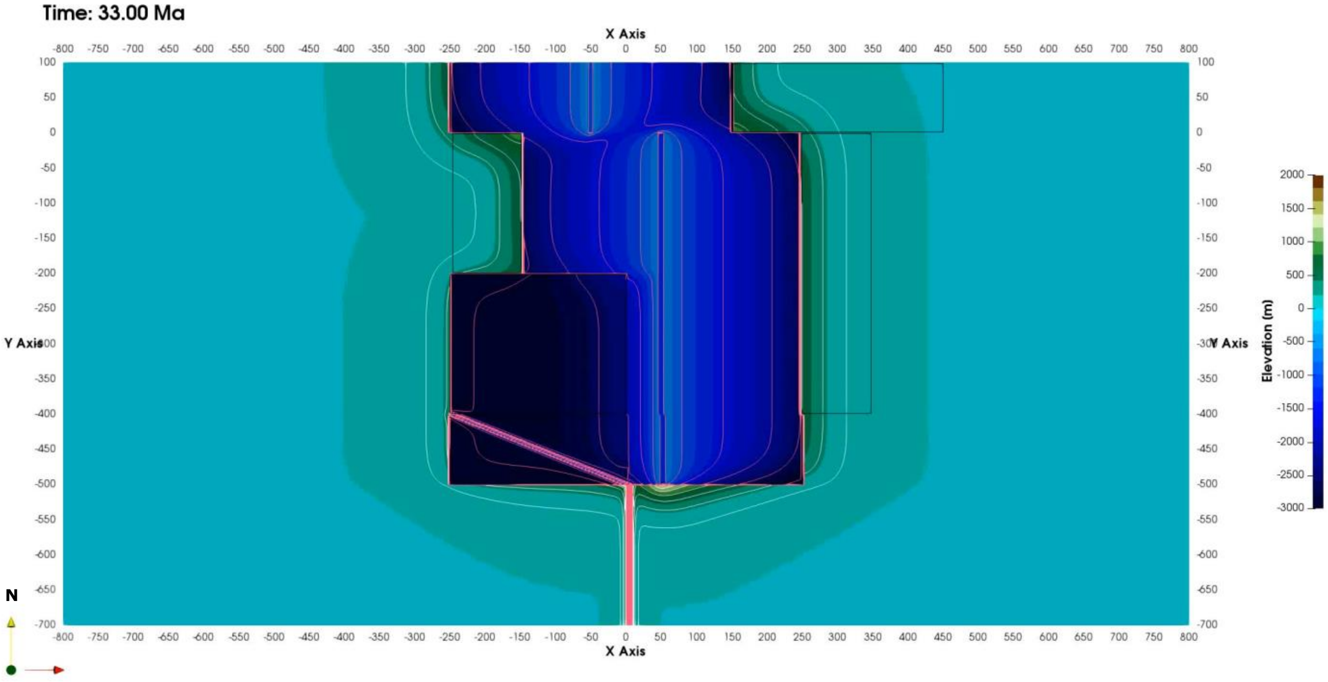
- The oil and gas windows are raised close to the southwestern edge in contact with the Kolbeinsey (IP) Ridge.

Stage 2 – Heat Flow



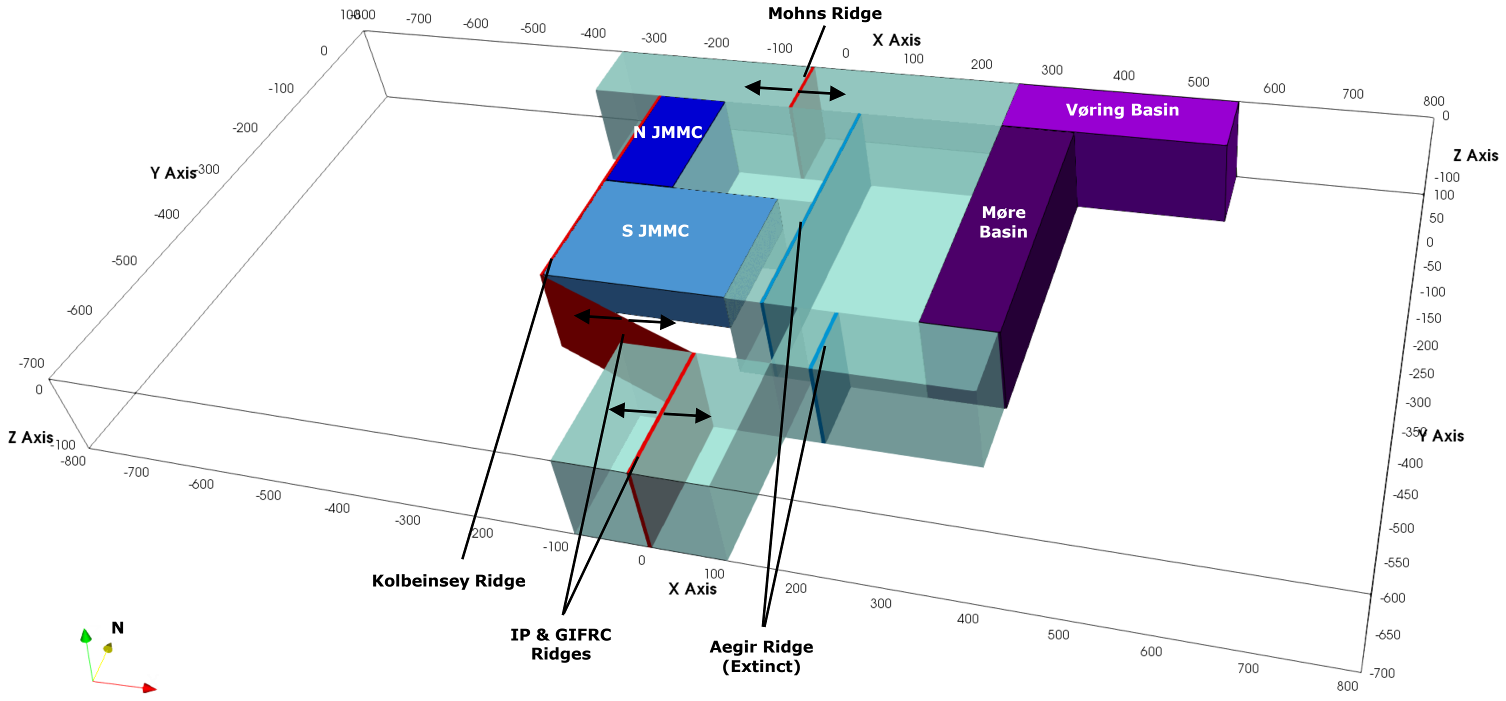
- Heat flow values in the N JMMC are slightly lowered as compared to the previous stage but do not return to background values as it receives some heat from oceanic lithosphere generated by the Mohns Ridge. Maximum heat flow values are recorded at the northeastern region and are only slightly higher than the background value (~68 mW/m^2) at the end of this stage.
- Heat flow values in most of the S JMMC decrease as it cools after rifting. Values close to the southwestern corner increase due to heat input from the Kolbeinsey (IP) Ridge but do not propagate significantly inwards due to the short time frame of this stage. Values of ~80 mW/m^2 are recorded close to the eastern edge.

Stage 2 - Uplift



- The entire N JMMC has experienced uplift at the end of this stage with most of the region experiencing more than 50 m uplift. The highest amount of uplift (~800 m) is recorded at the northeastern corner. Uplift decreases from east to west.
- The S JMMC subsides further as most of it cools during this stage. Only the southwestern edge of the S JMMC records relative uplift as it heated by the Kolbeinsey (IP) Ridge.

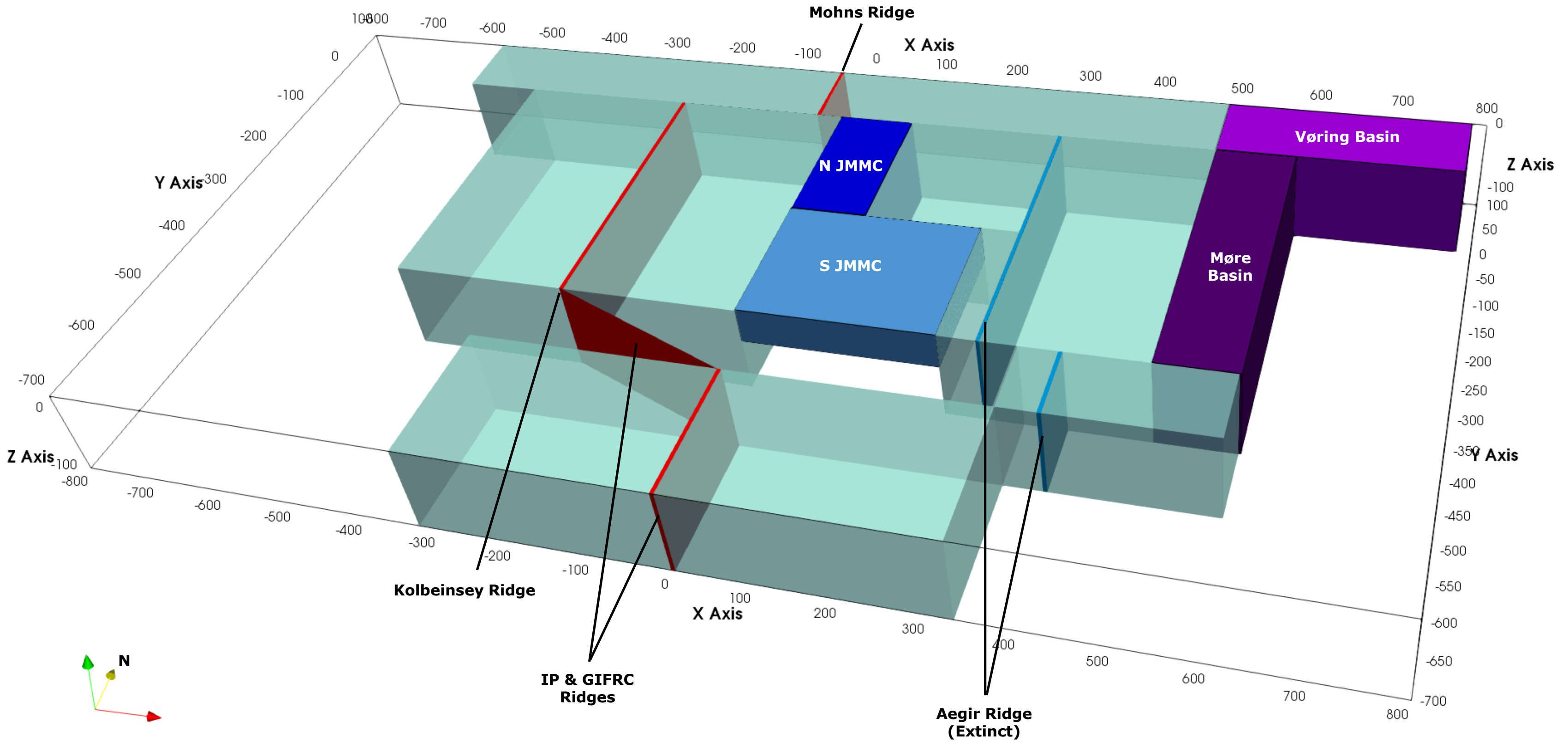
Stage 3 - Initial Configuration (23 Ma)



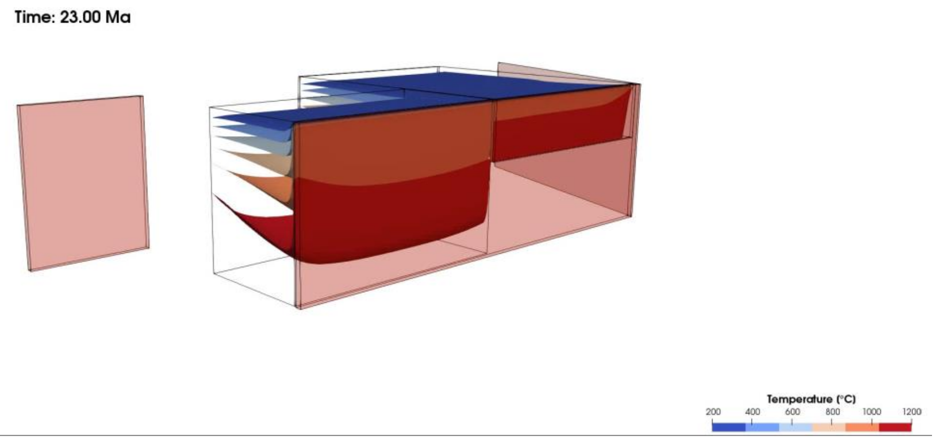
- The Kolbeinsey Ridge extends along the western border of the JMMC and starts spreading there.

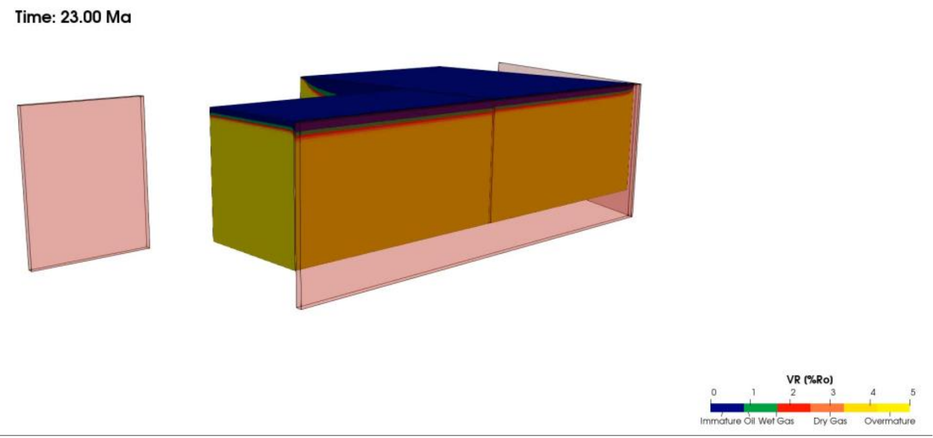
Stage 3 – Total Displacement (X) Per Time Step

Stage 3 – End Configuration (0 Ma)



Stage 3 – JMMC Temperature & Maturity

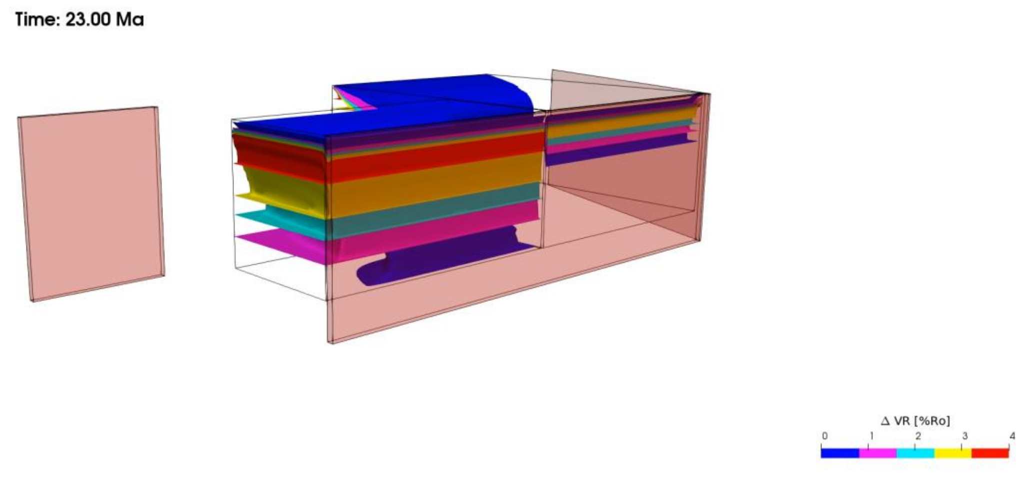


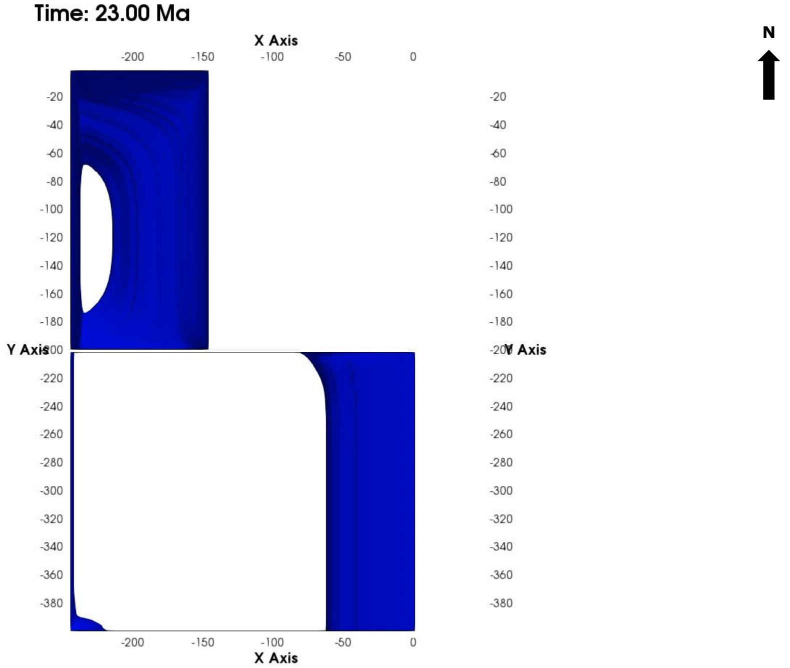


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The entire western edge of the JMMC receives heat from the Kolbeinsey Ridge that is active during this stage.
- The northern part of the N JMMC receives additional heat as the Mohns Ridge traverses the northern edge in the opposite direction.
- The JMMC cools once it moves away from the spreading centers.
- Maturity levels increase rapidly in regions close to the influence of spreading centers.

Stage 3 – JMMC Differential Maturity

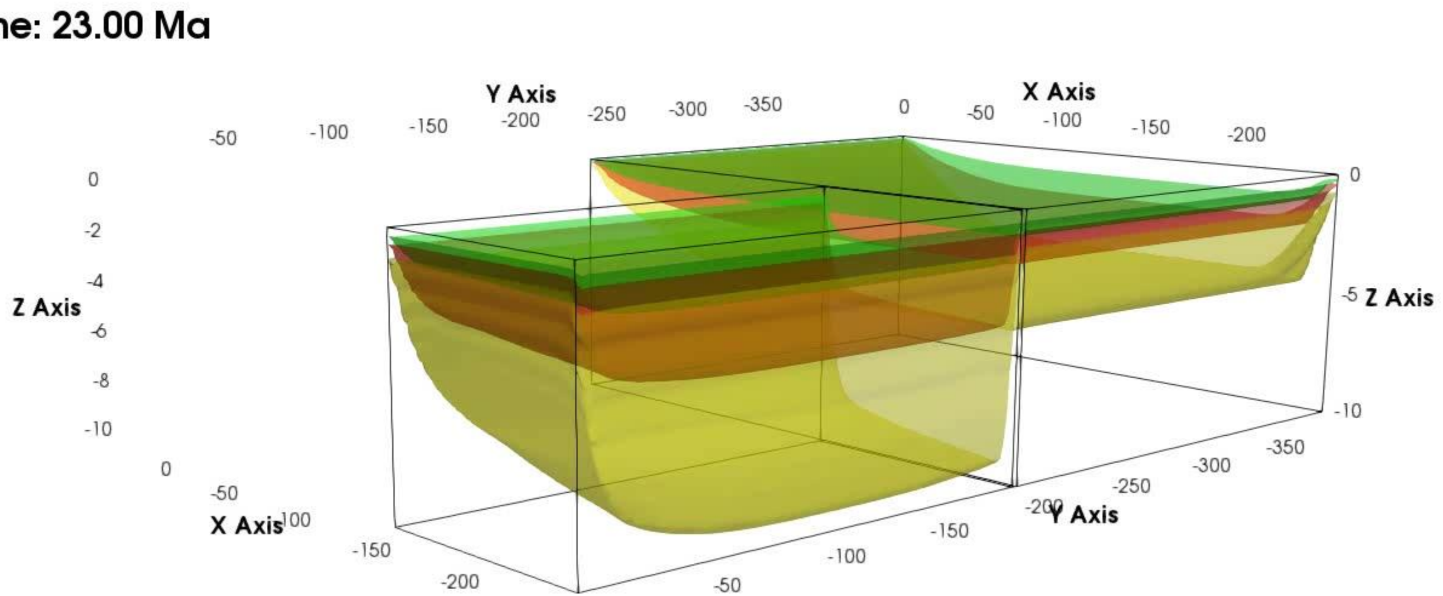




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Maturity levels increase close to the western edge of the JMMC due to heat input from the Kolbeinsey Ridge. They also increase in the northern part of the N JMMC due to the Mohns Ridge.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values covers all of the N JMMC during this stage. There is a minor perturbation in maturity levels at the southwestern corner and western edge of the S. JMMC. The perturbation extends ~60 km from the eastern edge of the S JMMC showing a slight reduction in extent as compared to the other stages.

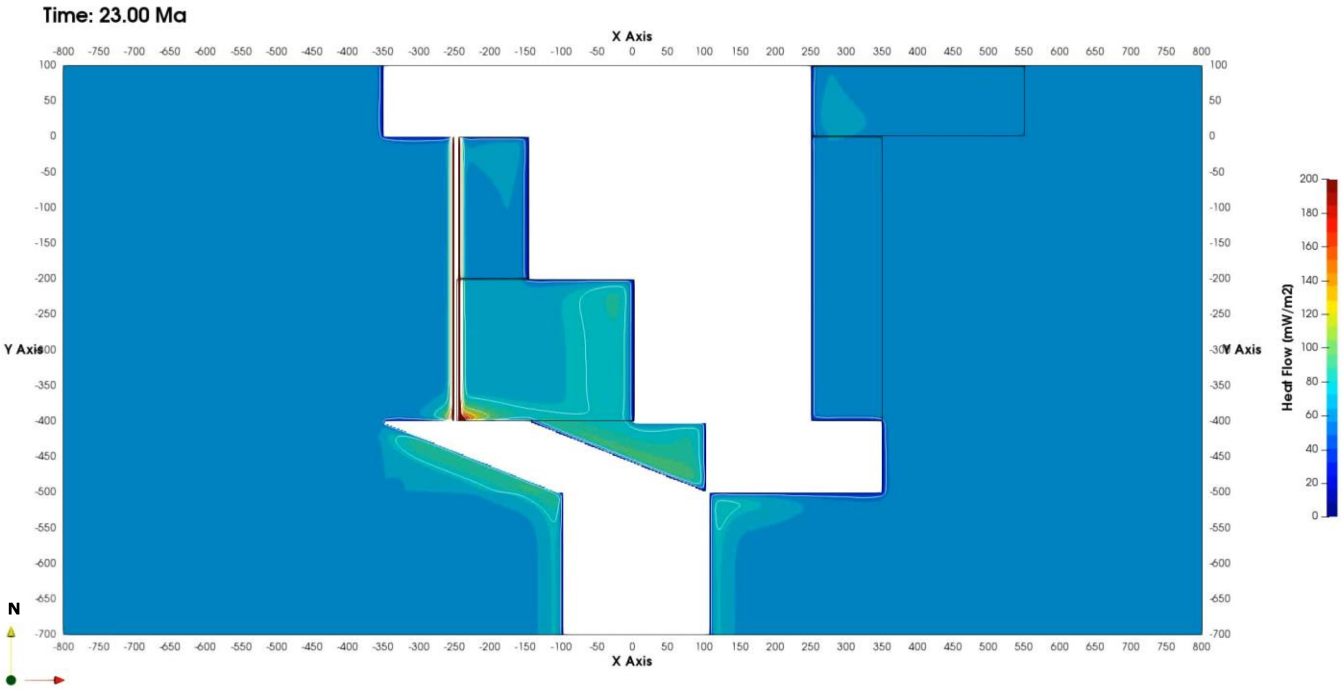
Stage 3 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

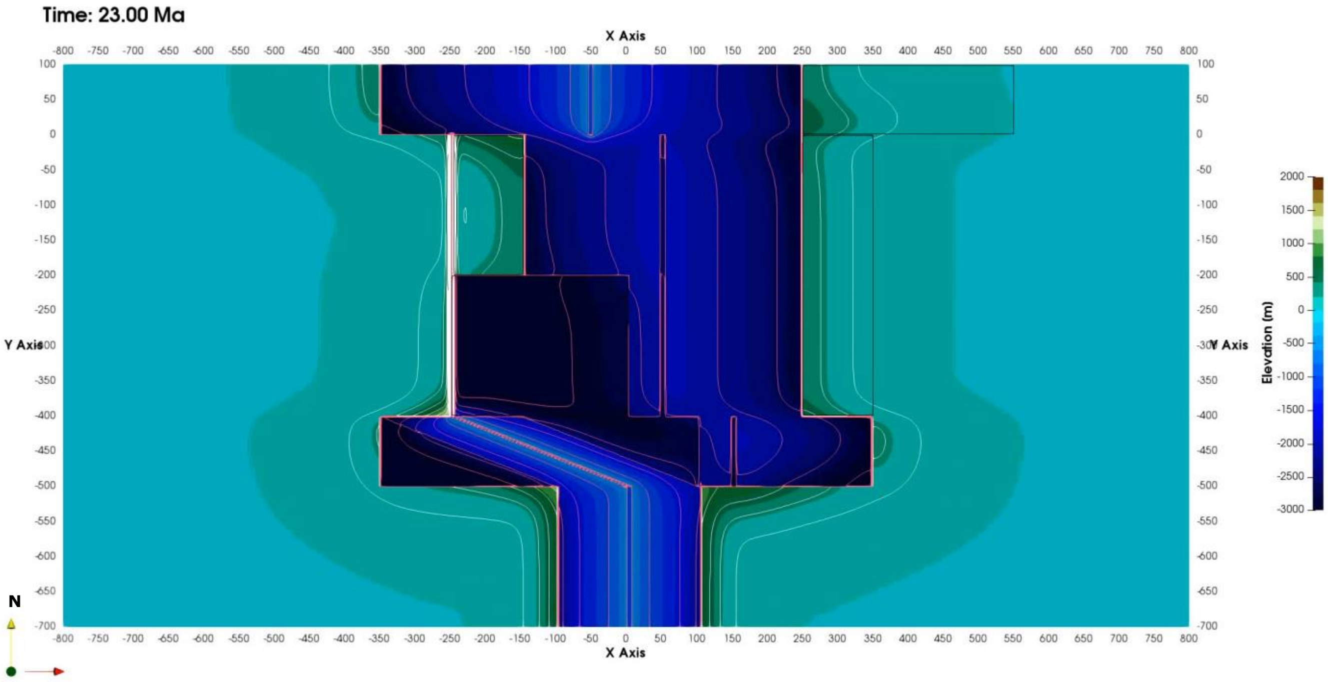
- The oil and gas windows are raised close to the western edge in contact with the Kolbeinsey Ridge.
- The windows are also raised in the northern part of N JMMC as the Mohns Ridge traverses it.

Stage 3 – Heat Flow



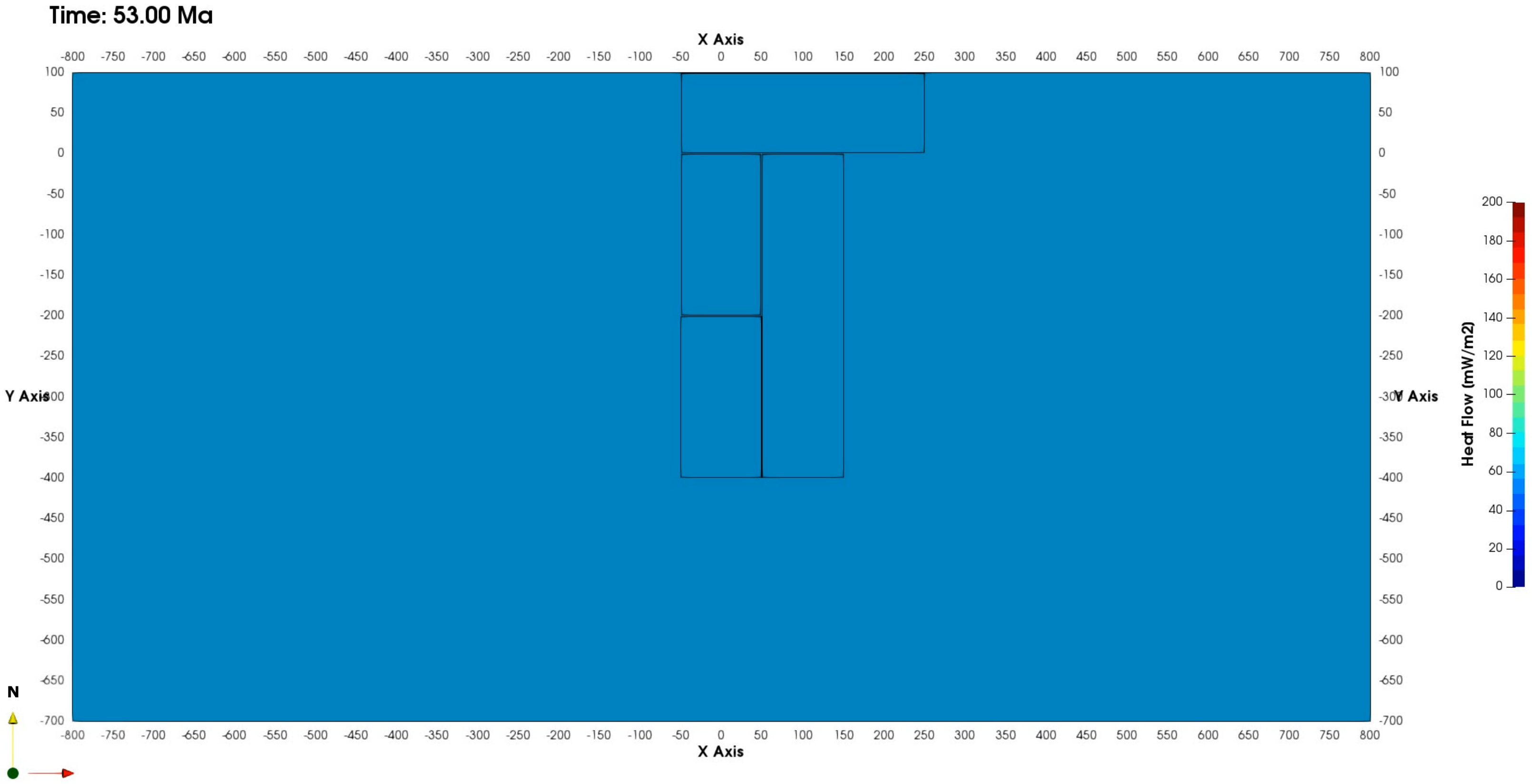
- Heat flow values in the JMMC increase as it is heated by the Kolbeinsey Ridge from the western edge. The N JMMC also receives heat from the Mohns Ridge as it passes by along the northern edge in the opposite direction from previous stages.
- Heat flow values reduce once the JMMC moves away from the spreading centers.
- Present-day heat flow values in the N JMMC reach a maximum of ~90 mW/m^2 in the northwestern corner and decreases towards the southeastern corner. The maximum value in the S JMMC is found in the southwestern corner and is lower (~71 mW/m^2) than the maximum in the N JMMC. Values decrease to background values towards the northeastern corner.

Stage 3 - Uplift

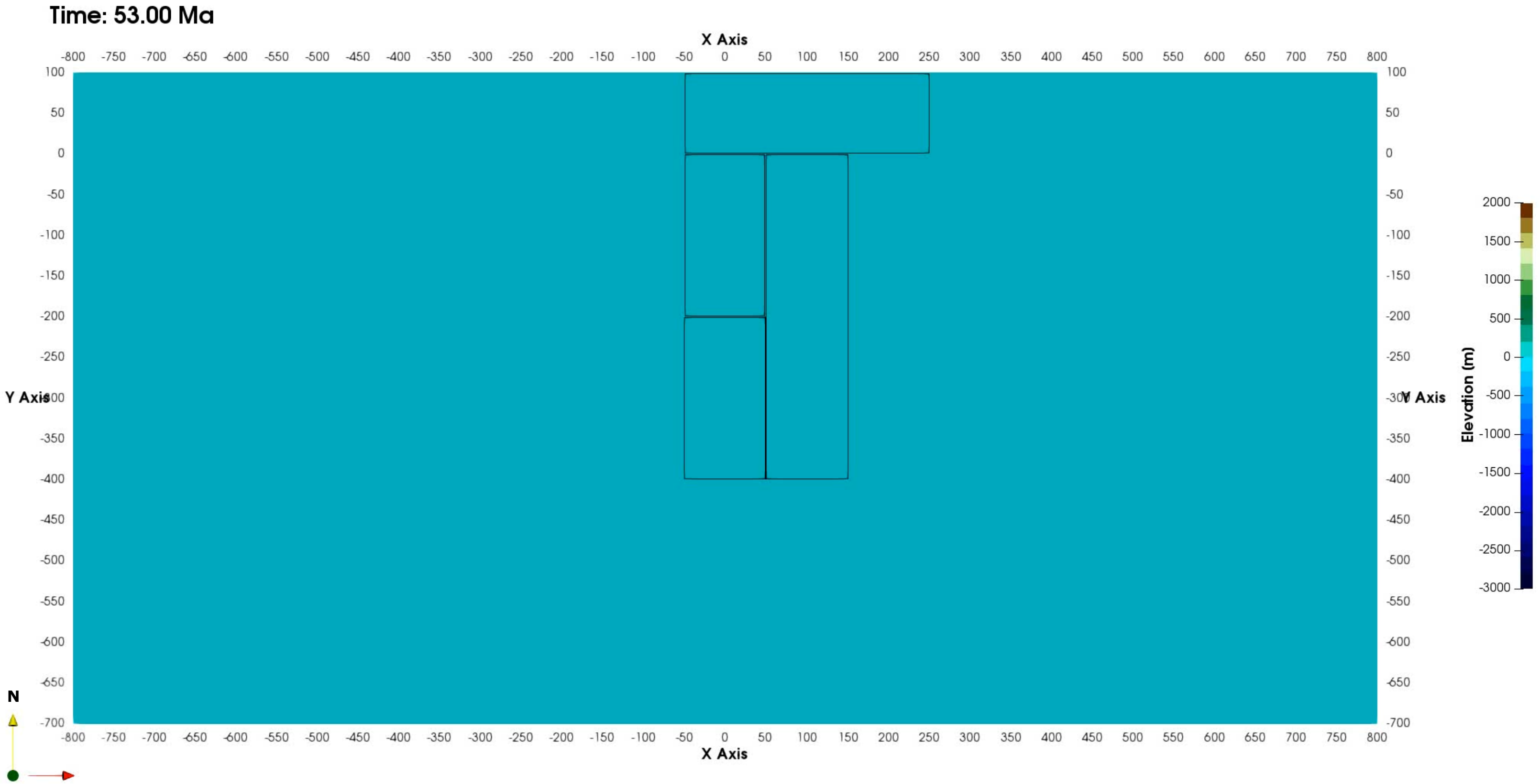


- The entire western edge of the JMMC experiences (relative) uplift as it is heated by the Kolbeinsey Ridge. The northern edge of N JMMC also experiences additional uplift due to the Mohns Ridge. The amount of uplift reduces as the JMMC moves away from the ridges and cools.
- The present-day uplift predicted by the model in the N JMMC is ~1200 m at the northwestern edge and reduces down to ~150 m at the southeastern edge.
- The present-day subsidence in the S JMMC is lowest at the southwestern edge (~-2800 m) and highest in the northern part (~ -3600 m). Note that the model does not take into account basin infill and erosion. Therefore, the prediction of uplift or subsidence should be realized as general tilt directions for the JMMC and not taken as absolute values.

Heat Flow



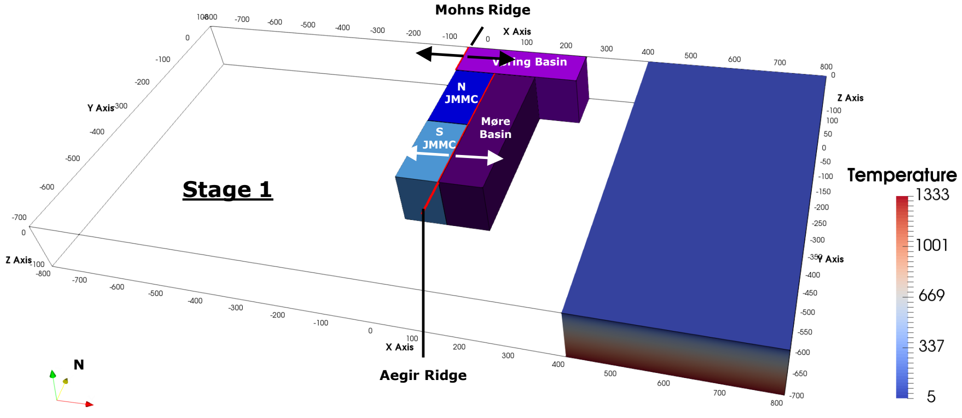
Uplift

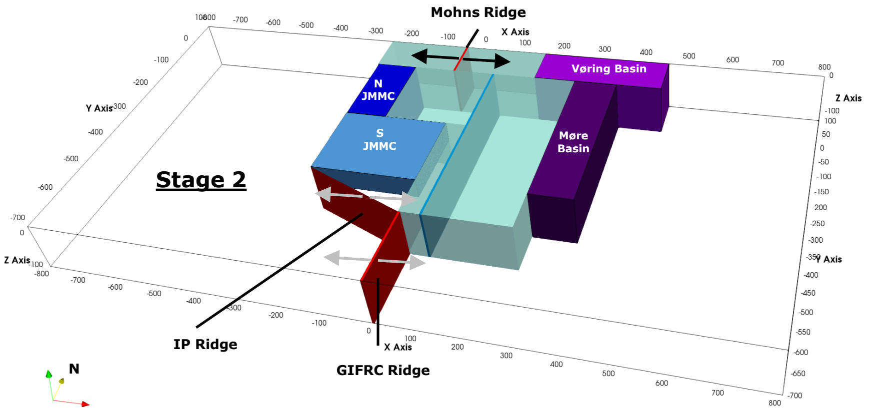

Time: 53.00 Ma
X Axis
Y Axis
N
Elevation (m)
2000
1500
1000
500
0
-500
-1000
-1500
-2000
-2500
-3000

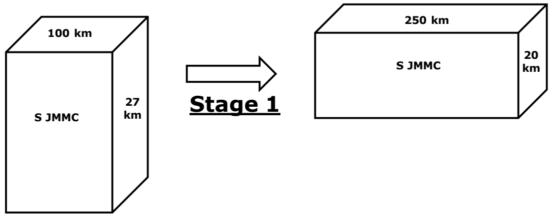
3D JMMC Model

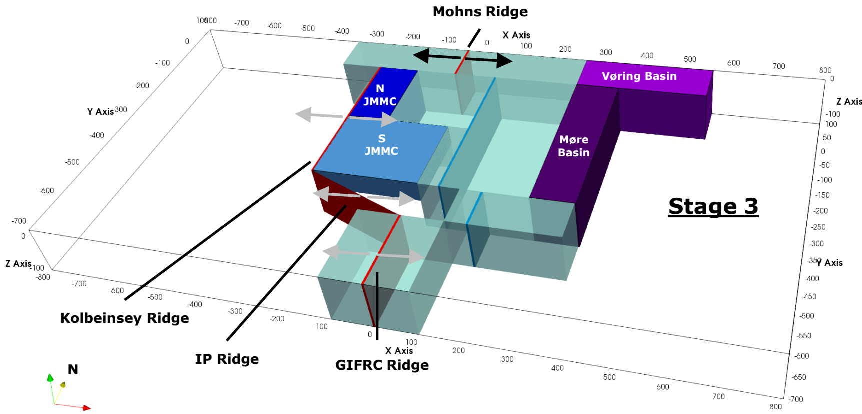
Run 3

Run 3: Setup

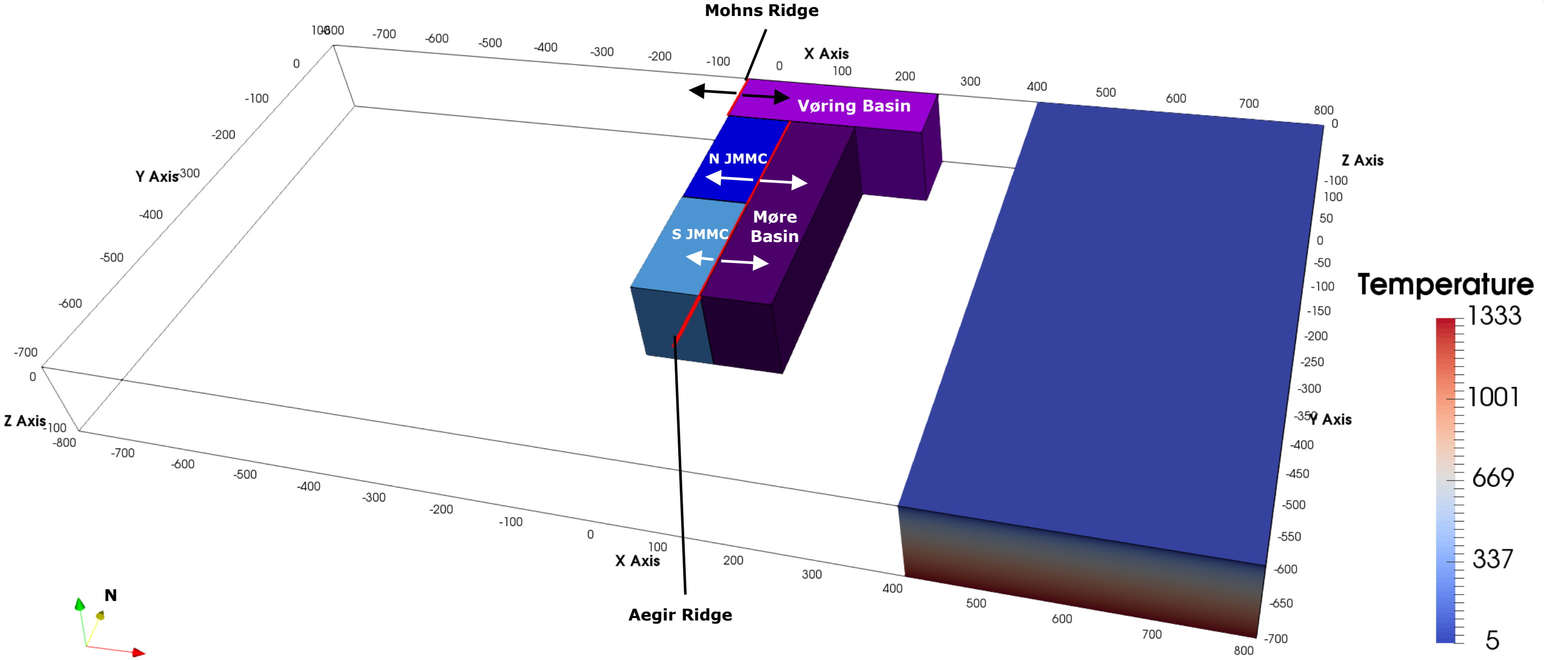

Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 1
Aegir Ridge
X Axis
Y Axis
Z Axis
N
Temperature
1333
1001
669
337
5


Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 2
IP Ridge
GIFRC Ridge
X Axis
Y Axis
Z Axis
N


100 km
S JMMC
27 km
Stage 1
250 km
S JMMC
20 km

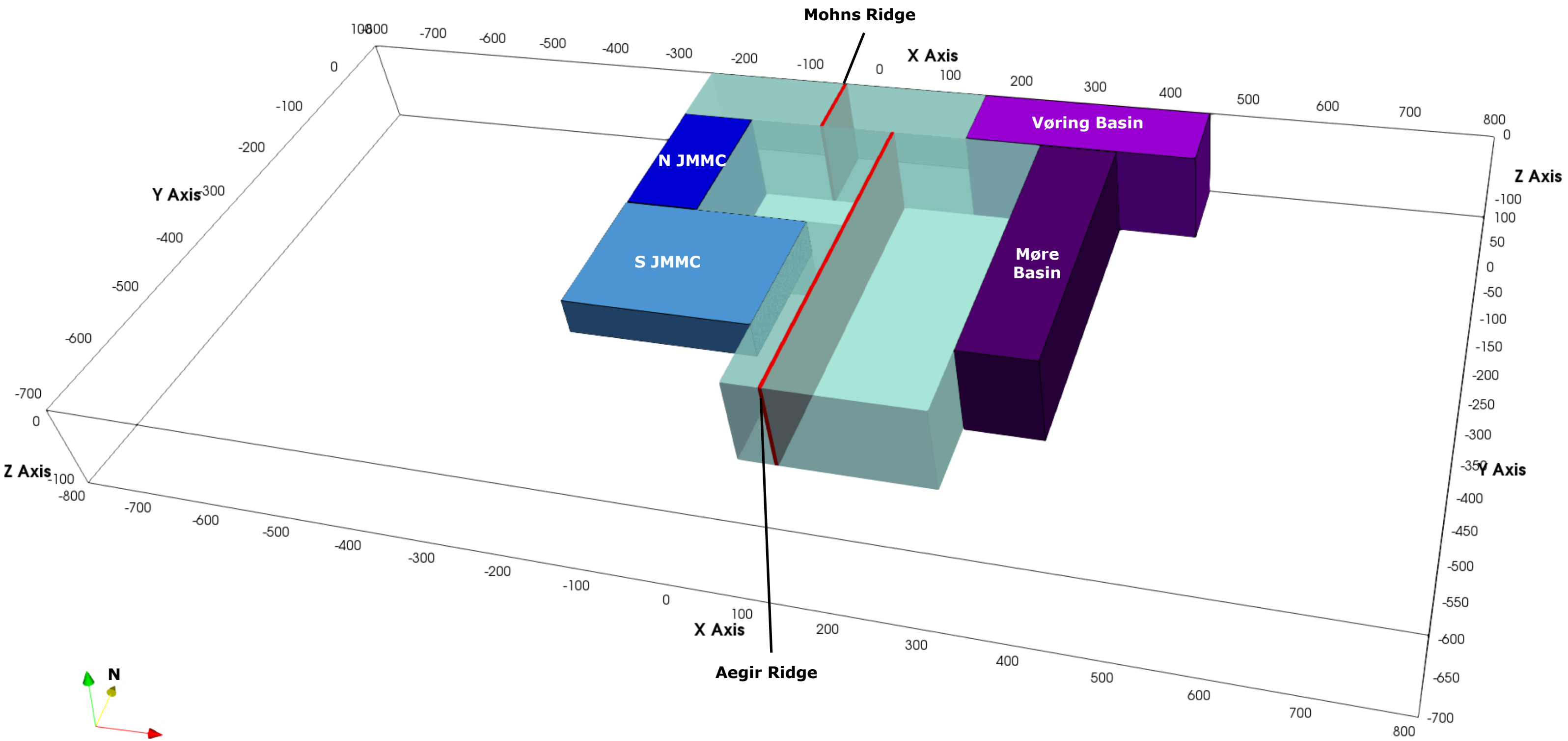

Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 3
Kolbeinsey Ridge
IP Ridge
GIFRC Ridge
X Axis
Y Axis
Z Axis
N

Stage 1 - Initial Configuration (53 Ma)

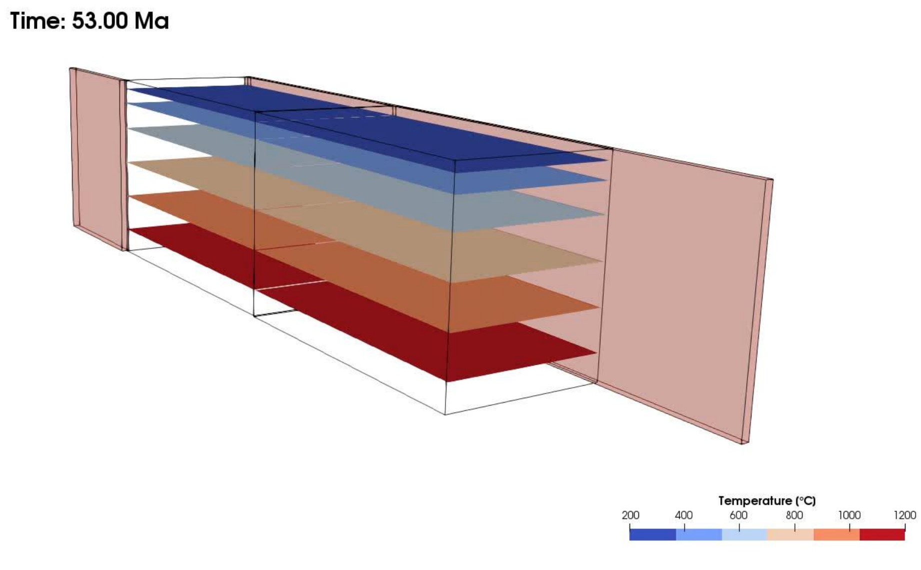


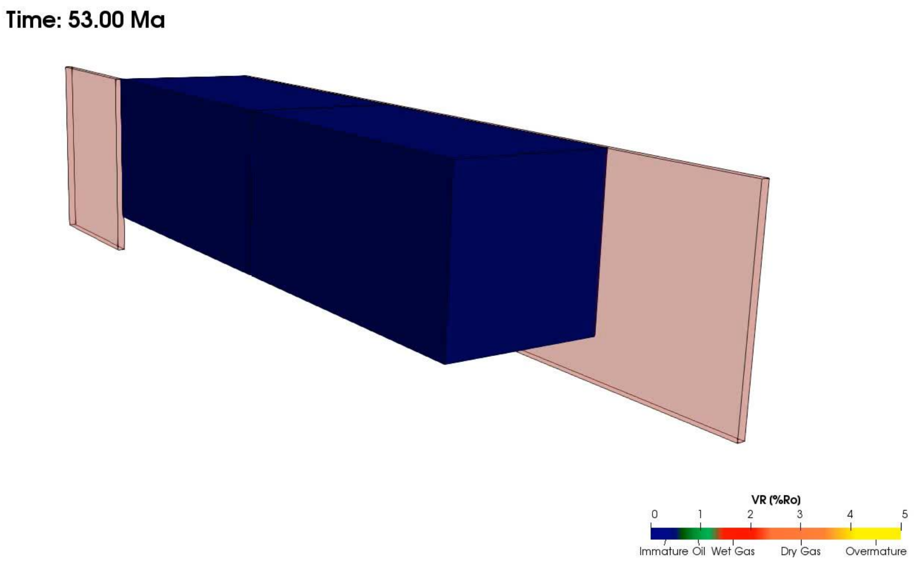
- Initialized to continental lithosphere everywhere and steady-state temperature. Top surface set to 5°C and bottom boundary to 1333°C. Ridges are emplaced at 1333°C and are 5 km wide.
- The widths of the northern and southern parts of the JMMC are 100 km initially. Initially, the sediment cover is 6 km deep and the Moho is at a depth of 27 km.
- The Mohns and the northern part of the Aegir Ridges spread symmetrically at 1 cm/yr (half-spreading rate). The southern part of the Aegir ridge spreads asymmetrically; 1 cm/yr to the east and 0.25 cm/yr to the west. The southern part of the JMMC (and the IP) undergoes rifting at the same time such that it extends in width at a rate of 0.75 cm/yr taking up the difference resulting from the asymmetrical spreading. The western edge of the N and S JMMC are therefore aligned with each other at all times. The time step during this stage is 1 Myr.
- Extension of the SJMMC and the IP is compensated by thinning of the continental crust. The final configuration of the SJMMC and IP is sediments and crust that are ~ 4.5 and 20 km deep, respectively.

Stage 1– End Configuration (33.25 Ma)



Stage 1 – JMMC Temperature & Maturity

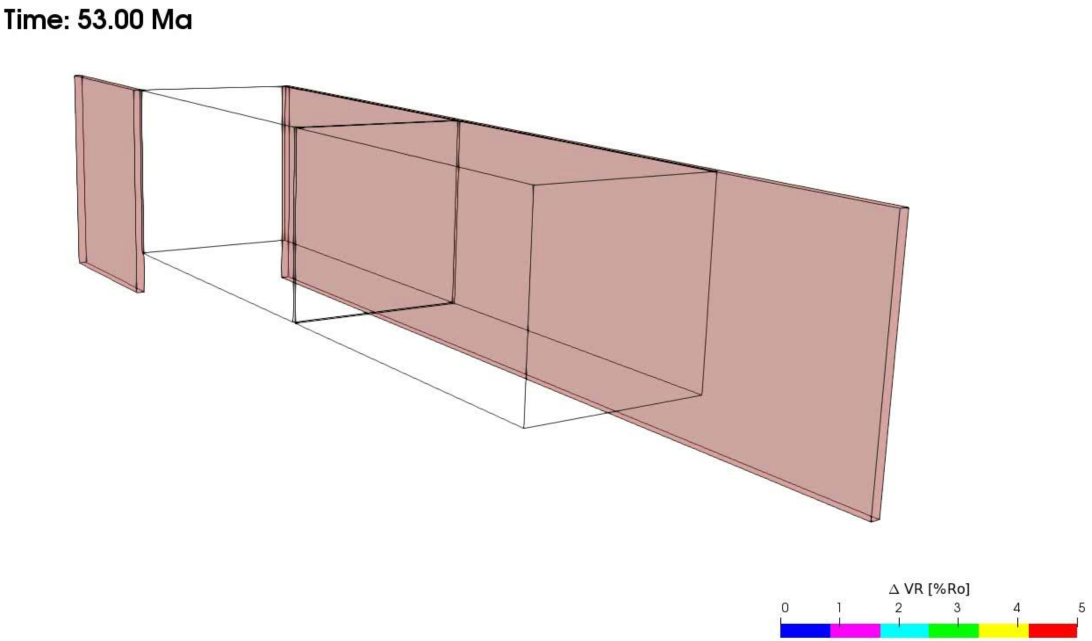


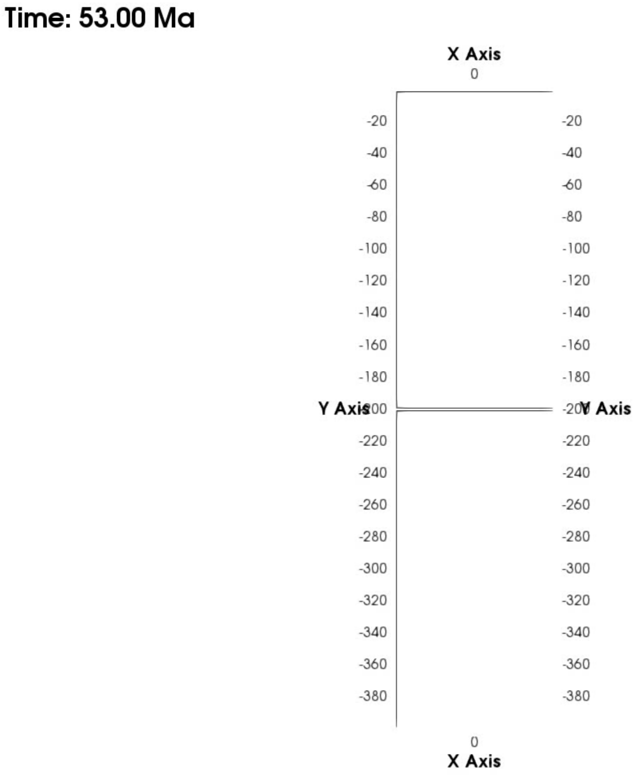


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The JMMC receives heat from the Aegir Ridge at its eastern edge. The influence of the Aegir Ridge on the JMMC decreases as the JMMC moves away and is abutted by increasingly colder and older oceanic lithosphere.
- The temperature in the S JMMC also increases as rifting progresses.
- The N JMMC also receives heat via its northern edge as it passes the Mohns Ridge.
- Maturity increases significantly and quickly to the maximum at the edges of the JMMC that are in contact with the hot ridge. Maturity of sediments inwards from the edges increases gradually as the thermal effects of the ridges propagates into the microcontinent.

Stage 1 – JMMC Differential Maturity

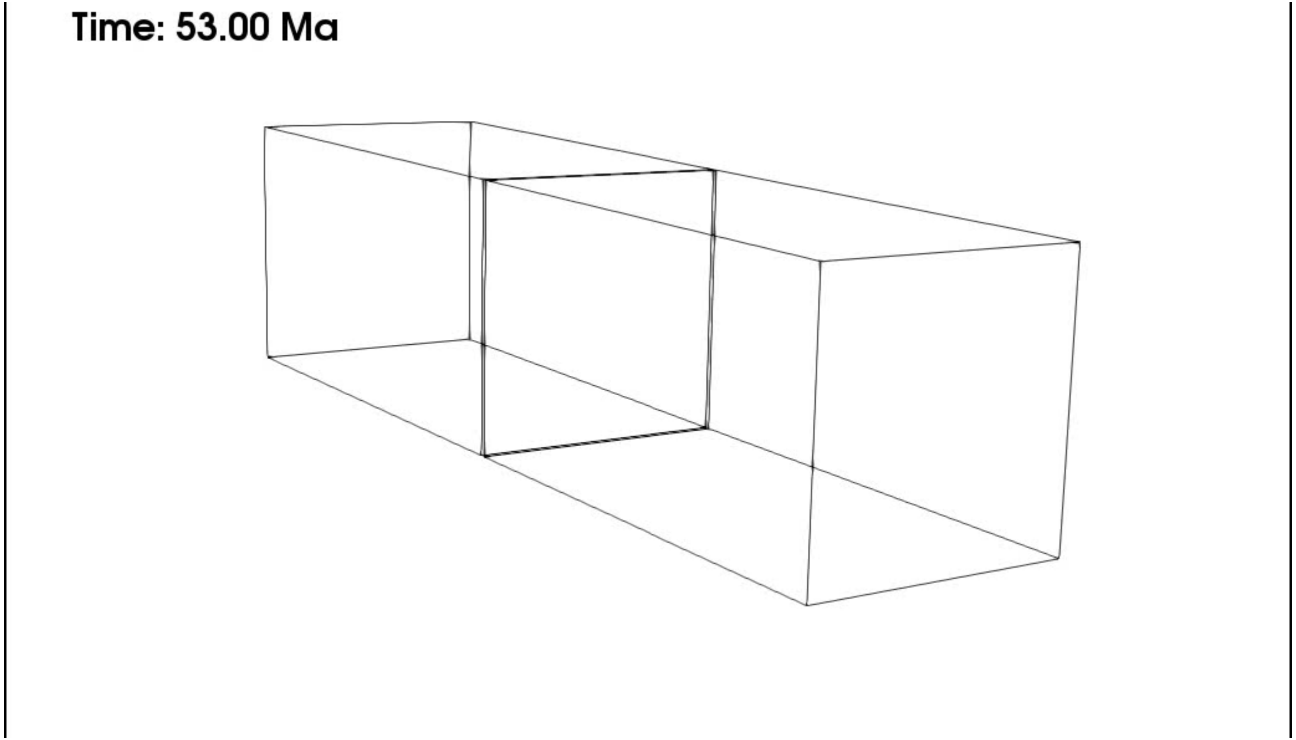




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Higher maturity levels in the S JMMC migrate up towards shallower depths as the isotherms become shallower during rifting.
- Maturity levels at the southern edge of the N JMMC are also affected by the rifting of the S JMMC and show increase in maturity.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values in the N JMMC is observed ~60 inwards from the eastern (Aegir Ridge influence) and the northern edges (Mohns Ridge influence. The perturbation has also moved inwards from the southern edge of the N JMMC by ~20 km due to rifting in the S JMMC. The S JMMC shows a perturbation in maturity levels ~80 km away from the eastern edge.

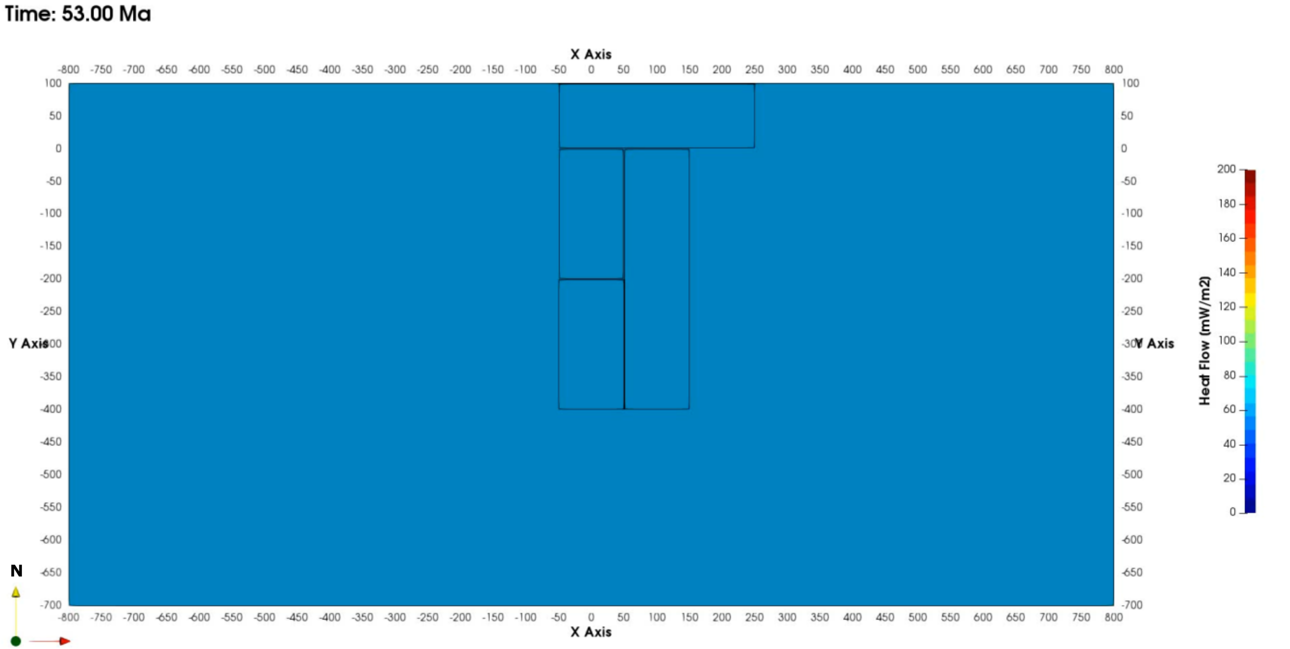
Stage 1 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

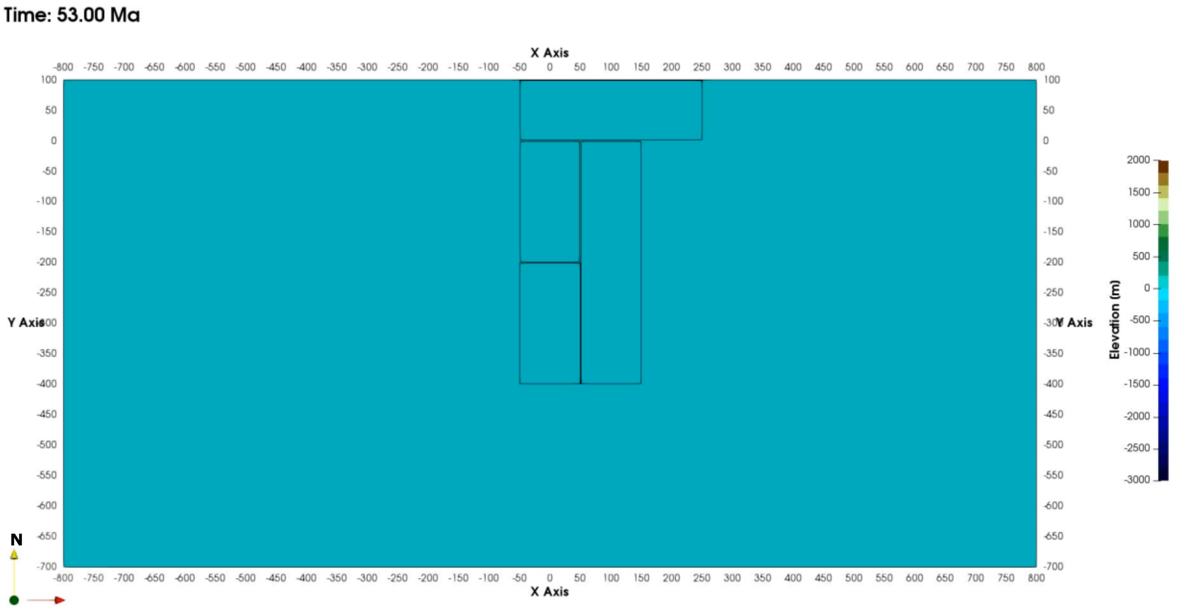
- The initial oil and gas window tops (background values) are at ~3 and 5.5 km, respectively.
- These windows are very shallow close to edges in contact with ridges and are raised up within the microcontinent as heat is progressively transferred into the JMMC during this stage by the ridges and by rifting of S JMMC.

Stage 1 – Heat Flow



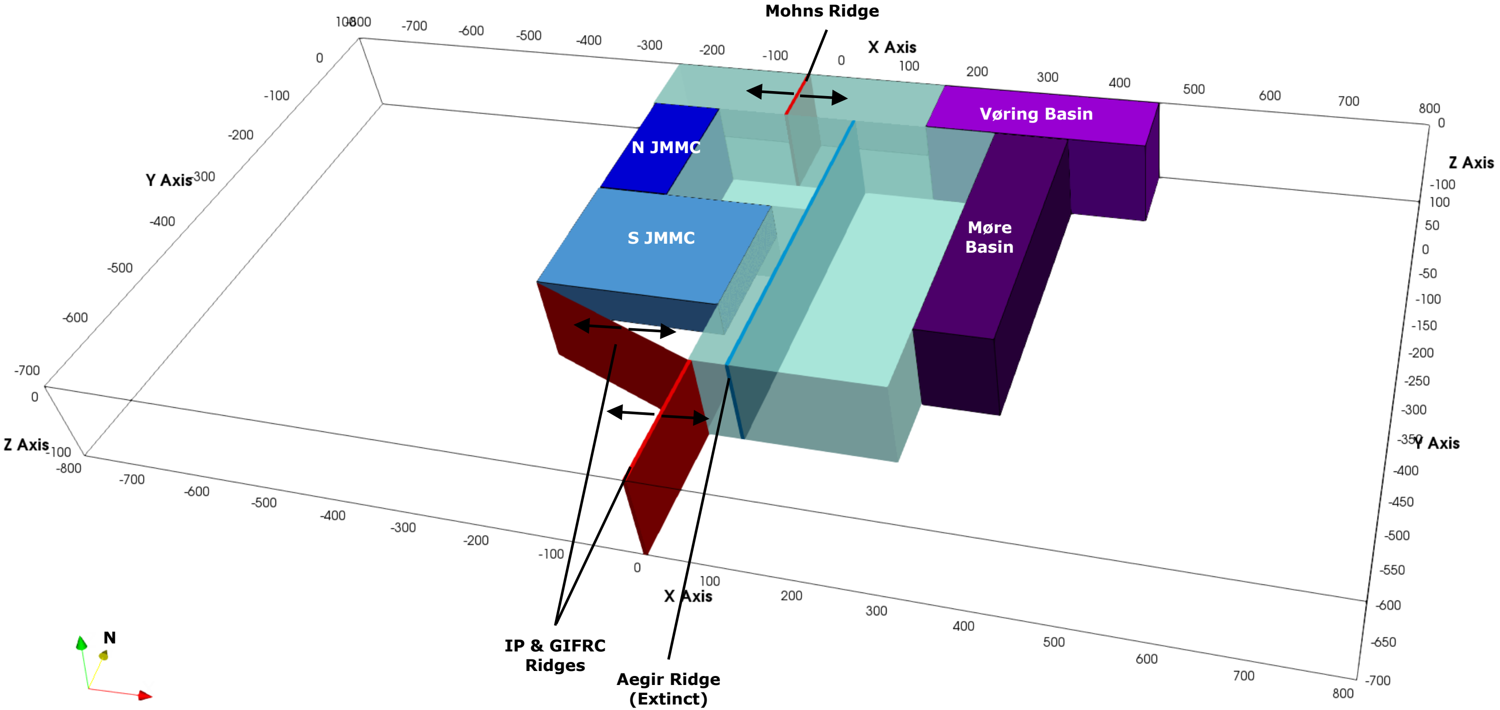
- Maximum heat flow values (~200 mW/m^2) occur within the continent close to the contact with the ridge where it is the hottest and spreads out away from there. Heat flow values decrease as the continent moves away from the spreading centers.
- An asymmetry develops in the regions with increased heat flow as they move away from the ridges during ocean spreading.
- The S JMMC shows heat flow values higher than the N JMMC as it is rifted.
- An increase in heat flow (~75 mW/m^2) relative to the background value (59 mW/m^2) is observed in the region around the northeastern corner of the N JMMC and in most of the S JMMC where it reaches values up to 90 mW/m^2.
- Contour values are between 50 and 200 mW/m^2 in steps of 25 mW/m^2.

Stage 1 - Uplift



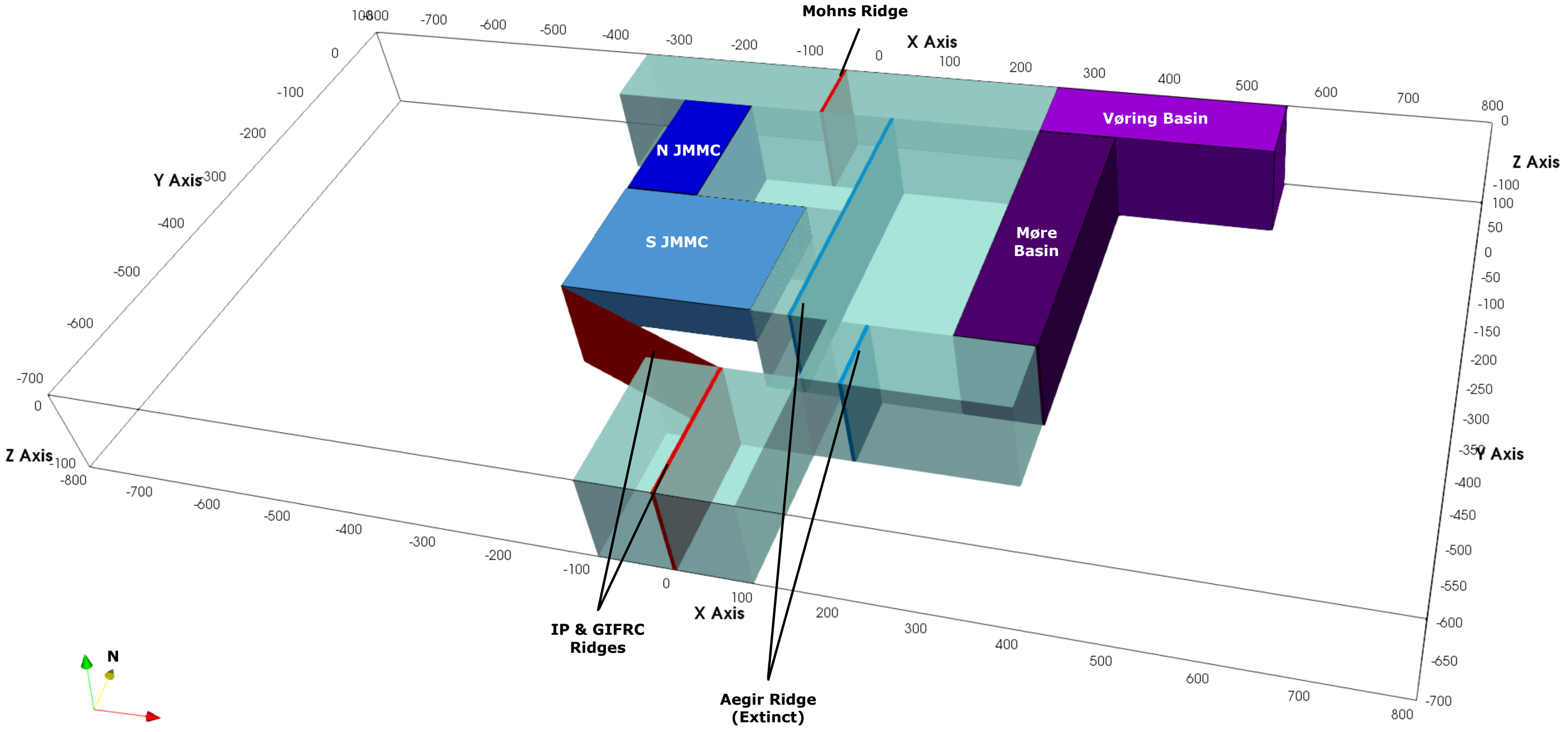
- Continental uplift/subsidence is calculated based on the principle of local isostasy relative to the initial continental lithosphere.
- Maximum uplift (~2000 m) occurs within the continent close to the contact with the ridge where it is the hottest and spreads out away from there.
- Uplift decreases as the continents move away from the spreading centers and cool with an asymmetry developing in the uplifted continental lithosphere as they move away from the ridges during ocean spreading.
- The S JMMC subsides (max. ~-1300 m) as it thins bringing up hot mantle upwards resulting in a dense lithospherical column relative to the initial continental configuration. The amount of subsidence is less than that in the previous model where rifting of the S JMMC results in a thinner crust. The eastern edge undergoes some uplift as heating by the Aegir Ridge is sufficient to counteract rifting.
- Most of the N JMMC has experienced uplift by the end of Stage 1 except for a small region at the western edge. Contour values for uplift are between 250 and 1750 m with a stepping of 250m and an additional contour at 50m. Contour values for subsidence are between -500 and -3000 m with a stepping of -500m.

Stage 2 - Initial Configuration (33 Ma)

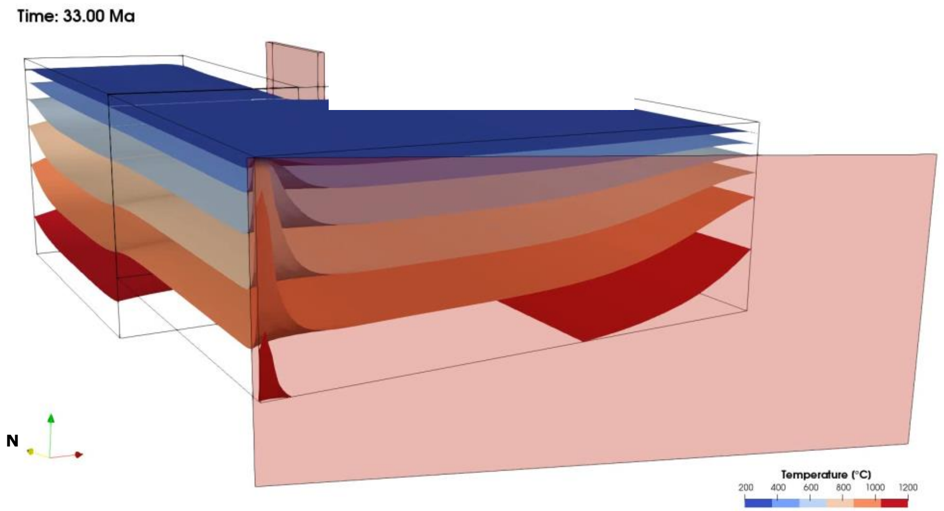


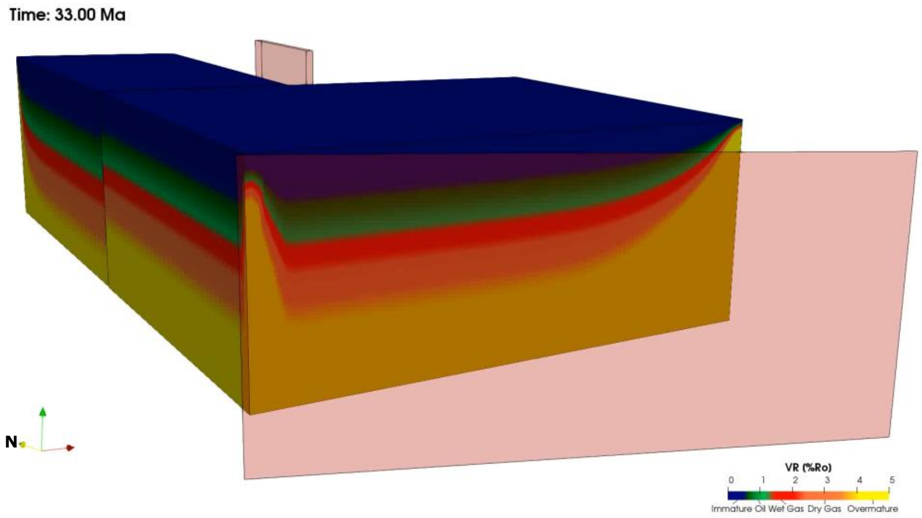
- Aegir Ridge is extinct during this stage.
- The IP and GIFRC Ridges split the Icelandic Plateau and the GIFRC, respectively. Spreading occurs symmetrically with a rate of 1cm/yr.
- Time step during this stage is 0.25 Myr.

Stage 2 – End Configuration (23.25 Ma)



Stage 2 – JMMC Temperature & Maturity

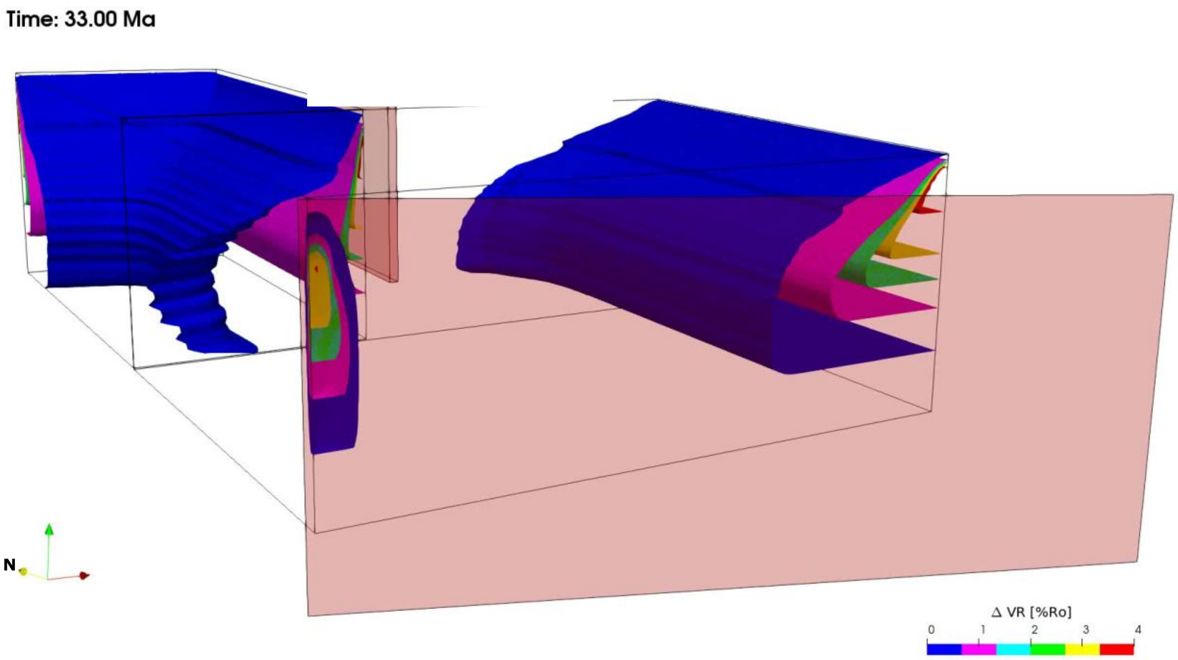


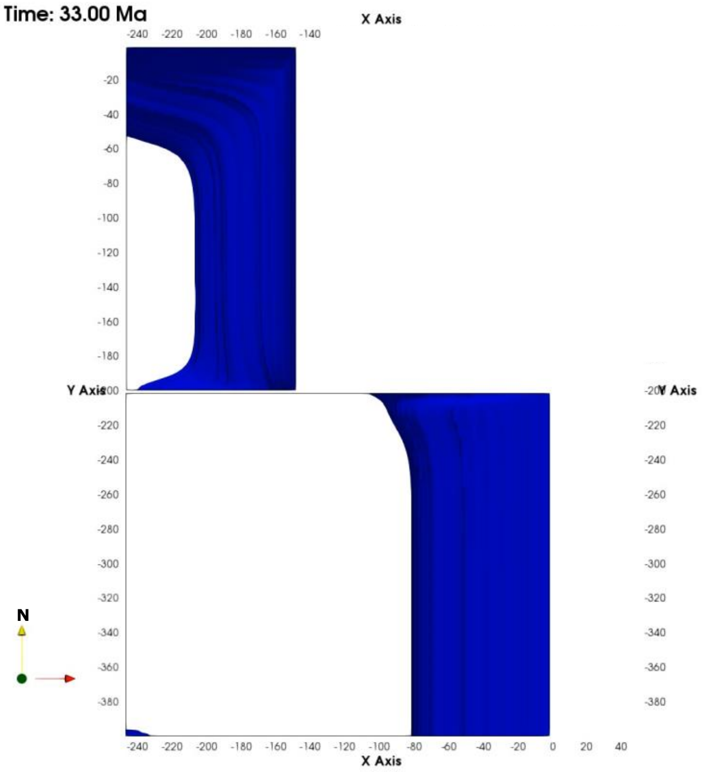


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Only the S JMMC receives heat directly from the Kolbeinsey (IP) Ridge from its southwestern corner bringing up isotherms in the region.
- The N JMMC receives some heat from its northern edge as relatively hot oceanic lithosphere formed at the Mohns Ridge moves past it.
- Maturity levels increase rapidly at and immediately around the southwestern corner of S JMMC.

Stage 2 – JMMC Differential Maturity

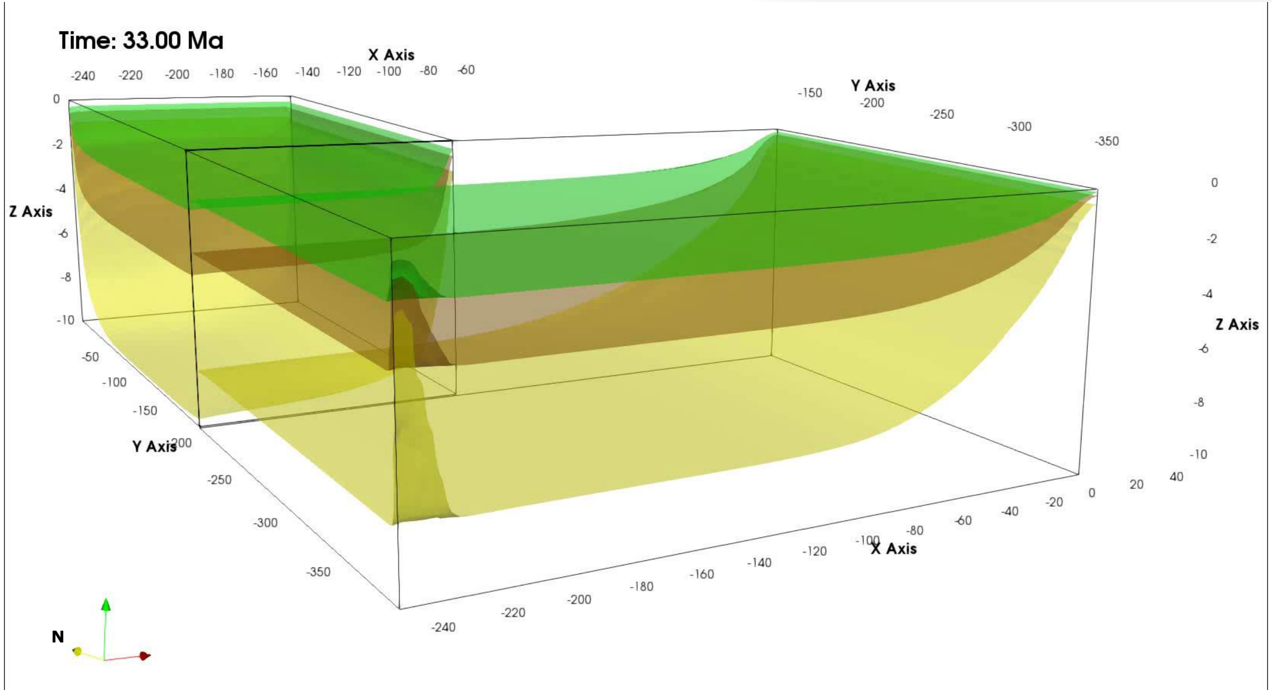




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Maturity levels increase close to the southwestern corner of the JMMC due to heat input from the Kolbeinsey (IP) Ridge.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values move into the JMMC with time. This covers most of the N JMMC during this stage. There is a perturbation in maturity levels at the southwestern corner of the S JMMC which extends ~20 km into the S JMMC. The perturbation extends ~75 km from the eastern edge of the S JMMC showing a slight reduction in extent as compared to Stage 1.

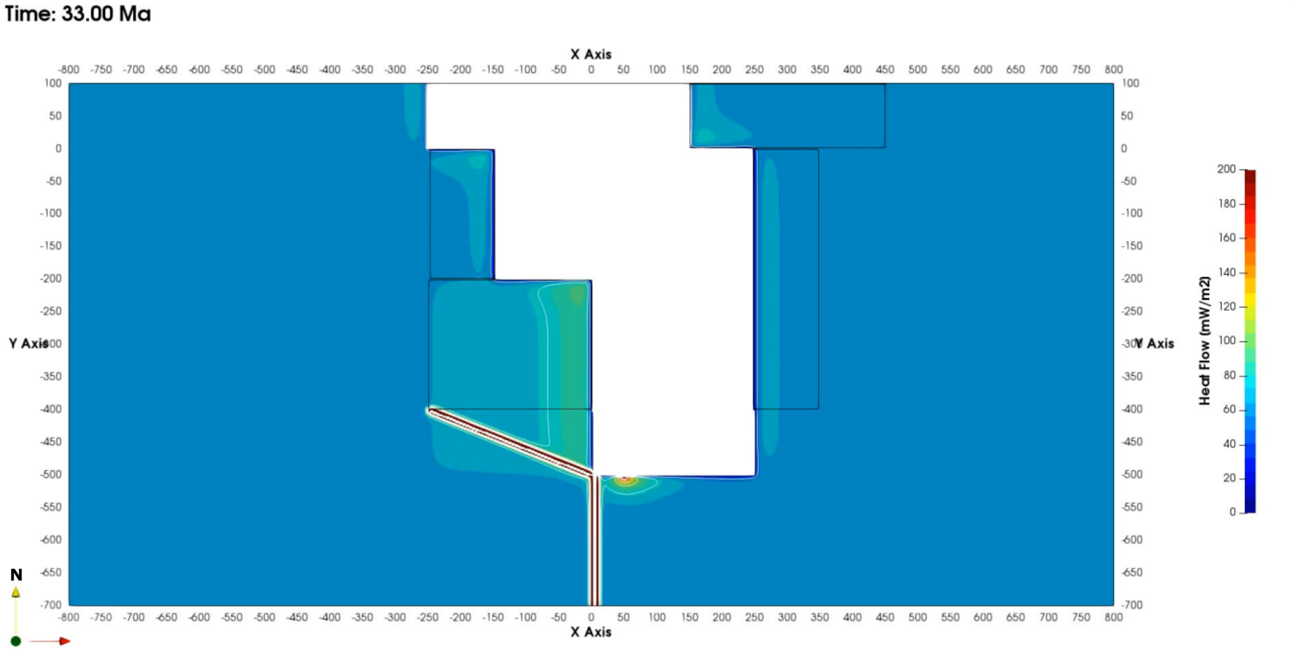
Stage 2 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

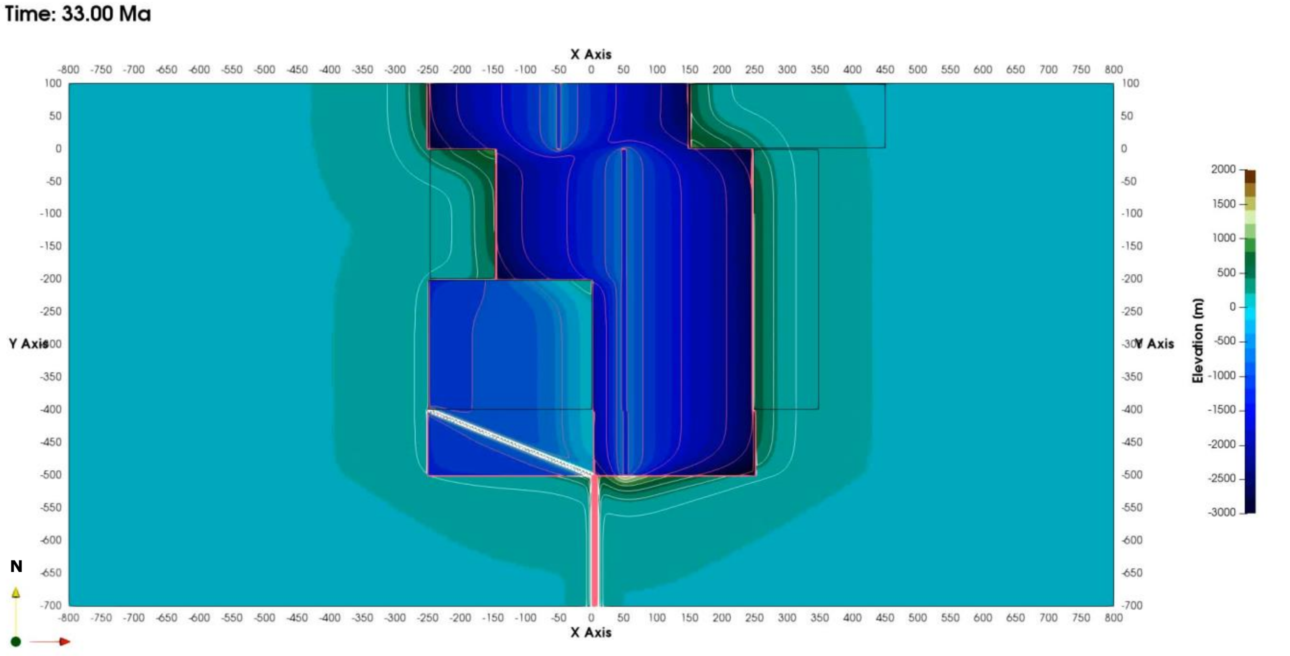
- The oil and gas windows are raised close to the southwestern edge in contact with the Kolbeinsey (IP) Ridge.

Stage 2 – Heat Flow



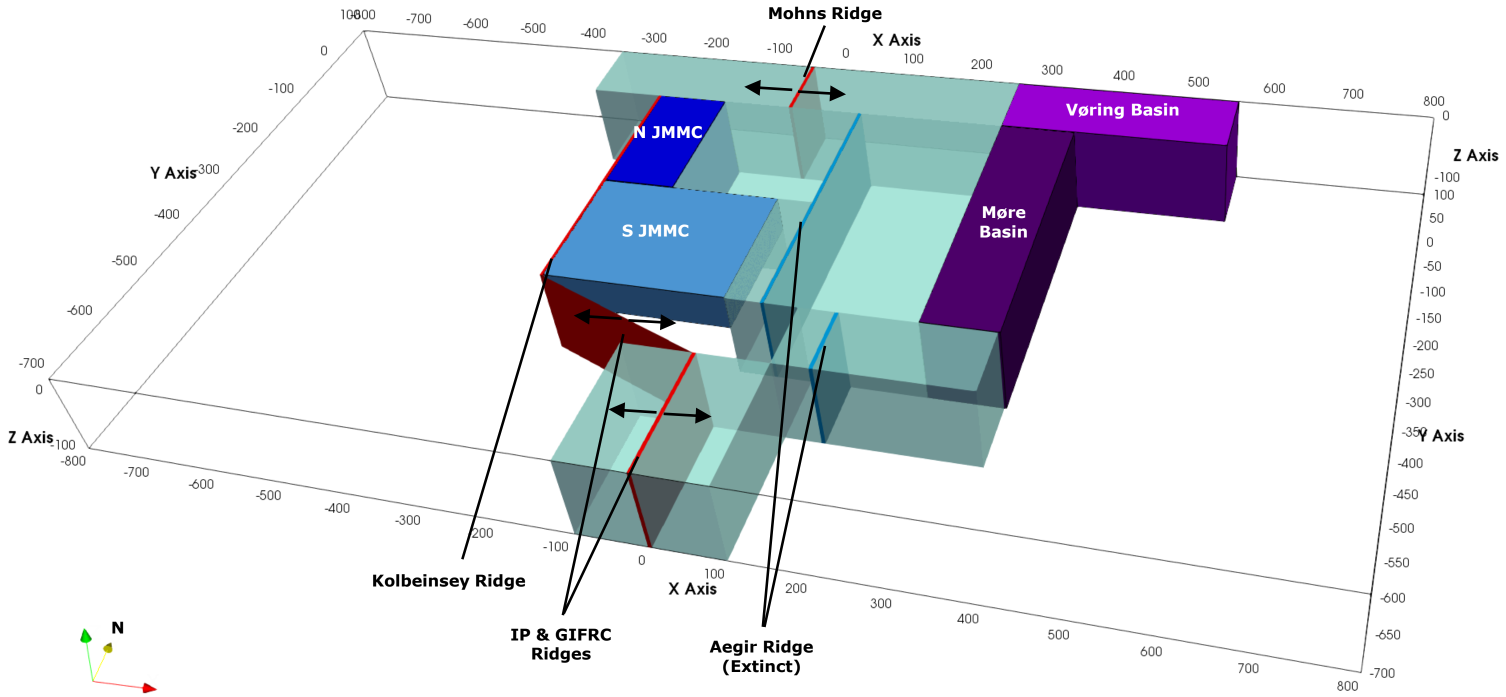
- Heat flow values in the N JMMC are slightly lowered as compared to the previous stage but do not return to background values as it receives some heat from oceanic lithosphere generated by the Mohns Ridge. Maximum heat flow values are recorded at the northeastern corner and are only slightly higher than the background value (~69 mW/m^2).
- Heat flow values in most of the S JMMC decrease as it cools after rifting. Values close to the southwestern corner increase due to heat input from the Kolbeinsey (IP) Ridge but do not propagate significantly inwards due to the short time frame of this stage. Values of ~78 mW/m^2 are recorded close to the eastern edge.

Stage 2 - Uplift



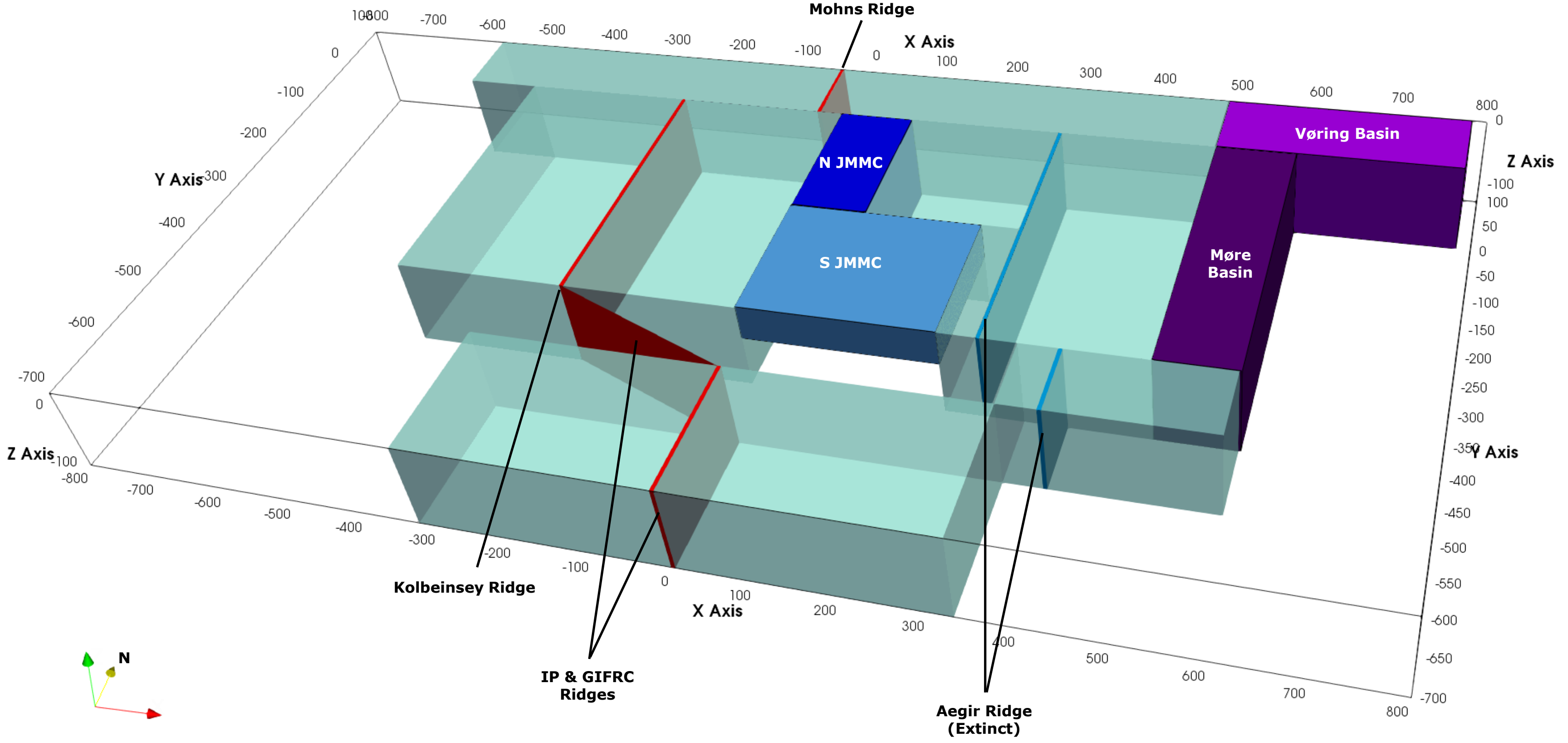
- The entire N JMMC has experienced uplift at the end of this stage with most of the region experiencing more than 50 m uplift. The highest amount of uplift (~800 m) is recorded at the northeastern corner. Uplift decreases from east to west.
- The S JMMC subsides further as most of it cools during this stage. Only the southwestern edge of the S JMMC records uplift as it heated by the Kolbeinsey (IP) Ridge.

Stage 3 - Initial Configuration (23 Ma)

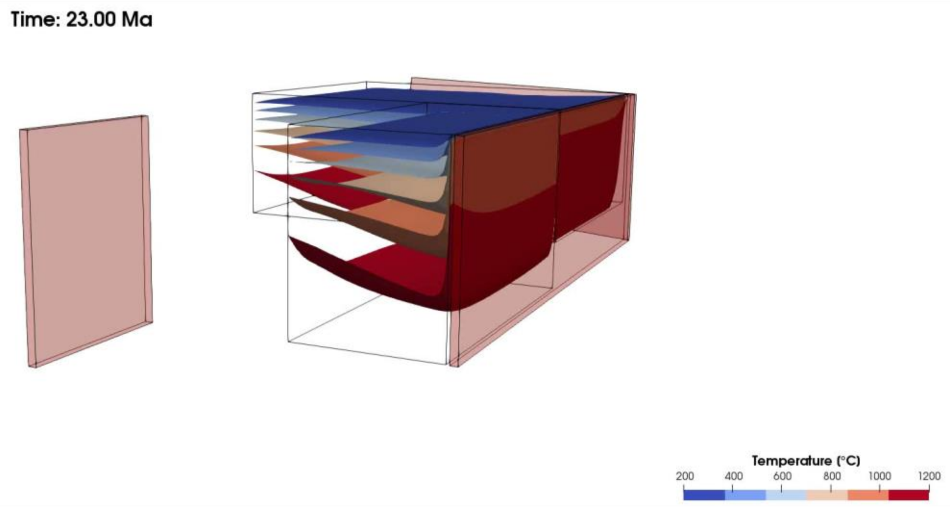


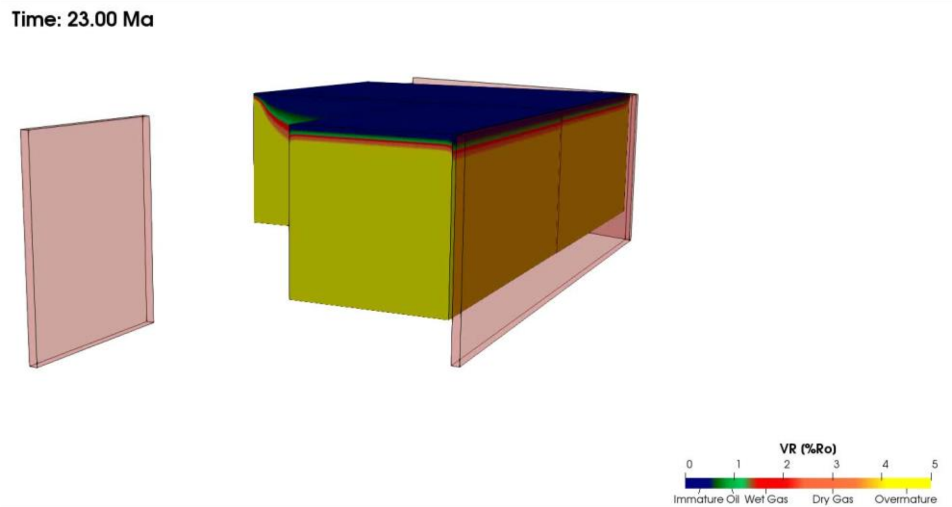
- The Kolbeinsey Ridge extends along the western border of the JMMC and starts spreading there.

Stage 3 – End Configuration (0 Ma)



Stage 3 – JMMC Temperature & Maturity

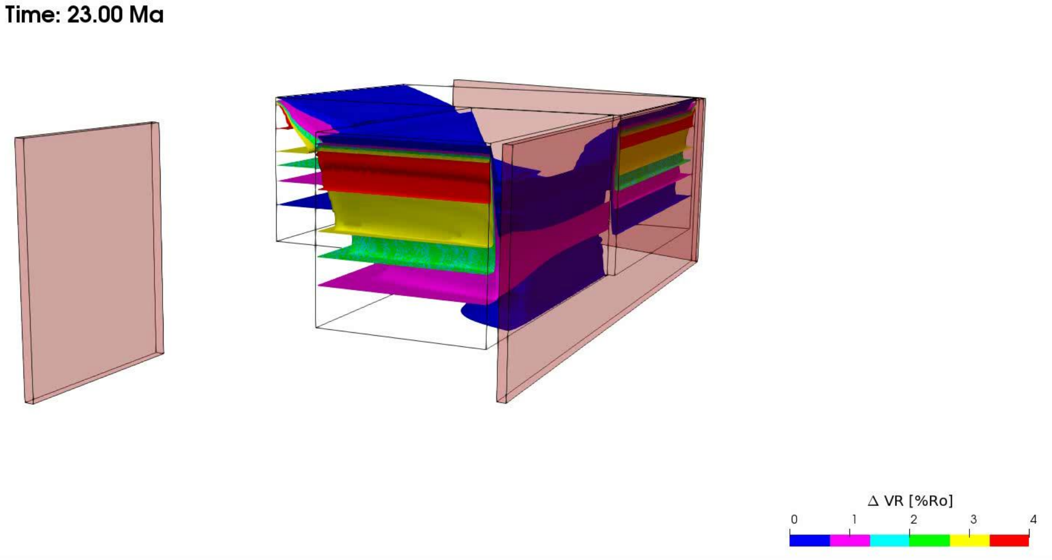


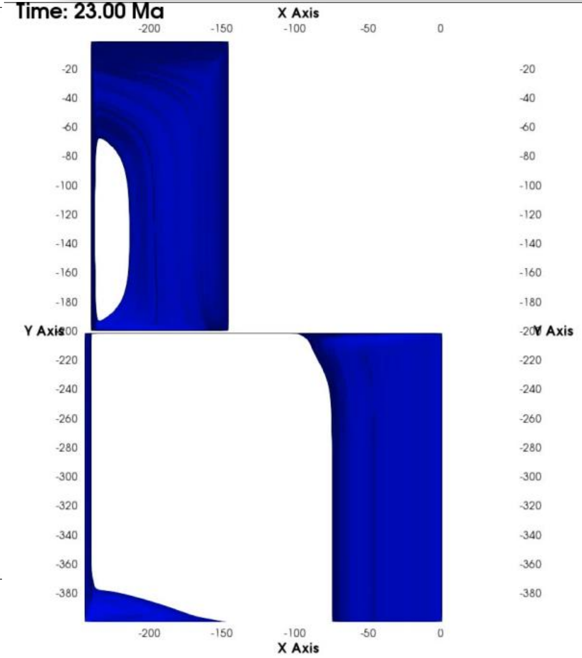


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The entire western edge of the JMMC receives heat from the Kolbeinsey Ridge that is active during this stage.
- The northern part of the N JMMC receives additional heat as the Mohns Ridge traverses the northern edge in the opposite direction.
- The JMMC cools once it moves away from the spreading centers.
- Maturity levels increase rapidly in regions close to the influence of spreading centers.

Stage 3 – JMMC Differential Maturity

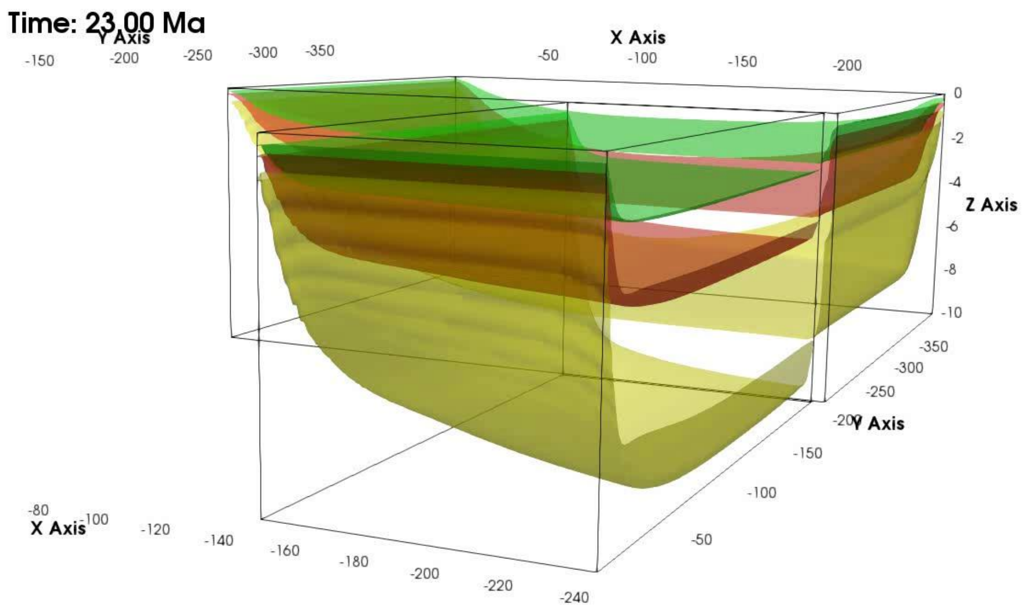




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Maturity levels increase close to the western edge of the JMMC due to heat input from the Kolbeinsey Ridge. They also increase in the northern part of the N JMMC due to the Mohns Ridge.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values covers most of the N JMMC during this stage. The perturbation in maturity levels extends by a few km into the S JMMC at the southwestern corner and western edge. The perturbation extends ~70 km from the eastern edge of the S JMMC showing a slight reduction in extent as compared to the other stages.

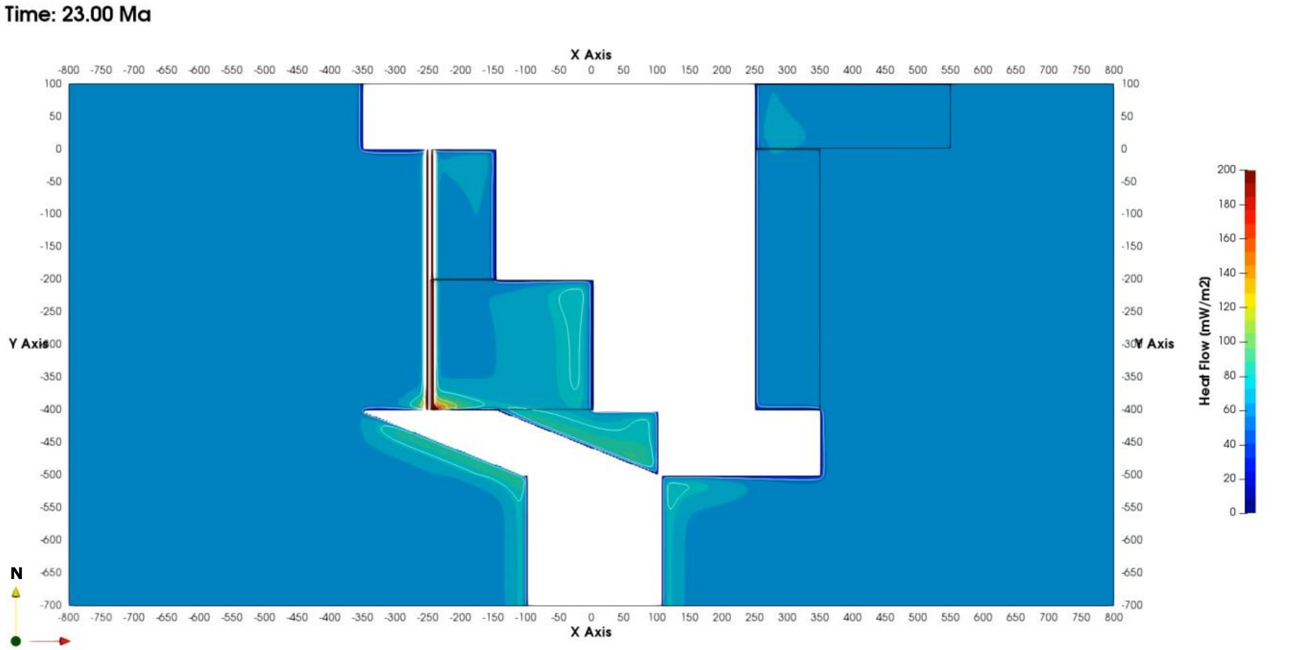
Stage 3 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

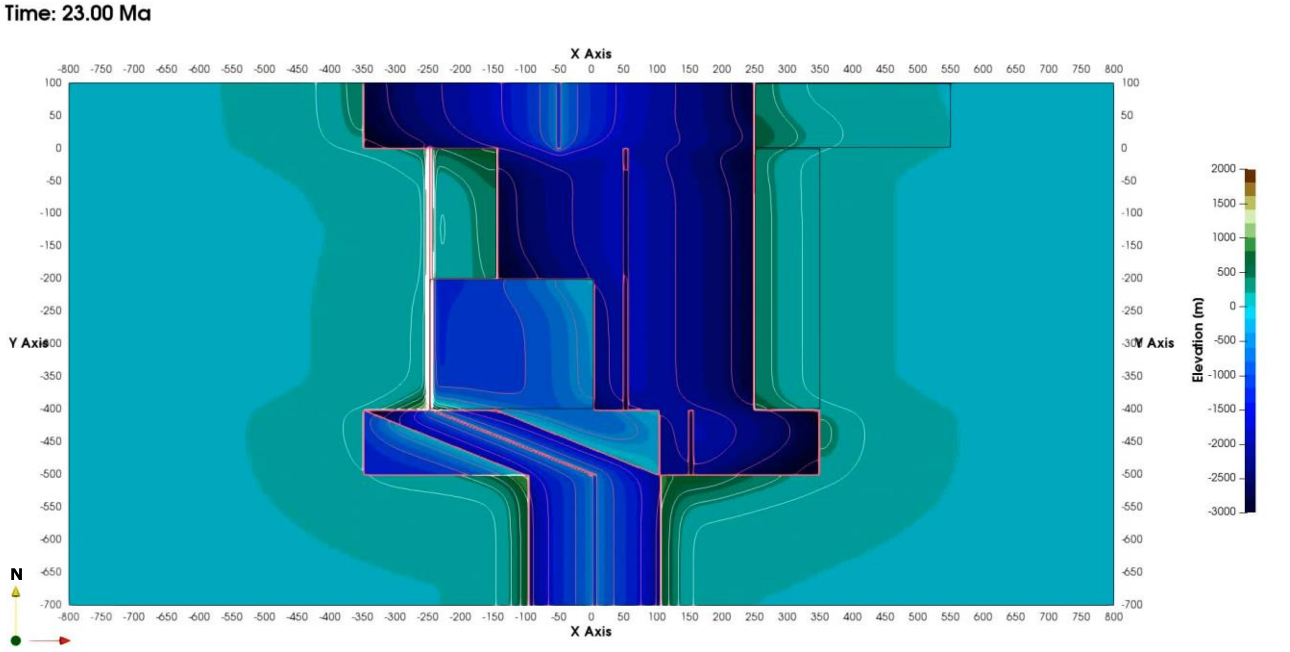
- The oil and gas windows are raised close to the western edge in contact with the Kolbeinsey Ridge.
- The windows are also raised in the northern part of N JMMC as the Mohns Ridge traverses it.

Stage 3 – Heat Flow



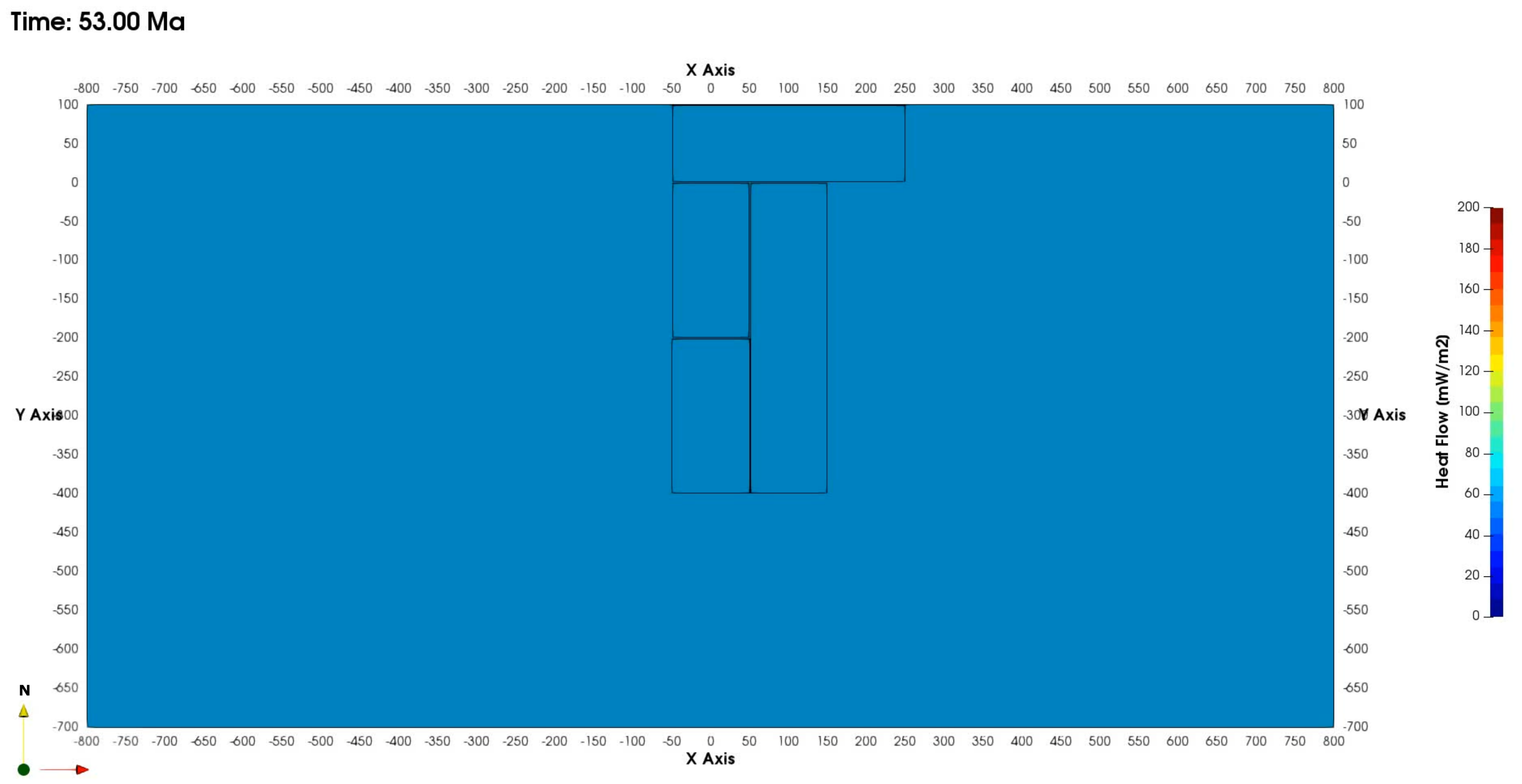
- Heat flow values in the JMMC increase as it is heated by the Kolbeinsey Ridge from the western edge. The N JMMC also receives heat from the Mohns Ridge as it passes by along the northern edge in the opposite direction from previous stages.
- Heat flow values reduce once the JMMC moves away from the spreading centers.
- Present-day heat flow values in the N JMMC reach a maximum of ~90 mW/m^2 in the northwestern corner and decreases towards the southeastern corner. The maximum value in the S JMMC is found in the southwestern corner and is lower (~71 mW/m^2) than the maximum in the N JMMC. Values decrease to background values towards the northeastern corner.

Stage 3 - Uplift

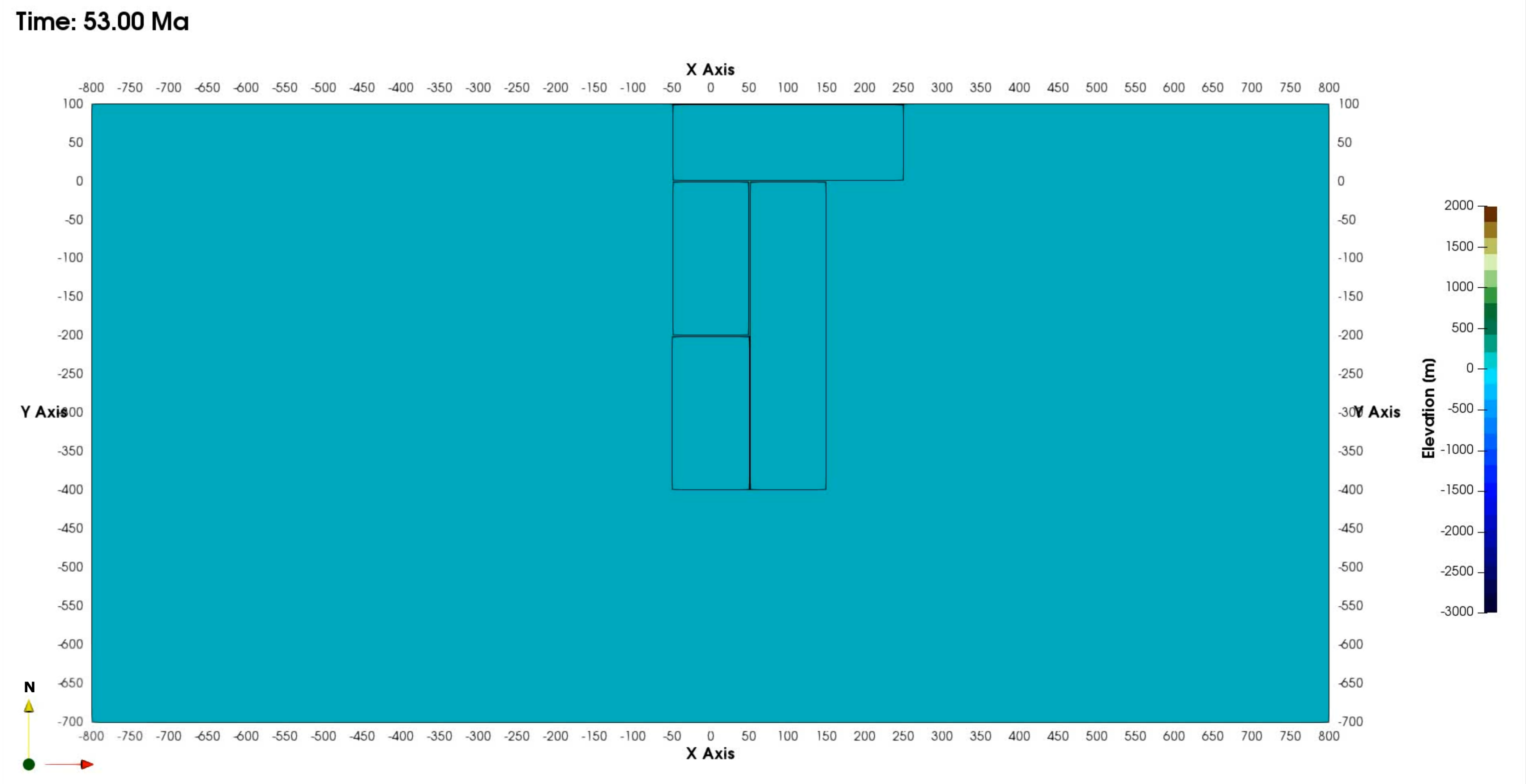


- The entire western edge of the JMMC experiences (relative) uplift as it is heated by the Kolbeinsey Ridge. The northern edge of N JMMC also experiences additional uplift due to the Mohns Ridge. The amount of uplift reduces as the JMMC moves away from the ridges and cools.
- The present-day uplift predicted by the model in the N JMMC is ~1100 m at the northwestern edge and reduces down to ~110 m at the southeastern edge.
- The present-day subsidence in the S JMMC is lowest at the southwestern edge (~-400 m) and highest in the northern part (~ -1250 m). Note that the model does not take into account basin infill and erosion. Therefore, the prediction of uplift or subsidence should be realized as general tilt directions for the JMMC and not taken as absolute values.

Heat Flow



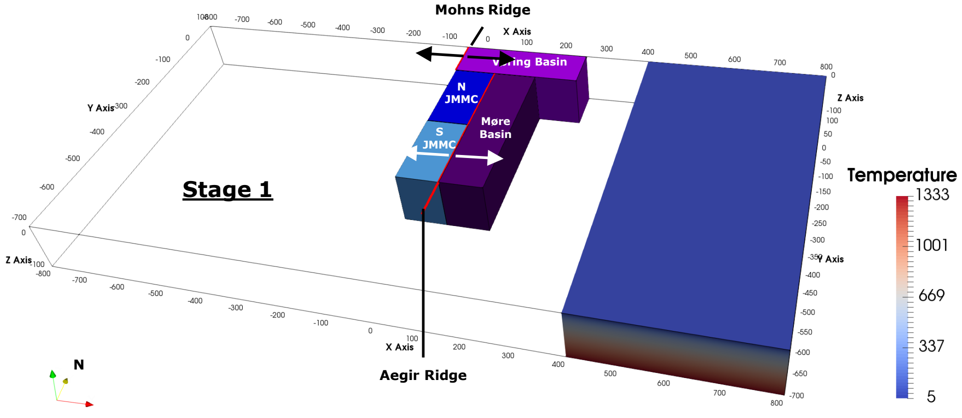
Uplift

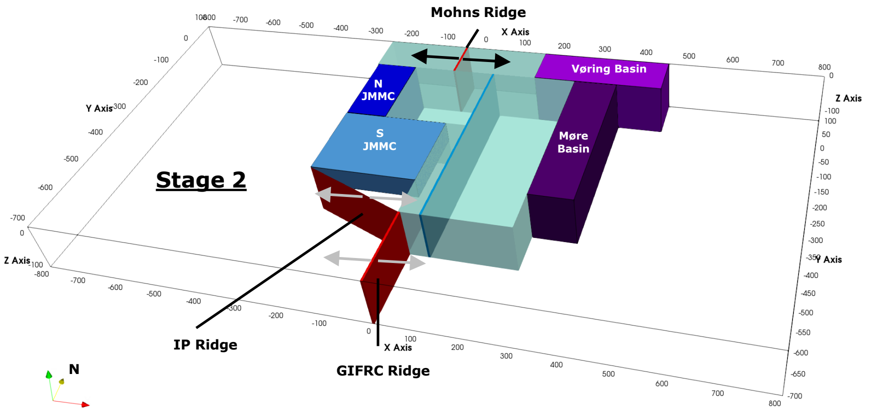


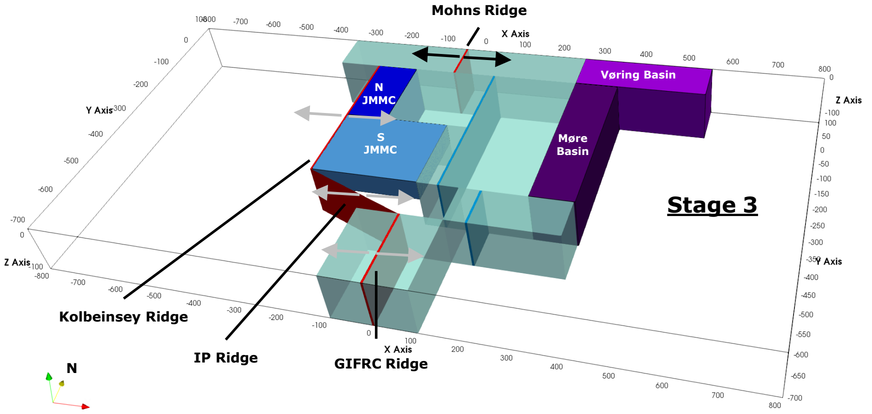
3D JMMC Model

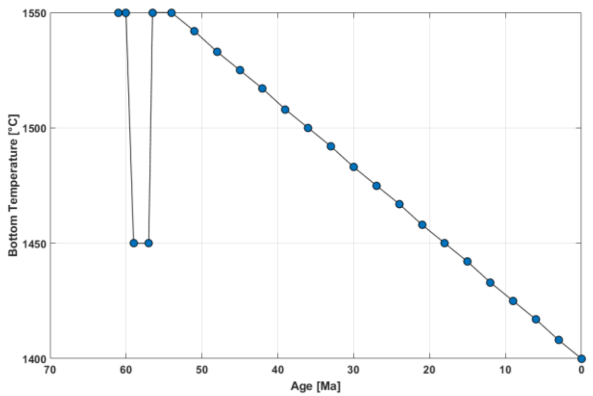
Run 4

Run 4: Setup

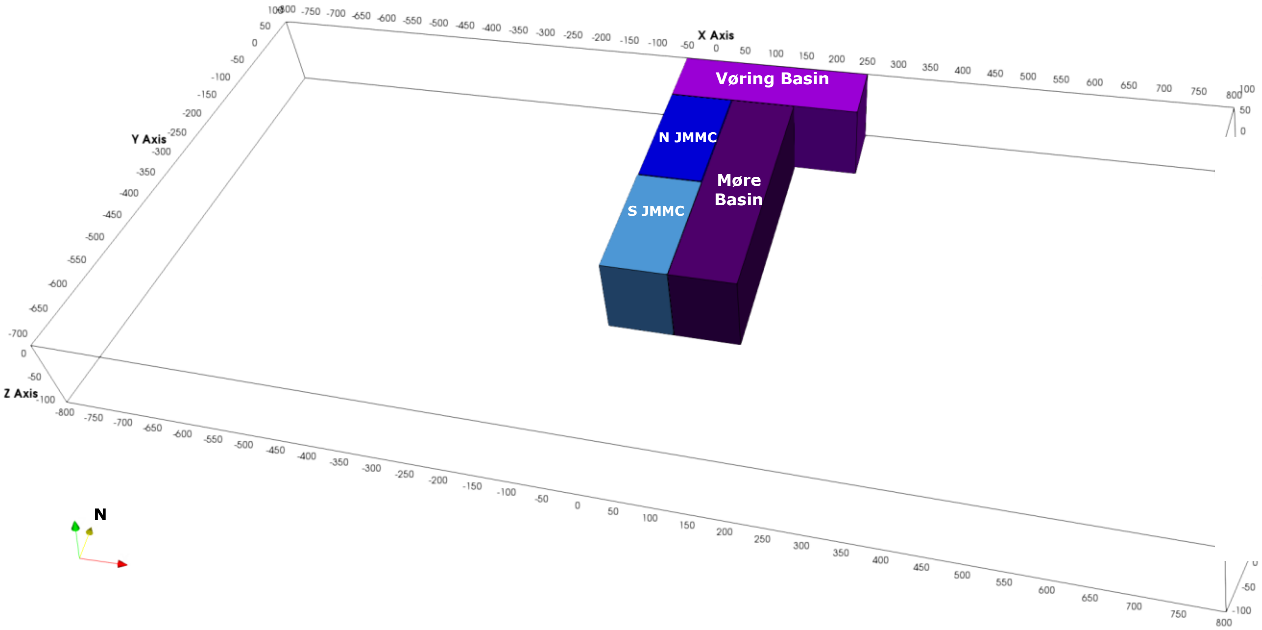

Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 1
Aegir Ridge
Temperature
1333
1001
669
337
5
N

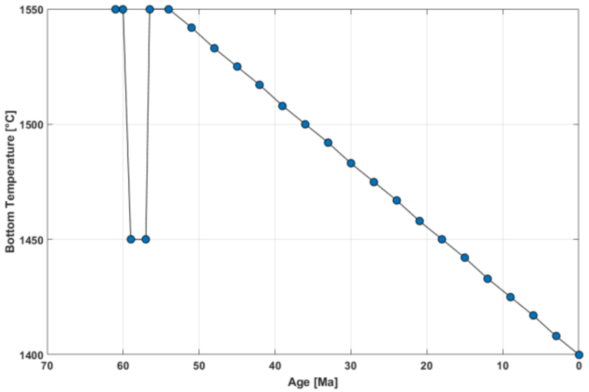

Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 2
IP Ridge
GIFRC Ridge
N


Mohns Ridge
Vøring Basin
N JMMC
S JMMC
Møre Basin
Stage 3
Kolbeinsey Ridge
IP Ridge
GIFRC Ridge
N


Bottom Temperature [°C]
1550
1500
1450
1400
Age [Ma]
70
60
50
40
30
20
10
0

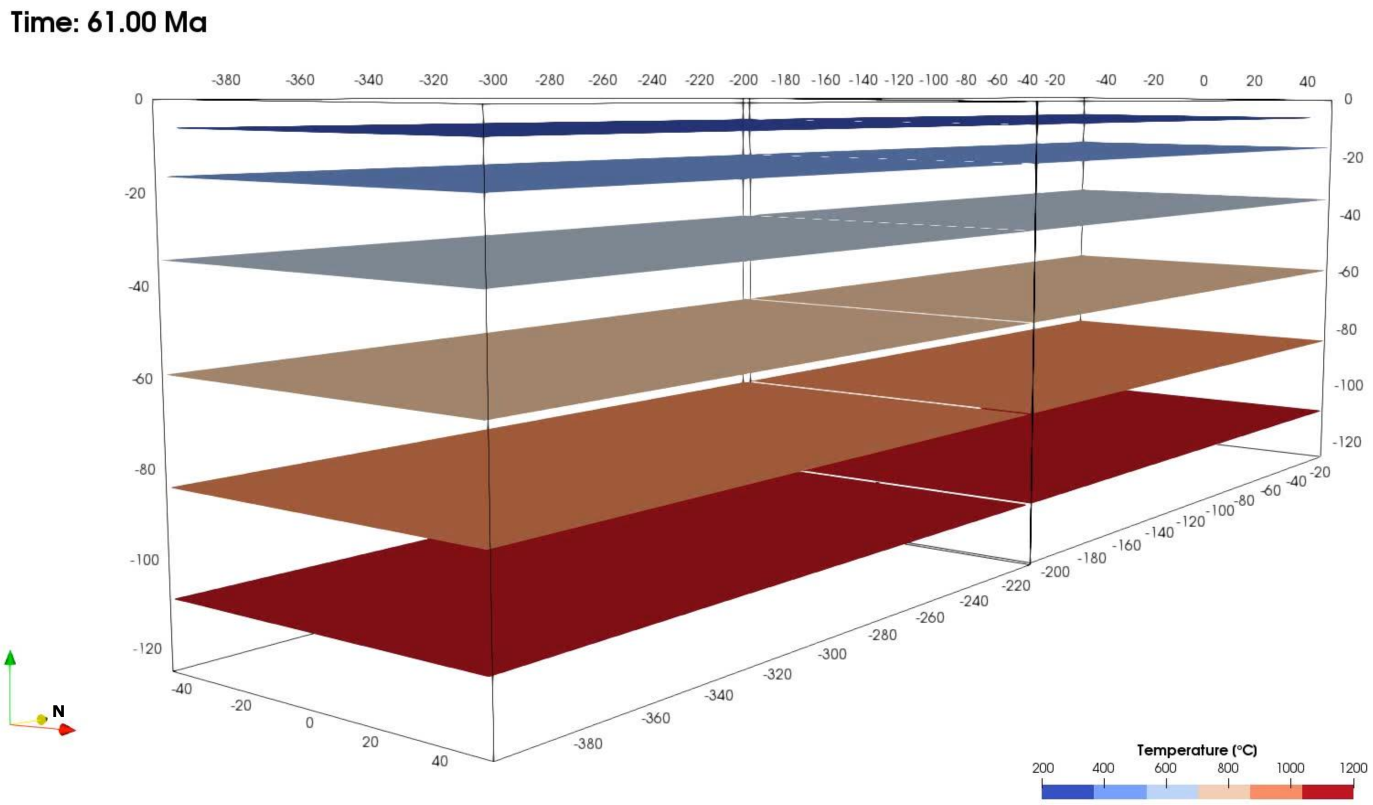
Stage 0 - Initial Configuration (61 Ma)





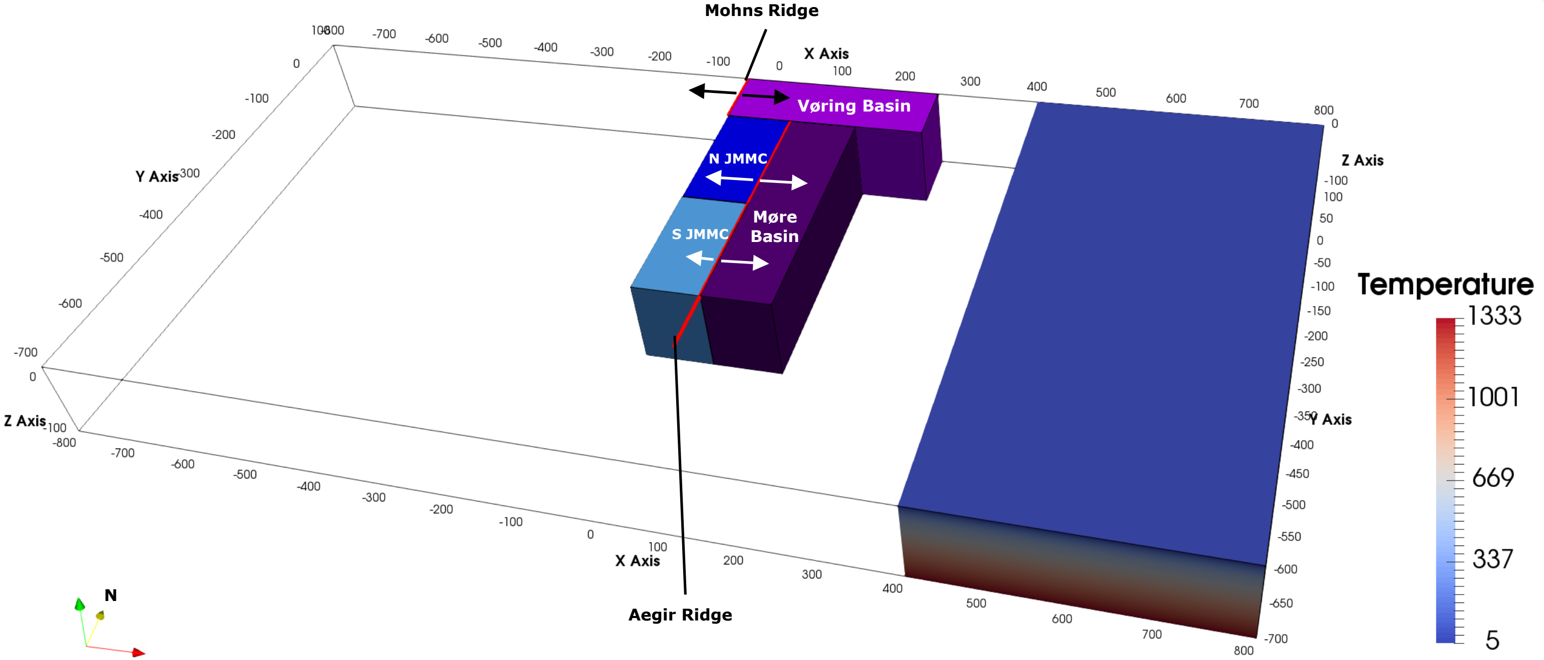
- Initialized to continental lithosphere everywhere and steady-state temperature. Top surface set to 5°C and bottom boundary to 1333°C. The widths of the northern and southern parts of the JMMC are 100 km initially. Initially, the sediment cover is 6 km deep and the Moho is at a depth of 27 km.
- Bottom boundary temperatures are changed with time based on the temperature curve for the region (Torsvik, et al., 2015).

Stage 0 – JMMC Temperature



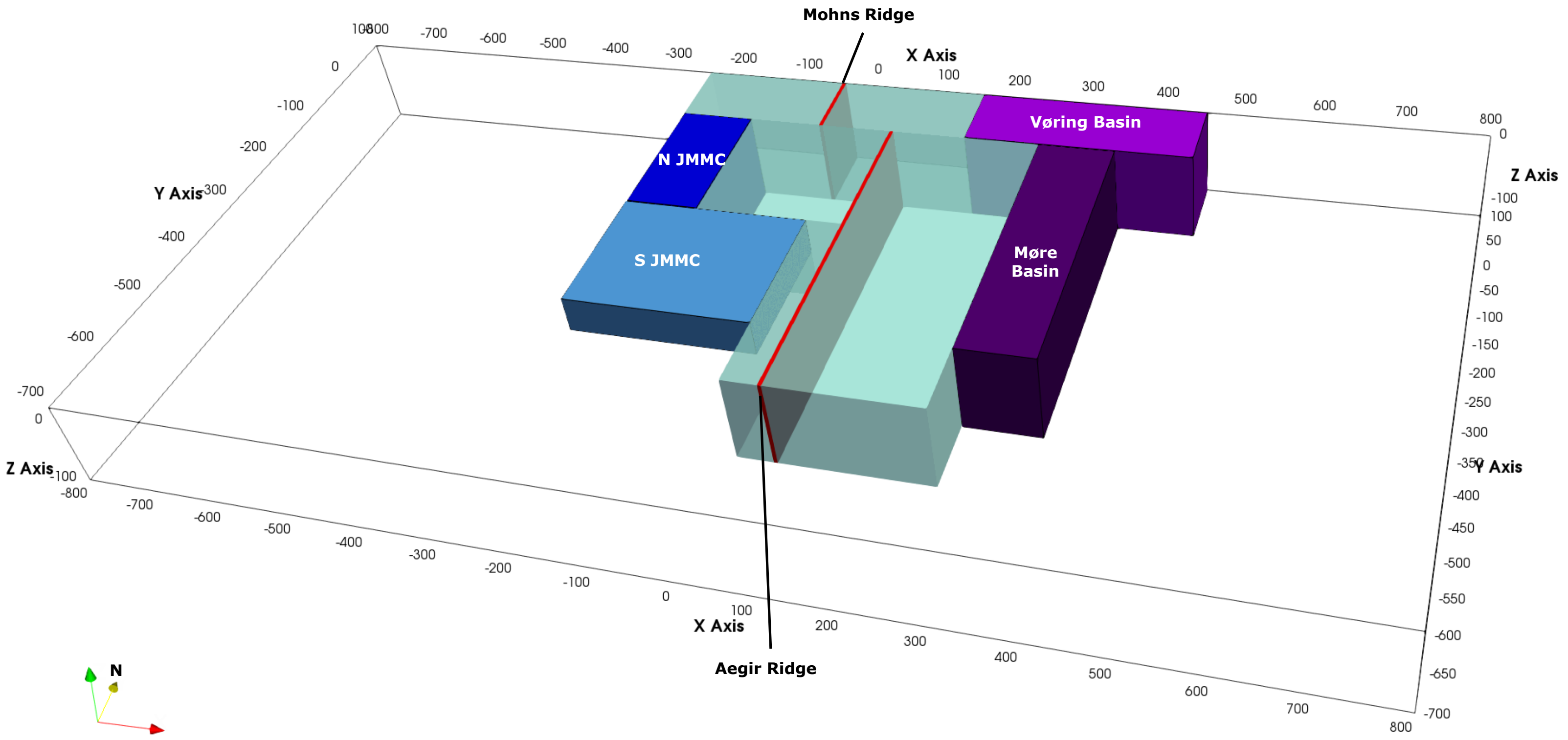
- Temperature in the lithosphere increases as relatively higher bottom temperatures are applied in this stage prior to breakup.

Stage 1 - Initial Configuration (53 Ma)

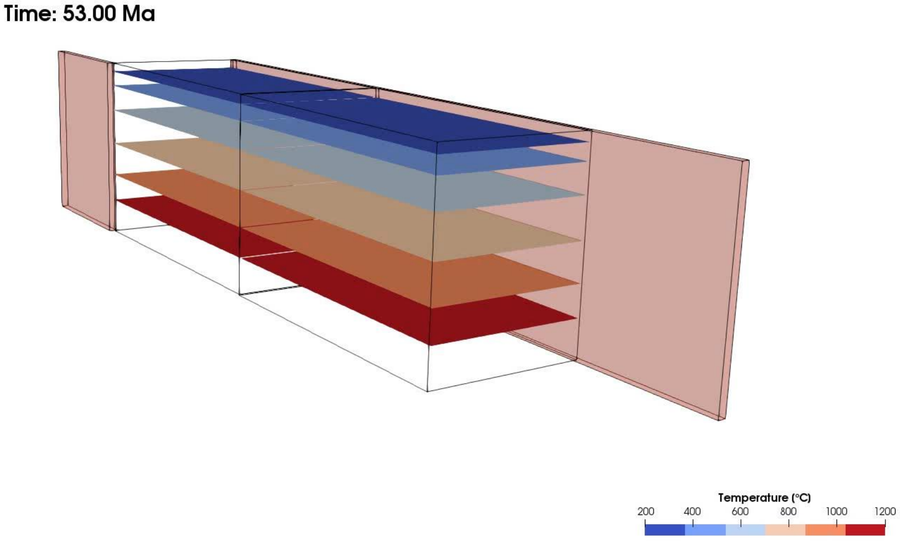


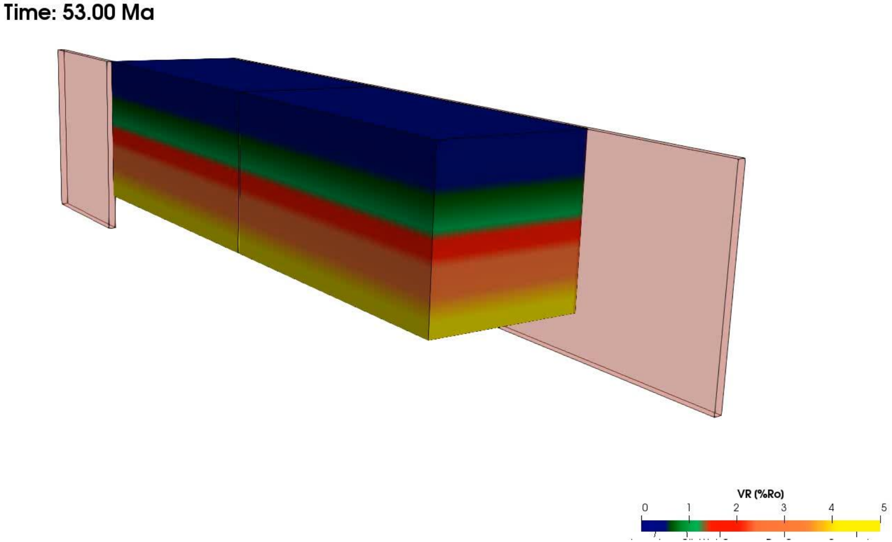
- Initialized to continental lithosphere everywhere and steady-state temperature. Top surface set to 5°C and bottom boundary as per the temperature curve. Ridges are emplaced at 1333°C and are 5 km wide.
- The widths of the northern and southern parts of the JMMC are 100 km initially. Initially, the sediment cover is 6 km deep and the Moho is at a depth of 27 km.
- The Mohns and the northern part of the Aegir Ridges spread symmetrically at 1 cm/yr (half-spreading rate). The southern part of the Aegir ridge spreads asymmetrically; 1 cm/yr to the east and 0.25 cm/yr to the west. The southern part of the JMMC (and the IP) undergoes rifting at the same time such that it extends in width at a rate of 0.75 cm/yr taking up the difference resulting from the asymmetrical spreading. The western edge of the N and S JMMC are therefore aligned with each other at all times. The time step during this stage is 1 Myr.
- Extension of the SJMMC and the IP is compensated by thinning of the continental crust. The final configuration of the SJMMC and IP is sediments and crust that are ~ 3 and 11 km deep, respectively.

Stage 1– End Configuration (33.25 Ma)



Stage 1 – JMMC Temperature & Maturity

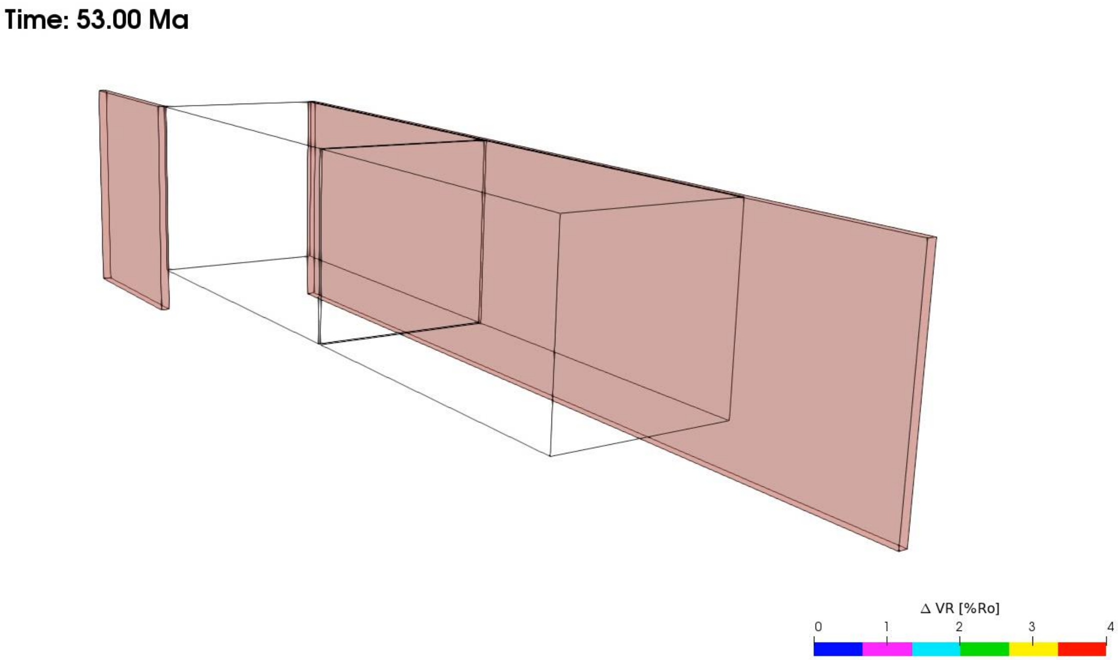


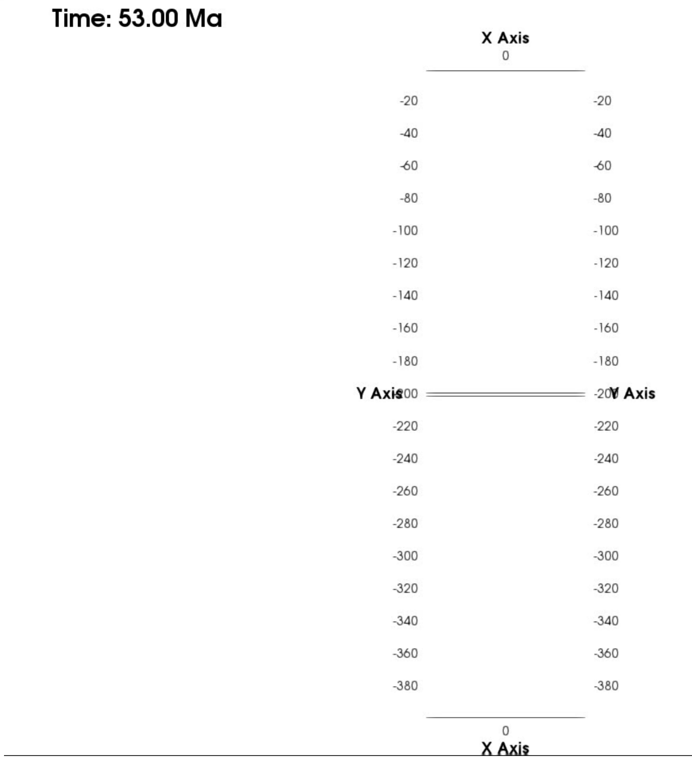


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The JMMC receives heat from the Aegir Ridge at its eastern edge. The influence of the Aegir Ridge on the JMMC decreases as the JMMC moves away and is abutted by increasingly colder and older oceanic lithosphere.
- The temperature in the S JMMC also increases as rifting progresses.
- The N JMMC also receives heat via its northern edge as it passes the Mohns Ridge.
- Maturity increases significantly and quickly to the maximum at the edges of the JMMC that are in contact with the hot ridge. Maturity of sediments inwards from the edges increases gradually as the thermal effects of the ridges propagates into the microcontinent.

Stage 1 – JMMC Differential Maturity

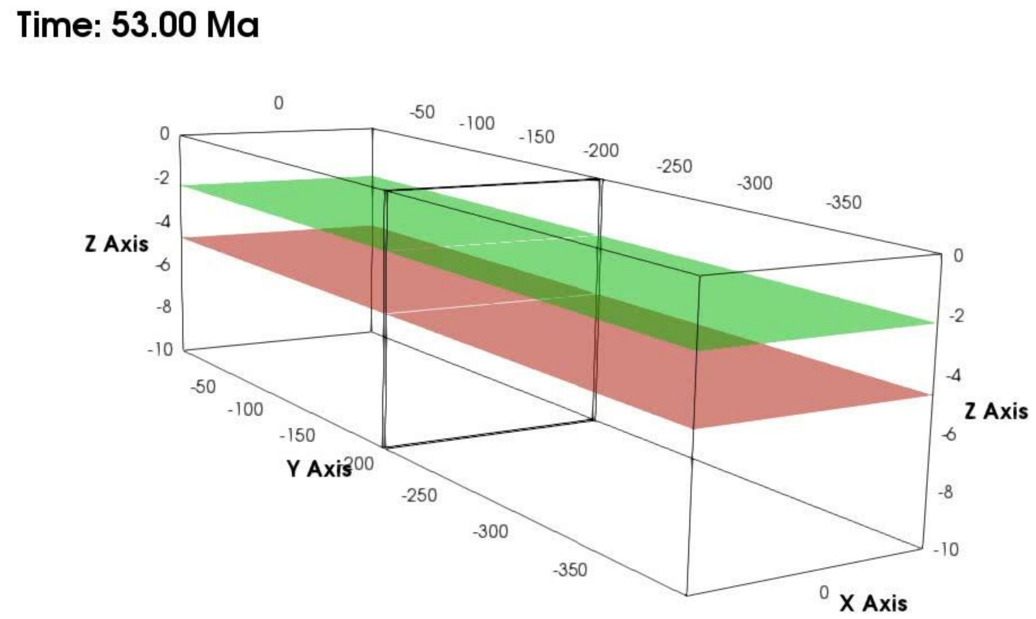




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Higher maturity levels in the S JMMC migrate up towards shallower depths as the isotherms become shallower during rifting.
- Maturity levels at the southern edge of the N JMMC are also affected by the rifting of the S JMMC and show increase in maturity.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values in the N JMMC is observed ~60 km inwards from the eastern (Aegir Ridge influence) and the northern edges (Mohns Ridge influence). The perturbation has also moved inwards from the southern edge of the N JMMC by ~18 km due to rifting in the S JMMC. The S JMMC shows a perturbation in maturity levels ~65 km away from the eastern edge.

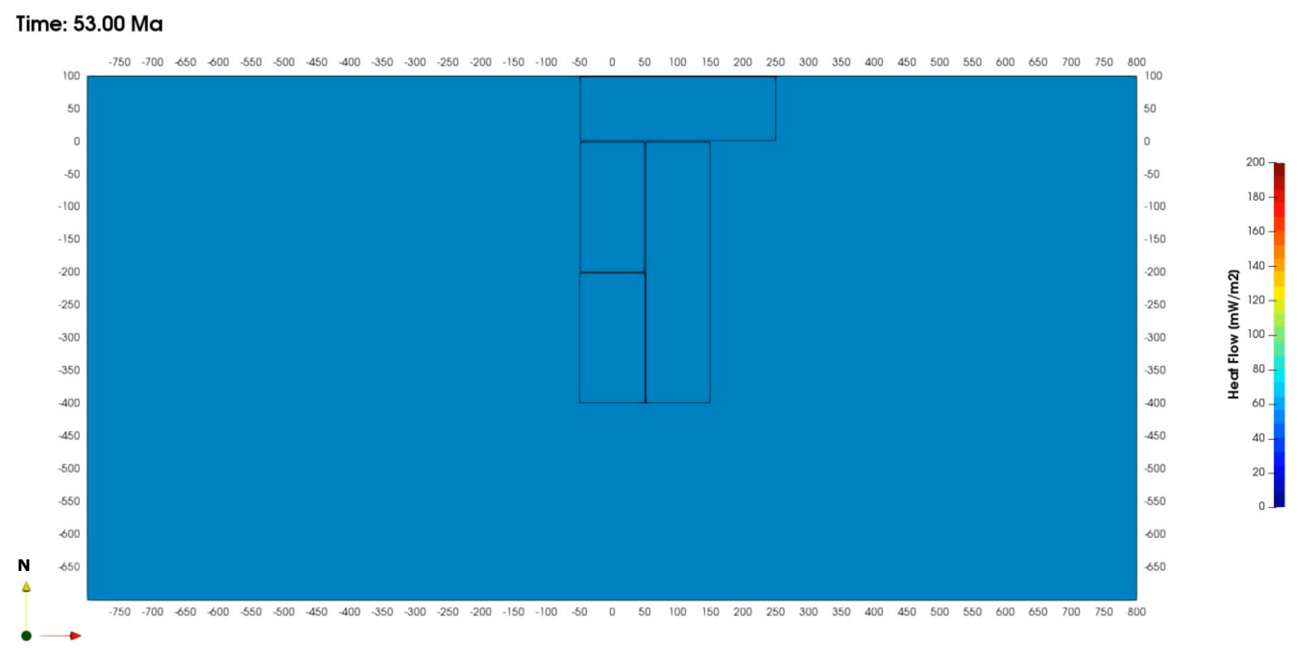
Stage 1 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

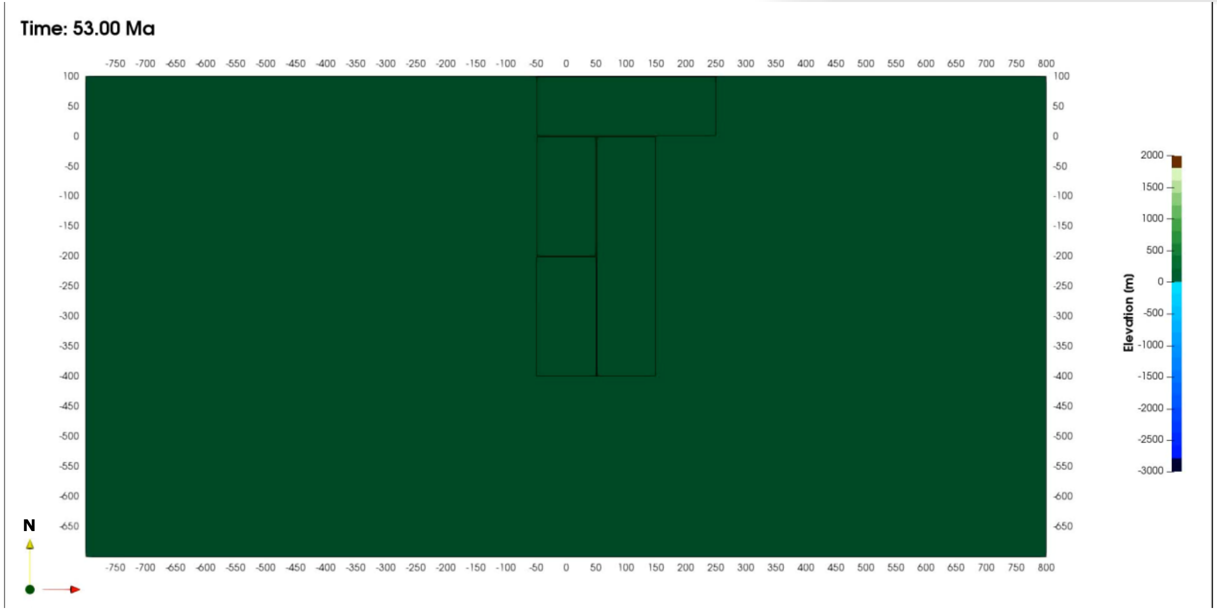
- The initial oil and gas window tops (background values) are at ~3 and 5.5 km, respectively.
- These windows are very shallow close to edges in contact with ridges and are raised up within the microcontinent as heat is progressively transferred into the JMMC during this stage by the ridges and by rifting of S JMMC.

Stage 1 – Heat Flow



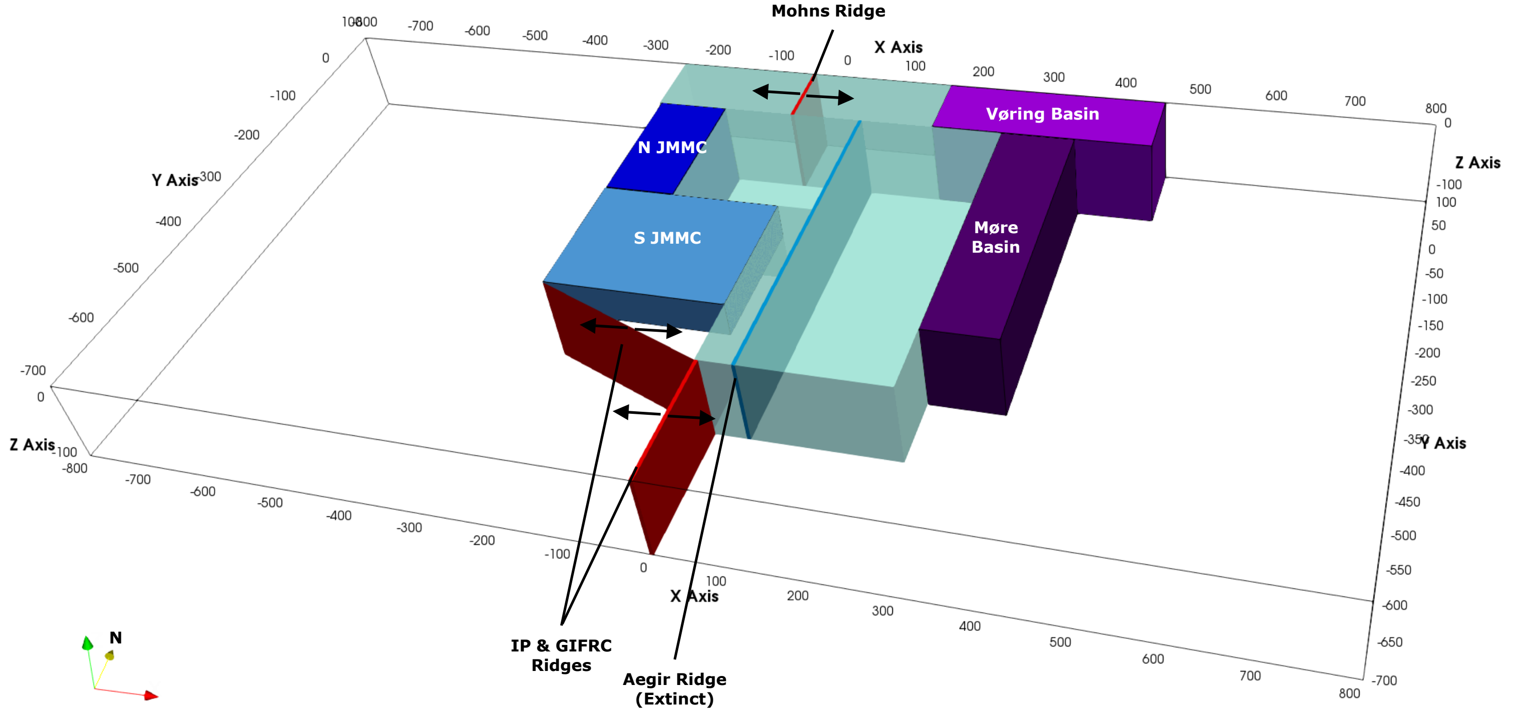
- Maximum heat flow values (~200 mW/m^2) occur within the continent close to the contact with the ridge where it is the hottest and spreads out away from there. Heat flow values decrease as the continent moves away from the spreading centers.
- An asymmetry develops in the regions with increased heat flow as they move away from the ridges during ocean spreading.
- The S JMMC shows heat flow values higher than the N JMMC as it is rifted.
- An increase in heat flow (~75 mW/m^2) relative to the background value (59 mW/m^2) is observed in the region around the northeastern corner of the N JMMC and in most of the S JMMC with a maximum of at ~105 mW/m^2 the end of Stage 1.
- Contour values are between 50 and 200 mW/m^2 in steps of 25 mW/m^2.

Stage 1 - Uplift



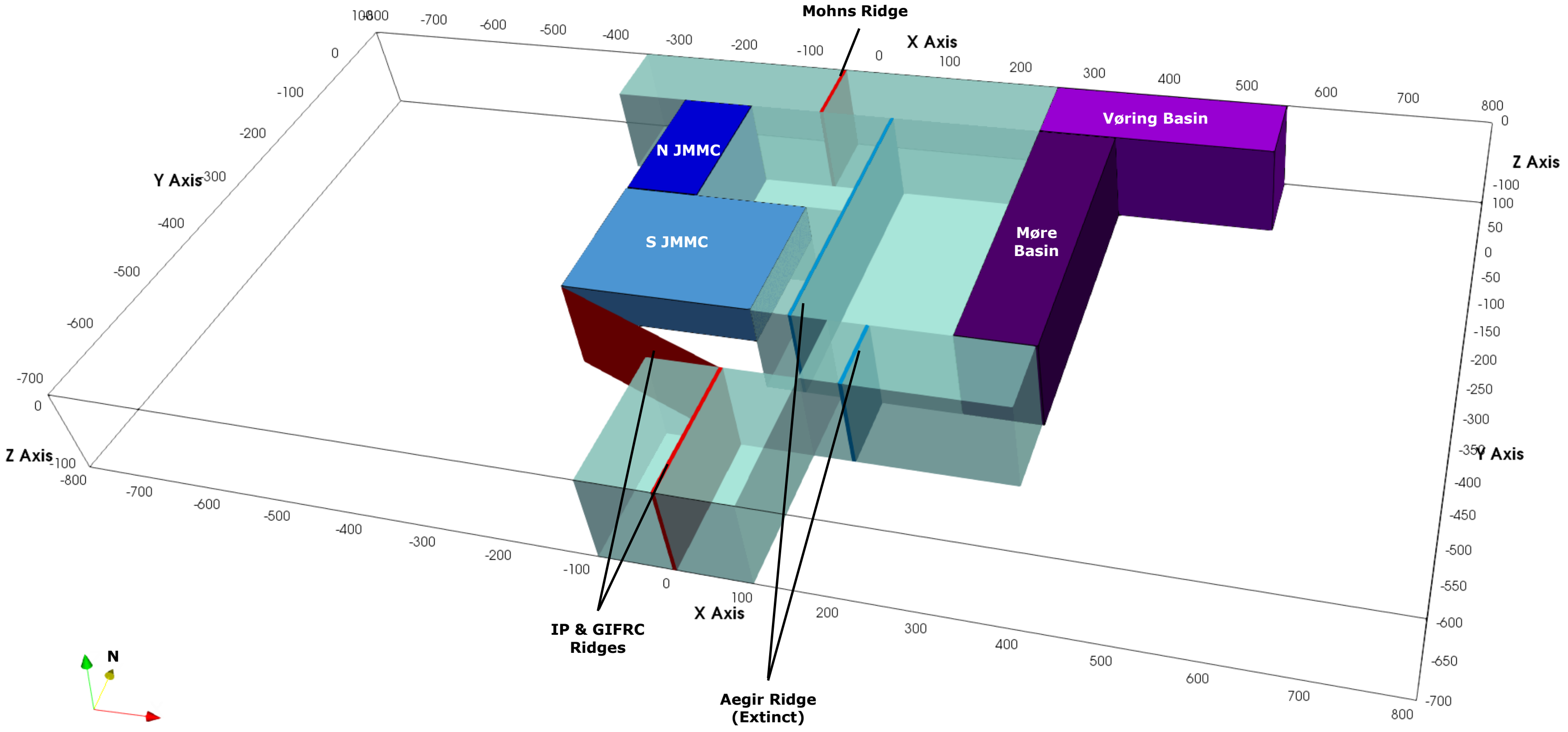
- Continental uplift/subsidence is calculated based on the principle of local isostasy relative to the initial continental lithosphere. Note that since the reference column has a bottom temperature of 1333°C the entire continental lithosphere is uplifted because of variation in the bottom temperature. The amount of background uplift experienced at the end of Stage 1 is ~188 m.
- Maximum uplift (~2000 m) occurs within the continent close to the contact with the ridge where it is the hottest and spreads out away from there.
- Uplift decreases as the continents move away from the spreading centers and cool with an asymmetry developing in the uplifted continental lithosphere as they move away from the ridges during ocean spreading.
- The S JMMC subsides (>-3000 m) as it thins bringing up hot mantle upwards resulting in a dense lithospherical column relative to the initial continental configuration.
- Most of the N JMMC has experienced uplift by the end of Stage 1 except for a small region at the western edge. Contour values for uplift are between 250 and 1750 m with a stepping of 250m and an additional contour at 50 m. Contour values for subsidence are between -500 and -3000 m with a stepping of -500m.

Stage 2 - Initial Configuration (33 Ma)

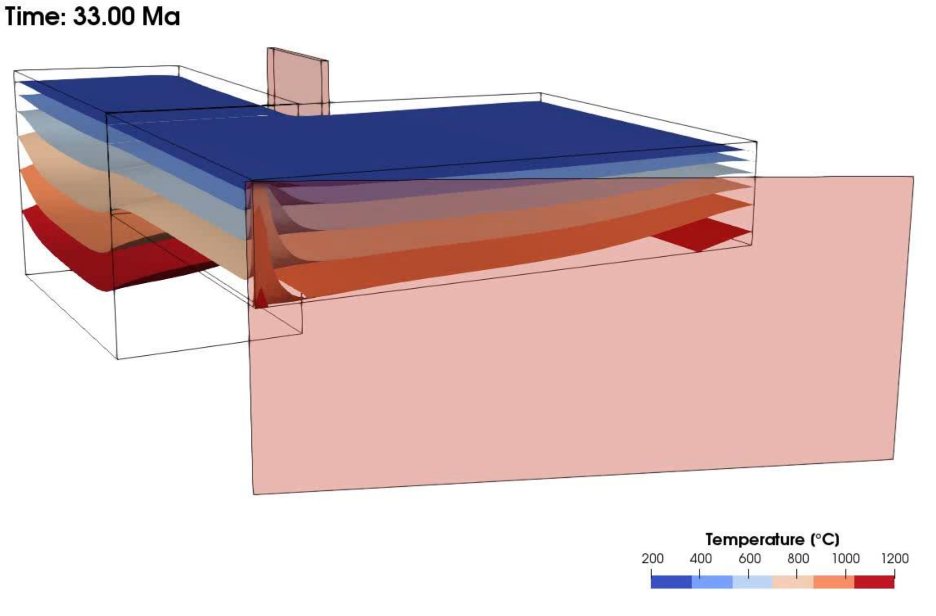


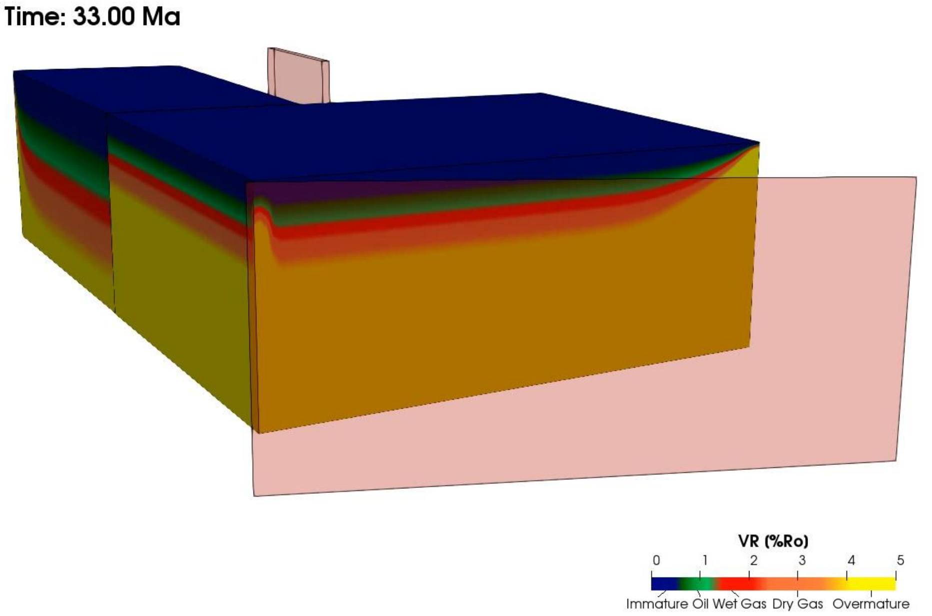
- Aegir Ridge is extinct during this stage.
- The IP and GIFRC Ridges split the Icelandic Plateau and the GIFRC, respectively. Spreading occurs symmetrically with a rate of 1cm/yr.
- Time step during this stage is 0.25 Myr.

Stage 2 – End Configuration (23.25 Ma)



Stage 2 – JMMC Temperature & Maturity

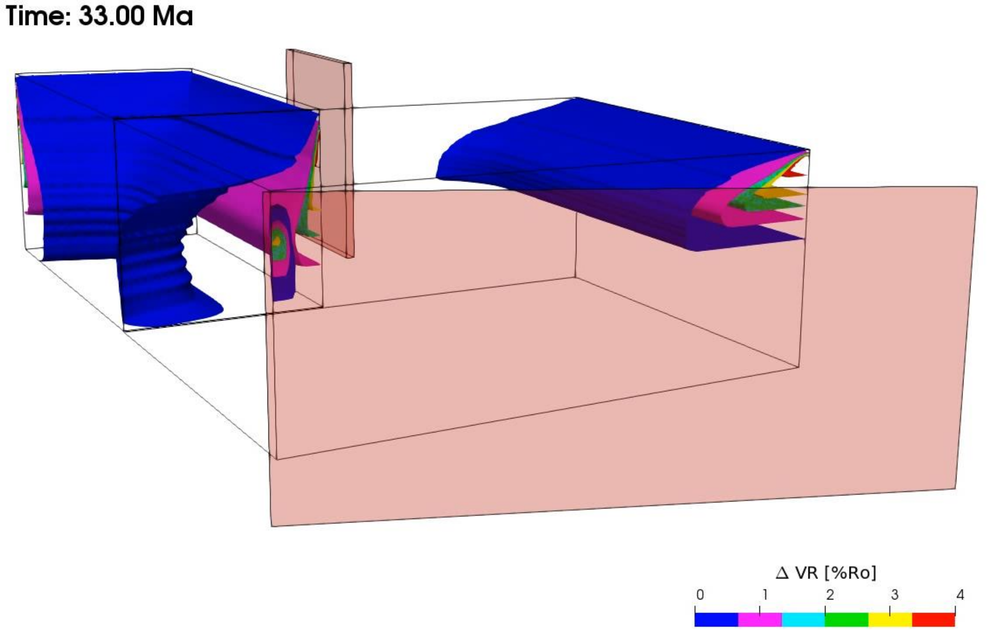


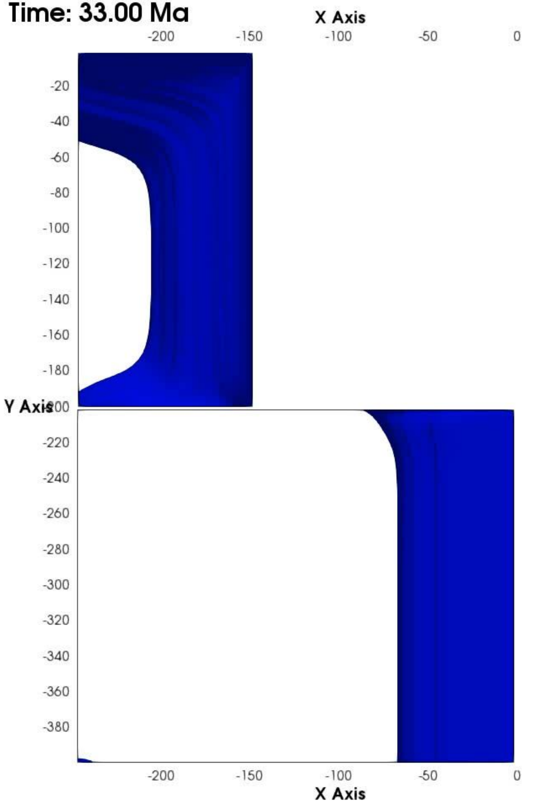


- Only the S JMMC receives heat directly from the Kolbeinsey (IP) Ridge from its southwestern corner bringing up isotherms in the region.
- The N JMMC receives some heat from its northern edge as relatively hot oceanic lithosphere formed at the Mohns Ridge moves past it.
- Maturity levels increase rapidly at and immediately around the southwestern corner of S JMMC.

Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

Stage 2 – JMMC Differential Maturity

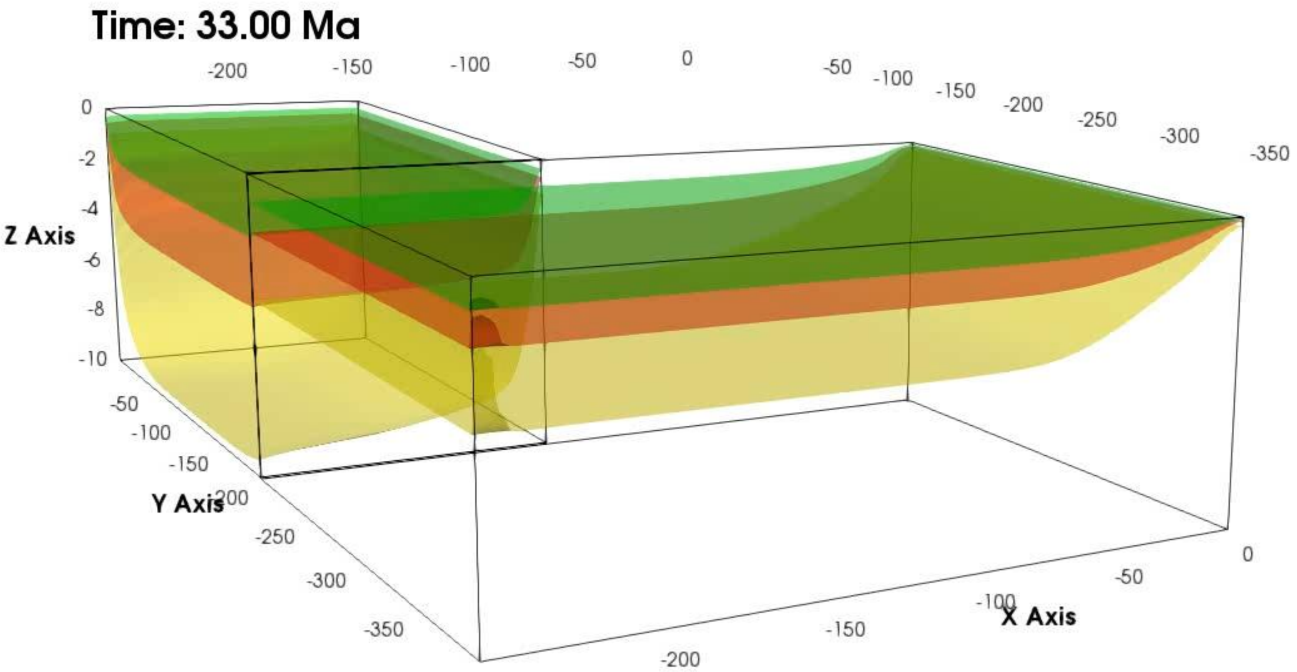




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Maturity levels increase close to the southwestern corner of the JMMC due to heat input from the Kolbeinsey (IP) Ridge.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values move into the JMMC with time. This covers most of the N JMMC during this stage. There is a perturbation in maturity levels at the southwestern corner of the S JMMC which extends ~10 km into the S JMMC. The perturbation extends ~62 km from the eastern edge of the S JMMC showing a slight reduction in extent as compared to Stage 1.

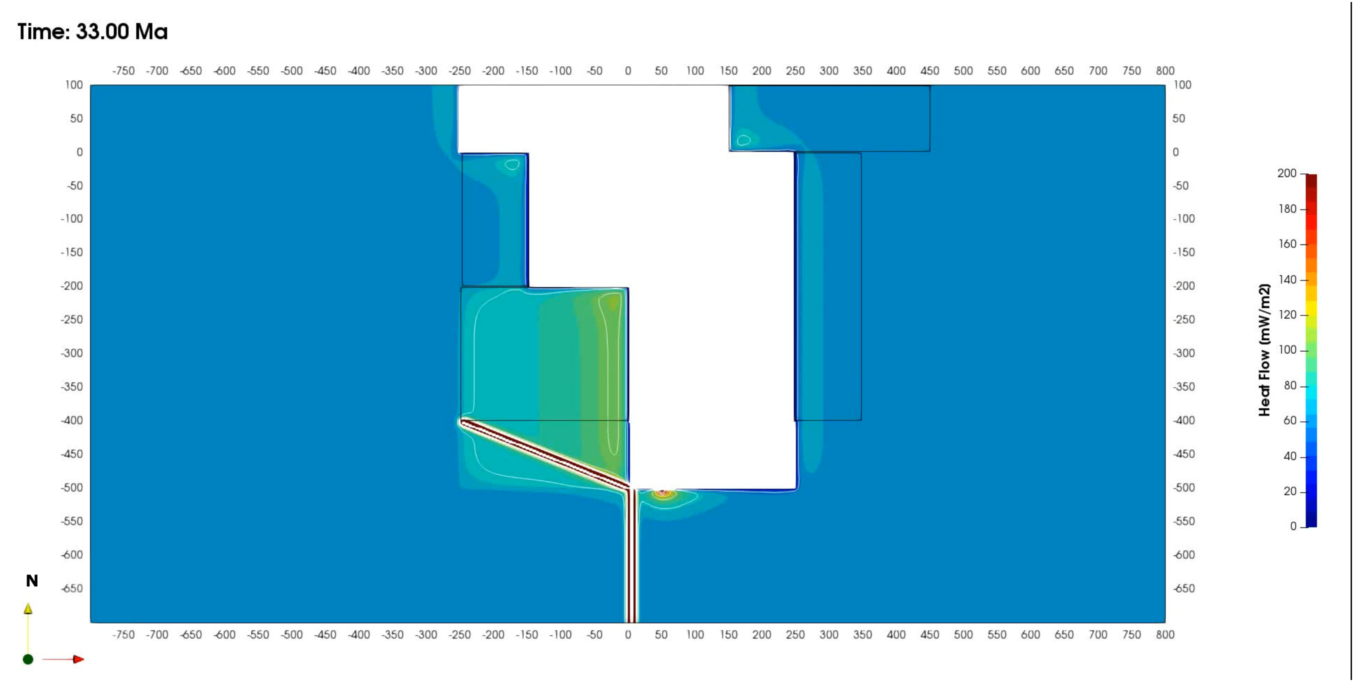
Stage 2 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

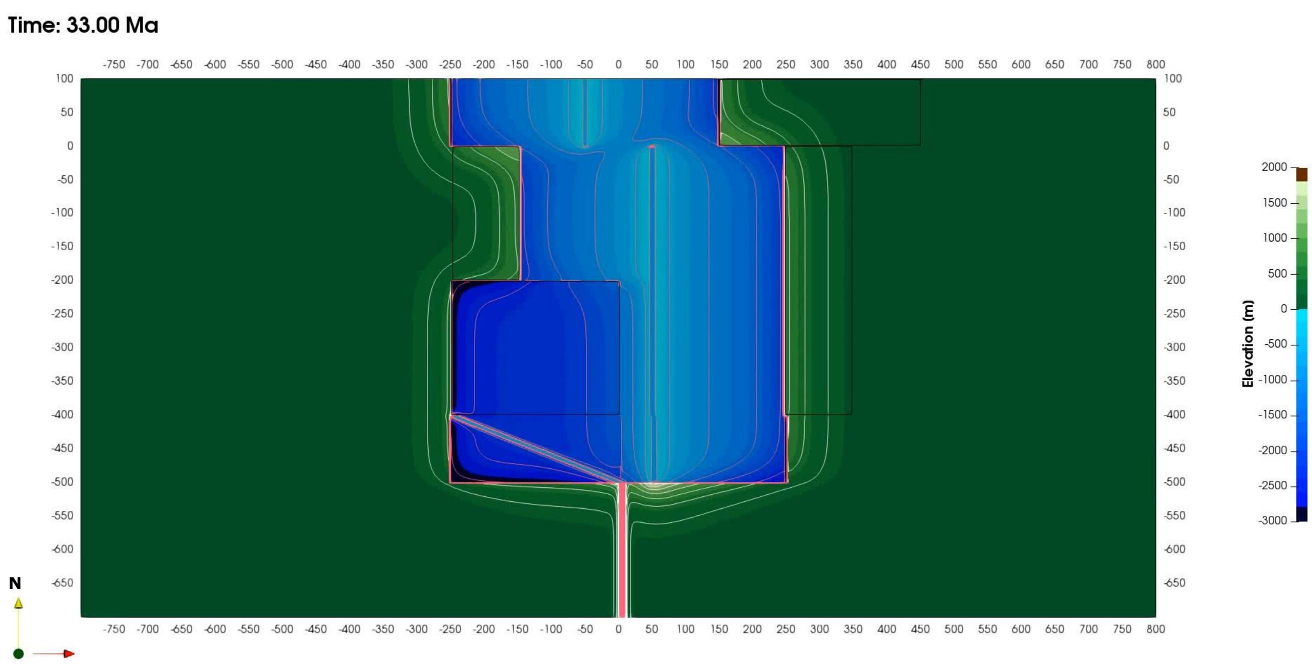
- The oil and gas windows are raised close to the southwestern edge in contact with the Kolbeinsey (IP) Ridge.

Stage 2 – Heat Flow



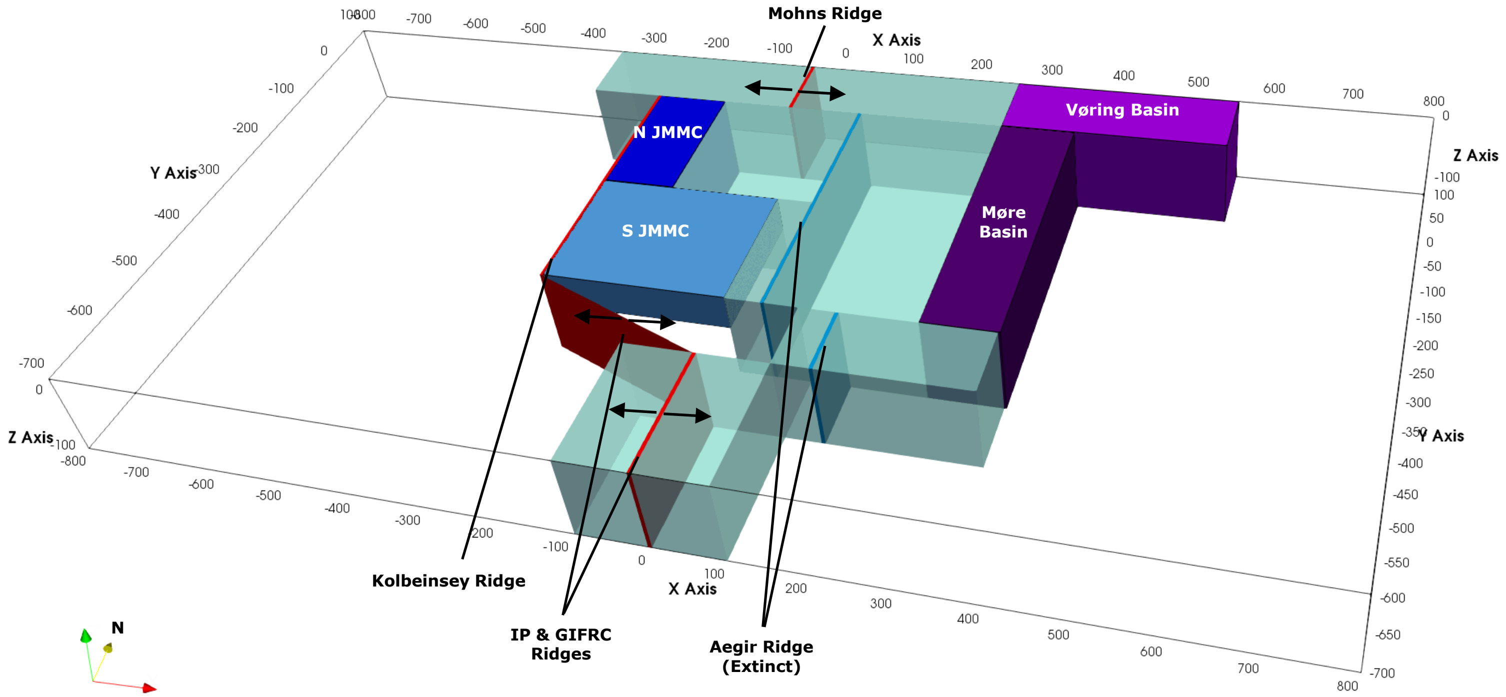
- Heat flow values in the N JMMC are slightly lowered as compared to the previous stage but do not return to background values as it receives some heat from oceanic lithosphere generated by the Mohns Ridge. Maximum heat flow values are recorded at the northeastern corner (~70 mW/m^2) at the end of Stage 2.
- Heat flow values in most of the S JMMC decrease as it cools after rifting. Values close to the southwestern corner increase due to heat input from the Kolbeinsey (IP) Ridge but do not propagate significantly inwards due to the short time frame of this stage. Values of ~84 mW/m^2 are recorded close to the eastern edge at the end of Stage 2.

Stage 2 - Uplift



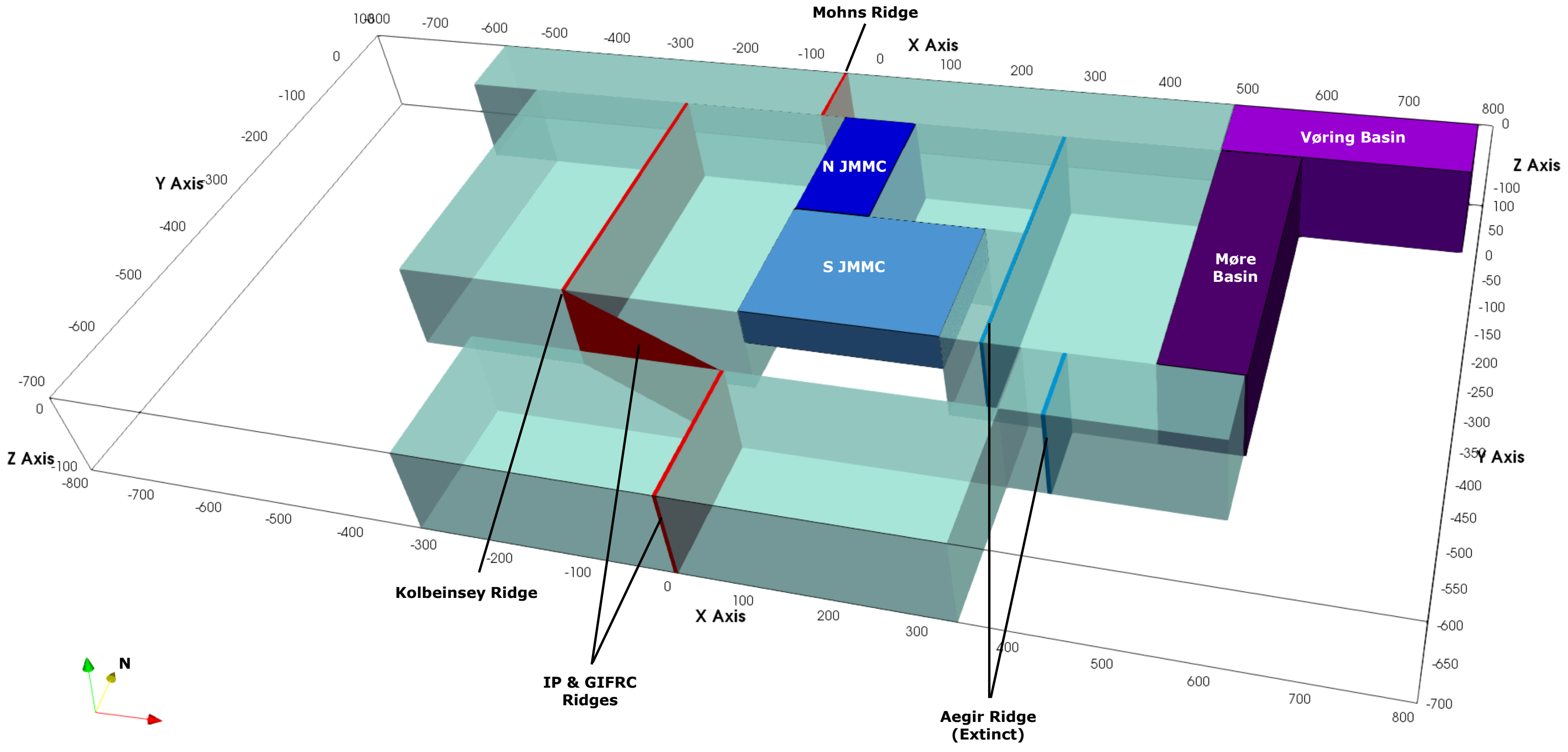
- Note that since the reference column has a bottom temperature of 1333°C the entire continental lithosphere is uplifted because of variation in the bottom temperature. The amount of background uplift experienced at the end of Stage 2 is ~196 m.
- The entire N JMMC has experienced uplift at the end of this stage with most of the region experiencing more than 200 m uplift. The highest amount of uplift (~1100 m) is recorded at the northeastern corner. Uplift decreases from east to west.
- The S JMMC subsides further as most of it cools during this stage. Only the southwestern edge of the S JMMC records uplift as it heated by the Kolbeinsey (IP) Ridge.

Stage 3 - Initial Configuration (23 Ma)

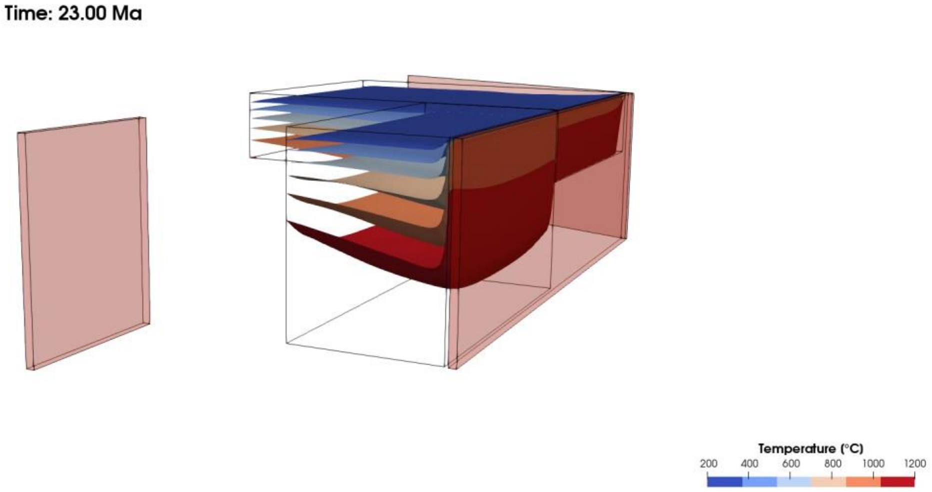


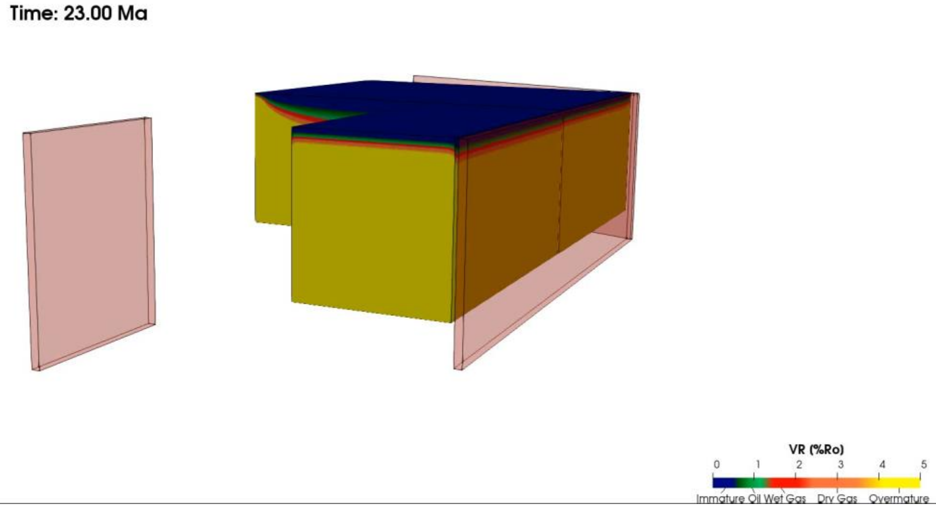
- The Kolbeinsey Ridge extends along the western border of the JMMC and starts spreading there.

Stage 3 – End Configuration (0 Ma)



Stage 3 – JMMC Temperature & Maturity

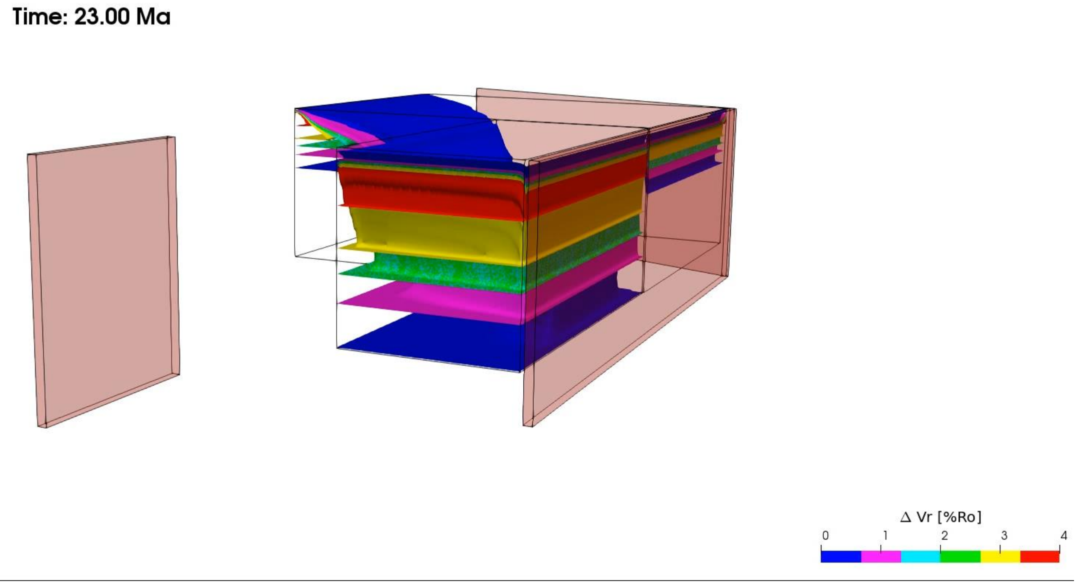


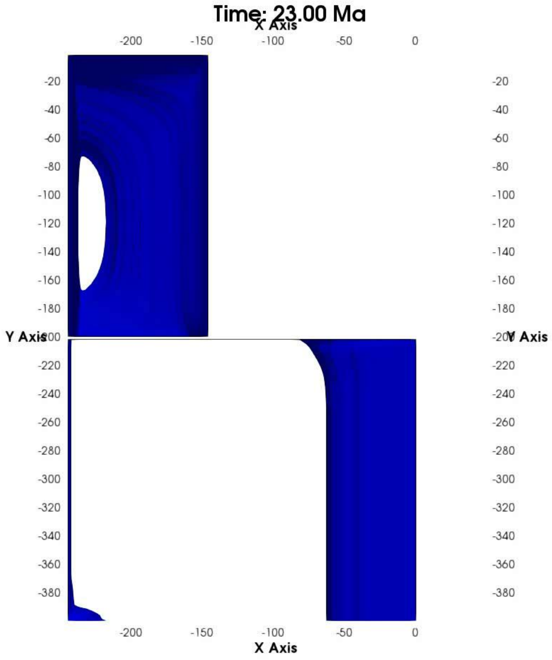


Note that the JMMC maturity plot is limited to 10 km depth and is 10x depth exaggerated for better visualization.

- The entire western edge of the JMMC receives heat from the Kolbeinsey Ridge that is active during this stage.
- The northern part of the N JMMC receives additional heat as the Mohns Ridge traverses the northern edge in the opposite direction.
- The JMMC cools once it moves away from the spreading centers.
- Maturity levels increase rapidly in regions close to the influence of spreading centers.

Stage 3 – JMMC Differential Maturity

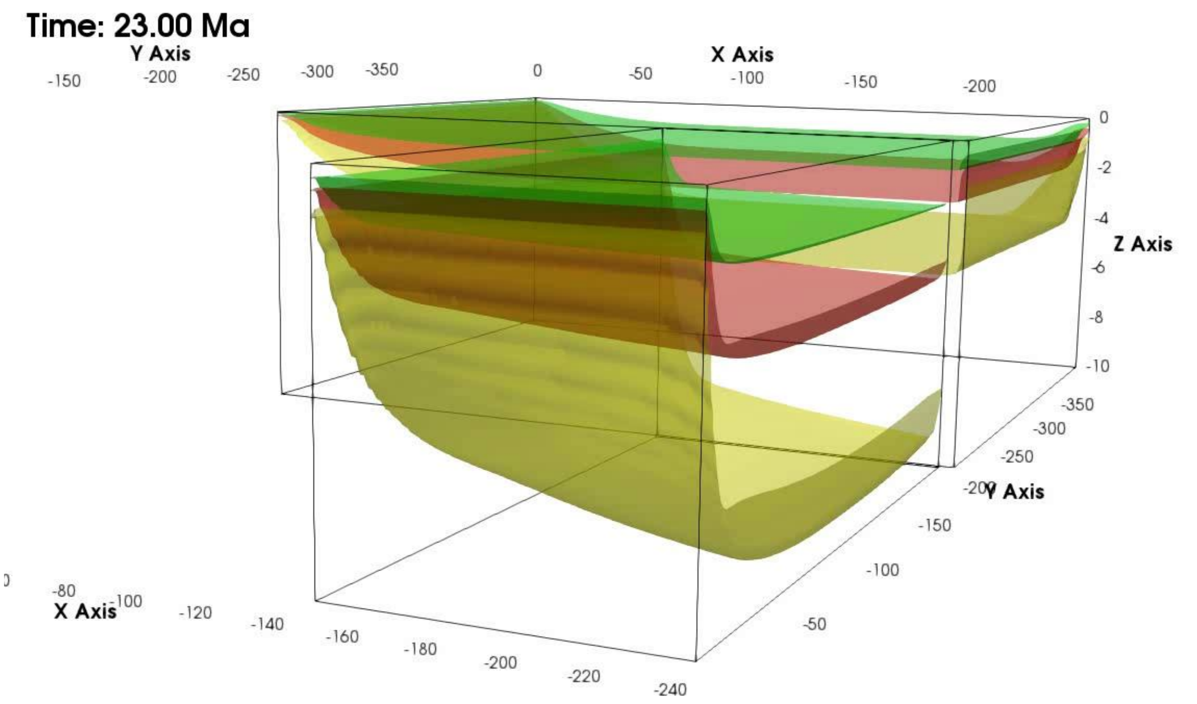




Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

- Maturity levels increase close to the western edge of the JMMC due to heat input from the Kolbeinsey Ridge. They also increase in the northern part of the N JMMC due to the Mohns Ridge.
- The perturbation in maturity levels (Δ=0.1%Ro) w.r.t. to background values covers most of the N JMMC during this stage. The perturbation in maturity levels extends by a few km into the S JMMC at the southwestern corner and western edge. The perturbation extends ~60 km from the eastern edge of the S JMMC showing a slight reduction in extent as compared to the other stages.

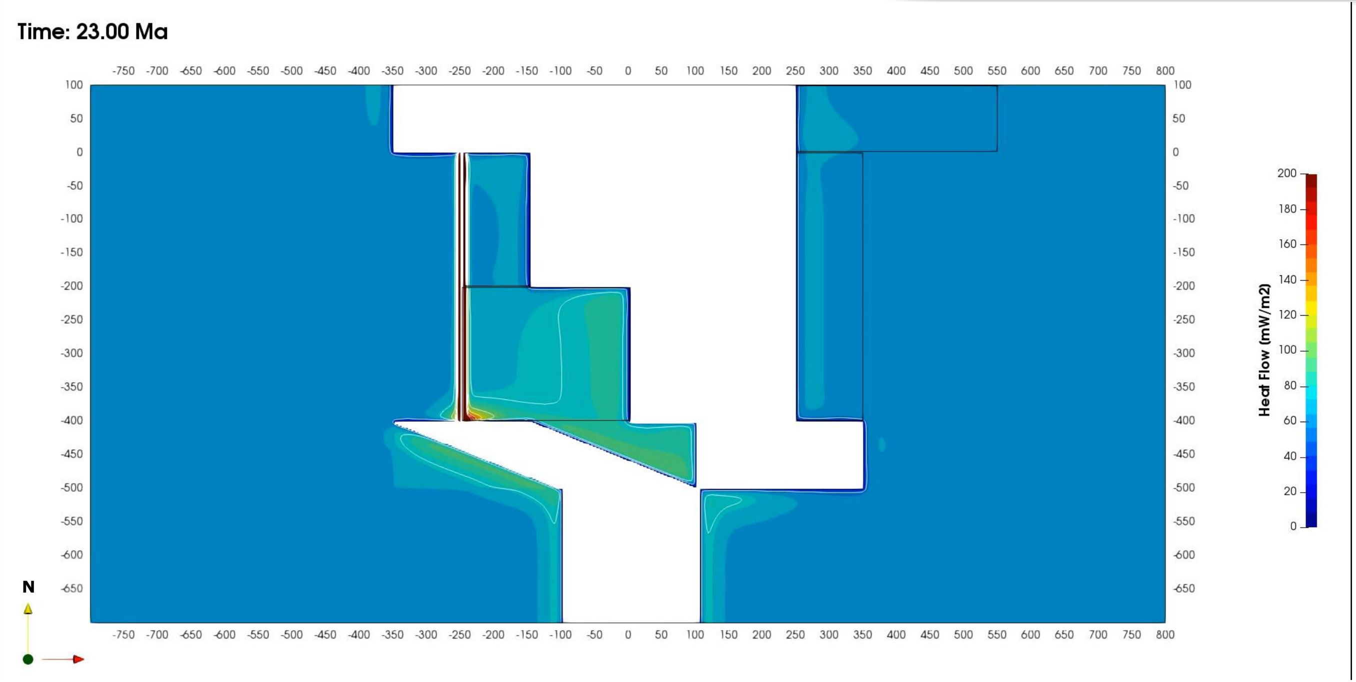
Stage 3 – JMMC Oil & Gas Windows



Note that the JMMC maturity plots are limited to 10 km depth and is 10x depth exaggerated for better visualization.

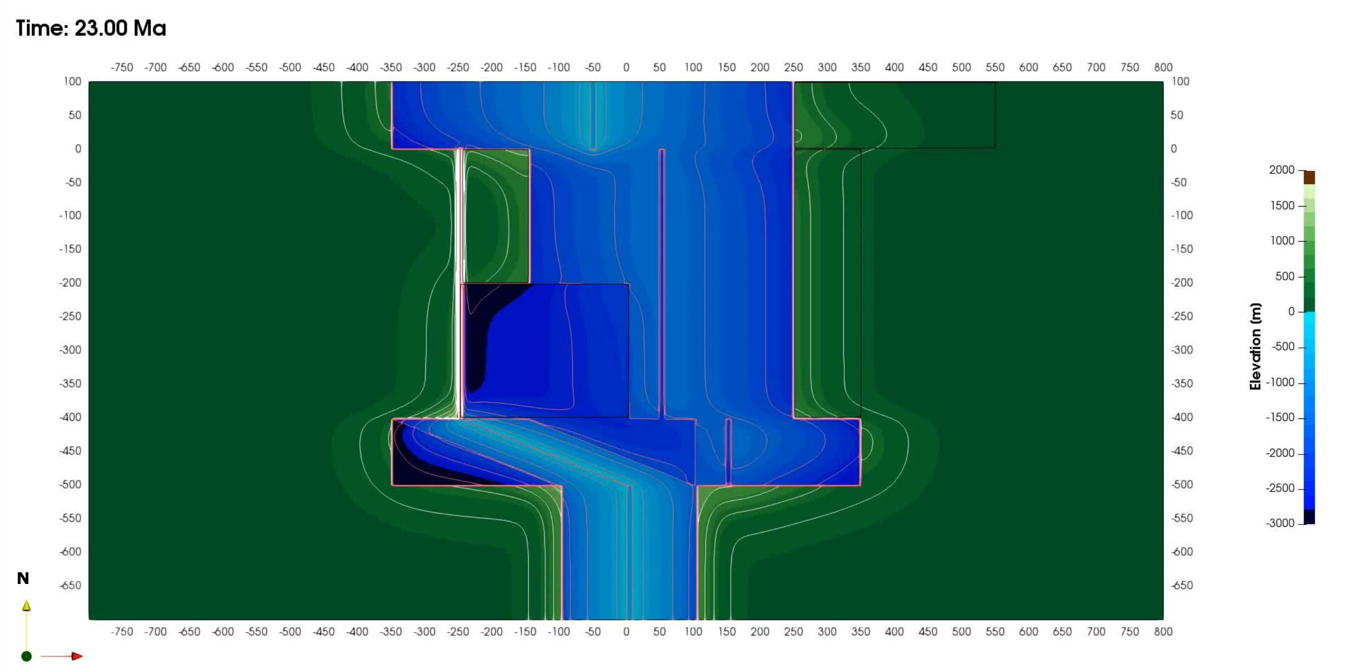
- The oil and gas windows are raised close to the western edge in contact with the Kolbeinsey Ridge.
- The windows are also raised in the northern part of N JMMC as the Mohns Ridge traverses it.

Stage 3 – Heat Flow



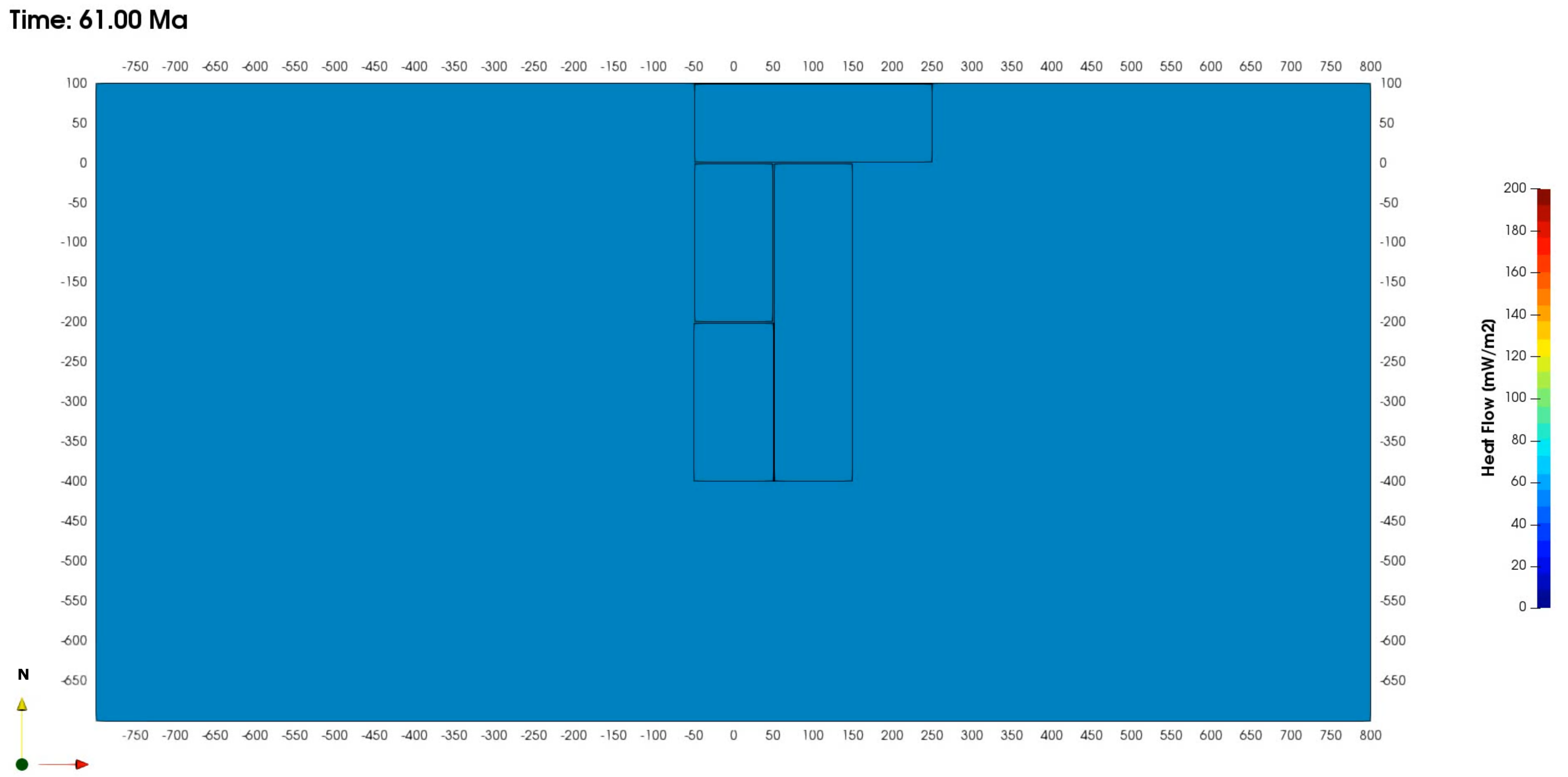
- Heat flow values in the JMMC increase as it is heated by the Kolbeinsey Ridge from the western edge. The N JMMC also receives heat from the Mohns Ridge as it passes by along the northern edge in the opposite direction from previous stages.
- Heat flow values reduce once the JMMC moves away from the spreading centers.
- Present-day heat flow values in the N JMMC reach a maximum of ~92 mW/m^2 in the northwestern corner and decreases towards the southeastern corner. The maximum value in the S JMMC is found in the southwestern corner and is lower (~73 mW/m^2) than the maximum in the N JMMC. Values decrease to background values towards the northeastern corner.

Stage 3 - Uplift

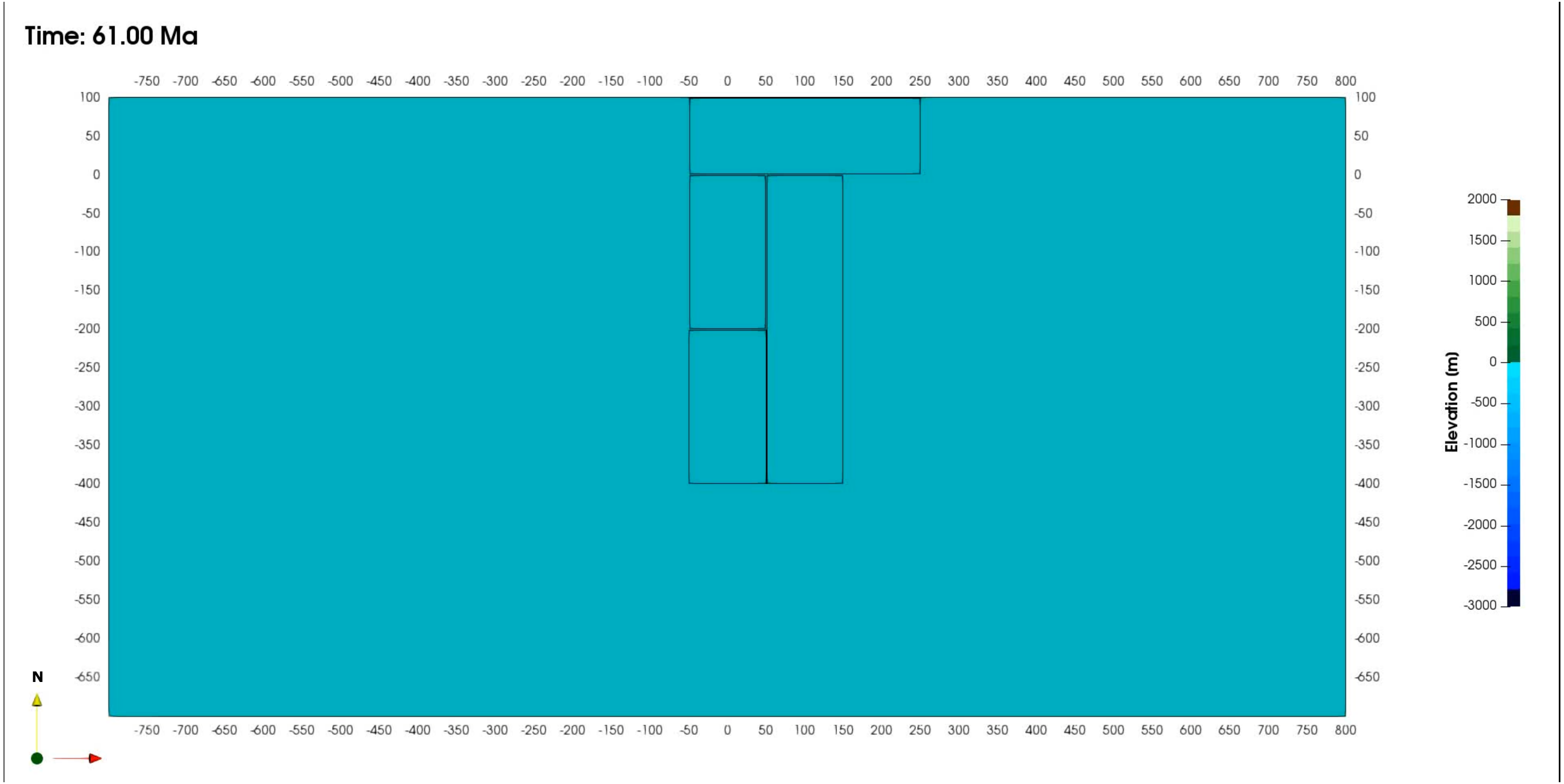


- Note that since the reference column has a bottom temperature of 1333°C the entire continental lithosphere is uplifted because of variation in the bottom temperature. The amount of background uplift experienced at the end of Stage 3 is ~175 m.
- The entire western edge of the JMMC experiences (relative) uplift as it is heated by the Kolbeinsey Ridge. The northern edge of N JMMC also experiences additional uplift due to the Mohns Ridge. The amount of uplift reduces as the JMMC moves away from the ridges and cools.
- The present-day uplift predicted by the model in the N JMMC is ~1300 m at the northwestern edge and reduces down to ~350 m at the southeastern edge.
- The present-day subsidence in the S JMMC is lowest at the southwestern edge (~-2500 m) and highest in the northern part (~ -3250 m). Note that the model does not take into account basin infill and erosion. Therefore, the prediction of uplift or subsidence should be realized as general tilt directions for the JMMC and not taken as absolute values.

Heat Flow

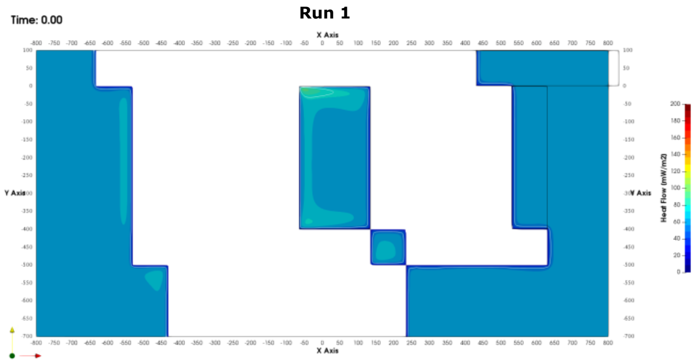

Time: 61.00 Ma
-750 -700 -650 -600 -550 -500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800
100 50 0 -50 -100 -150 -200 -250 -300 -350 -400 -450 -500 -550 -600 -650
N
Heat Flow (mW/m2)
200 180 160 140 120 100 80 60 40 20 0

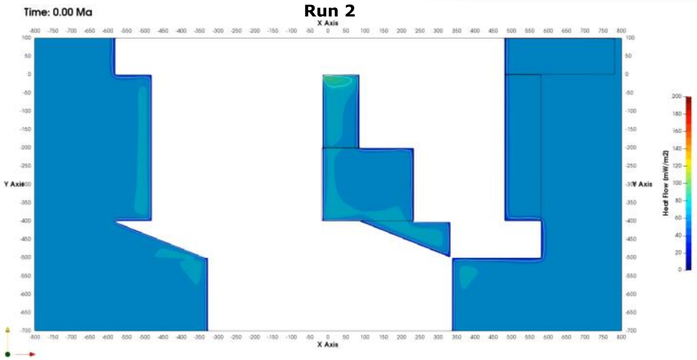
Uplift

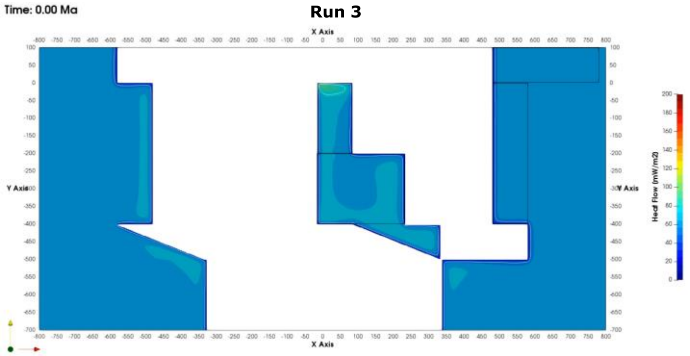

Time: 61.00 Ma
-750 -700 -650 -600 -550 -500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800
100 50 0 -50 -100 -150 -200 -250 -300 -350 -400 -450 -500 -550 -600 -650
N
Elevation (m)
2000 1500 1000 500 0 -500 -1000 -1500 -2000 -2500 -3000

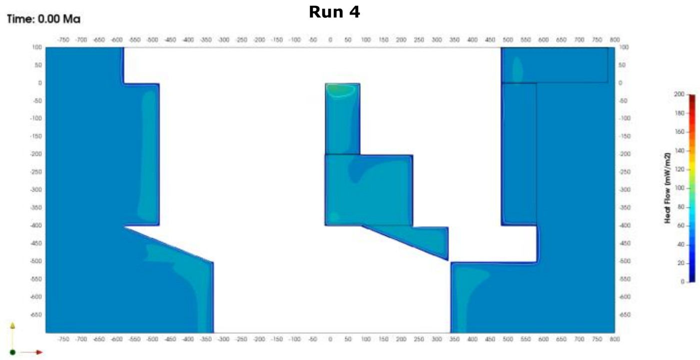
Comparison of Model Results

Model Results Comparison – Heat Flow



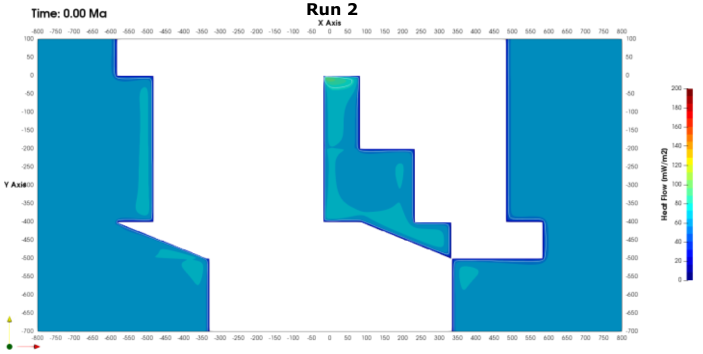


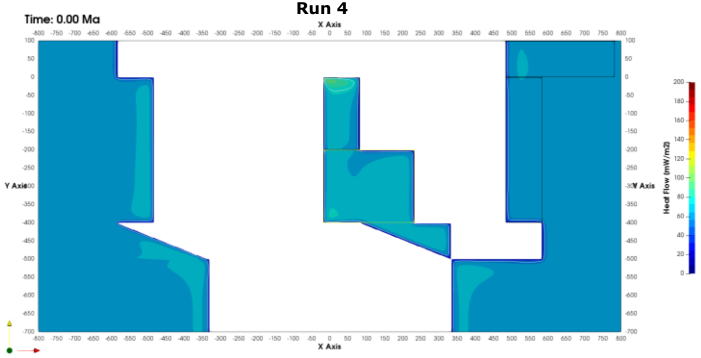


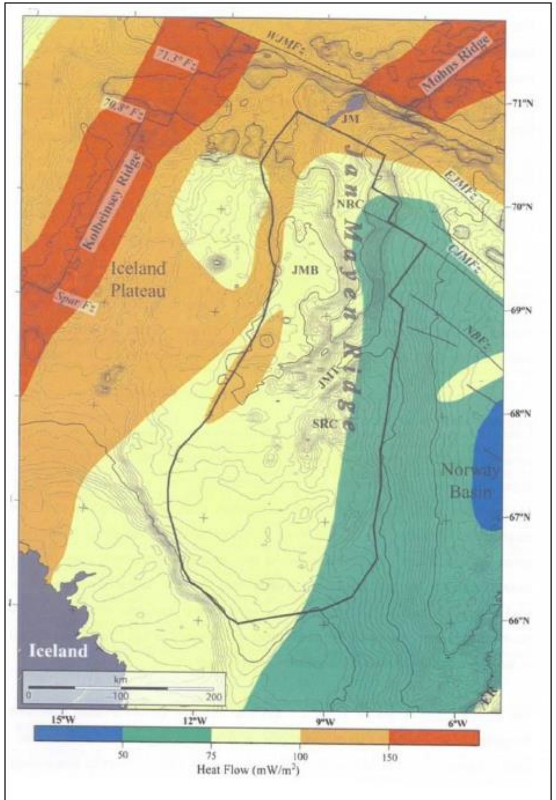


- The results from Run 1 are very different to the other runs due to the differences in geometry and cannot be directly compared to them.
- The JMMC in Run 1 shows high heat flow values in the north- (~90 mW/m^2) and southwestern (~73 mW/m^2) corners which decrease towards the east.
- The N JMMC in Runs 2 and 3 shows maximum heat flow values at the northwestern corner (~90 mW/m^2) and values decrease towards the south east. The S JMMC in these runs has maximum heat flow values near the southwestern corner (~71 mW/m^2) which decreases towards the center north.
- Run 4 is slightly hotter with maximum values at the northwestern corner of the N JMMC (~92 mW/m^2). The maximum value in the S JMMC is at the southwestern corner (~73 mW/m^2).

Comparison with Heat Flow Map







re 3.2: Heat flow in the Jan Mayen area (Rey, 2003)

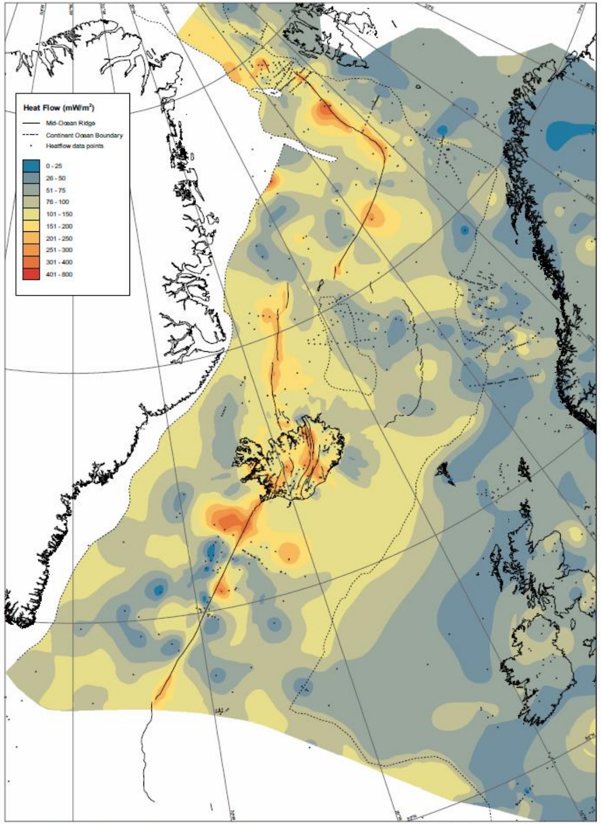


Figure 8.4 Interpolated heat flow grid over the region. Because of a lack of data constraints along the western and southern portions of the region, the grid is clipped along the COB off Greenland and along the Bight Fracture Zone to the south.

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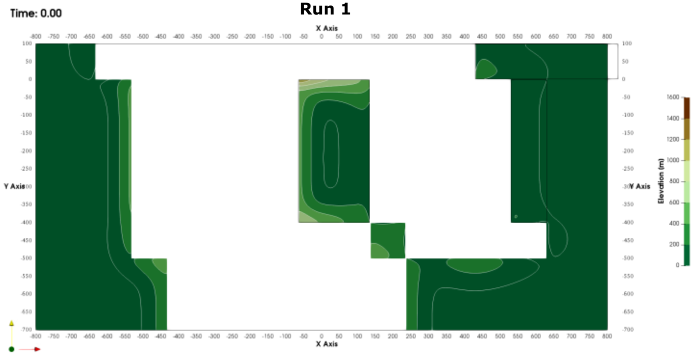
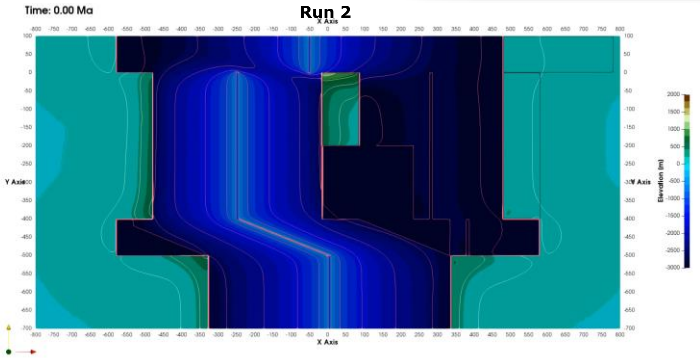
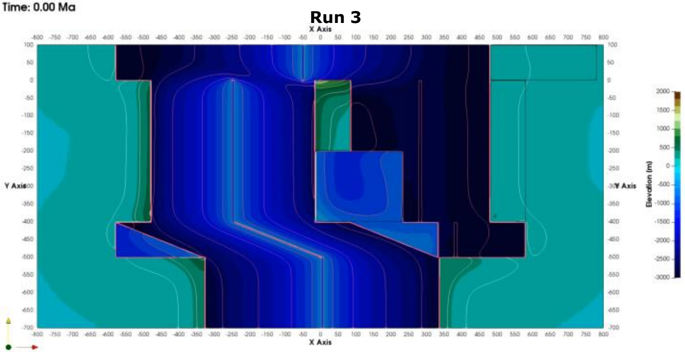
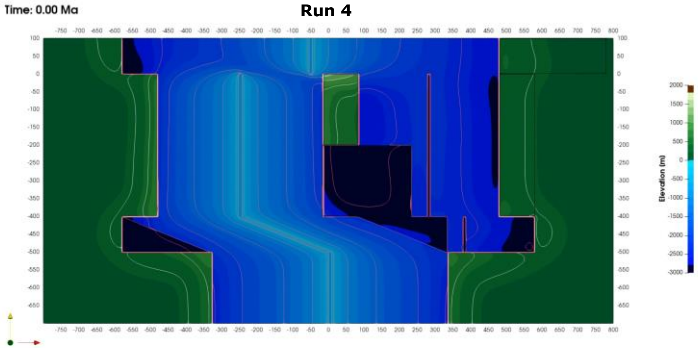
Model Results Comparison – Uplift



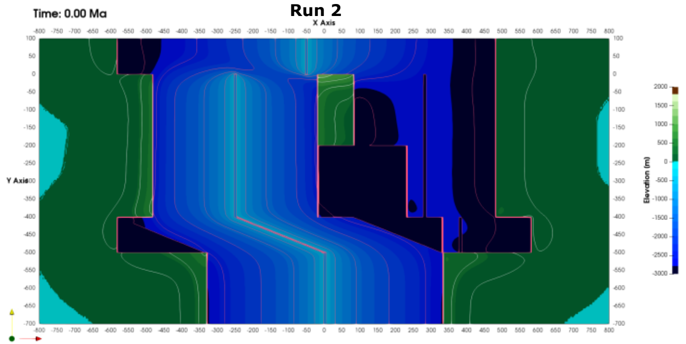


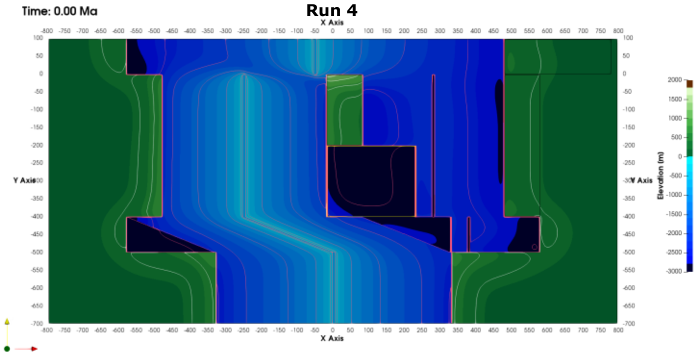


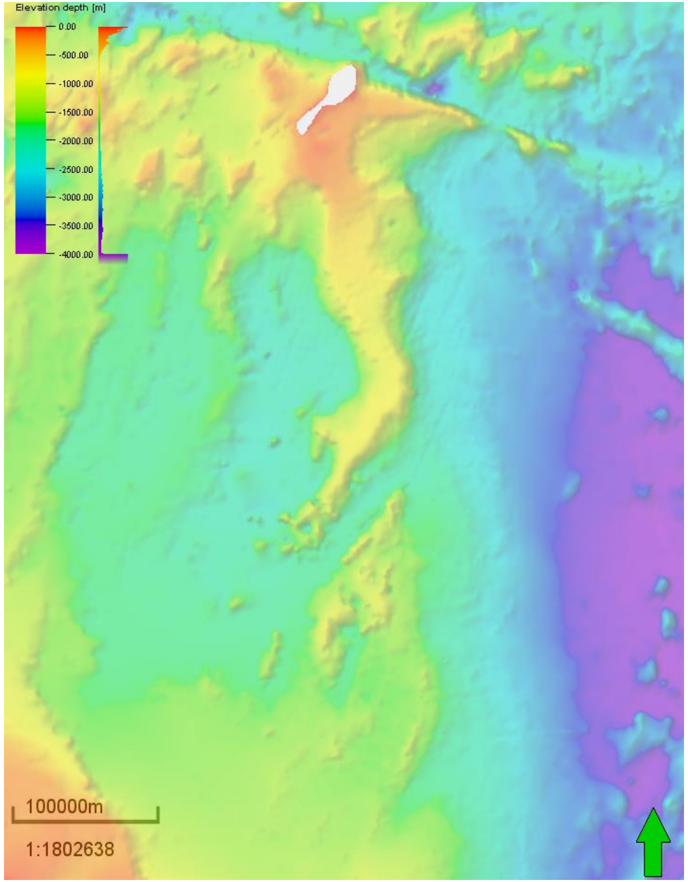


- The results from Run 1 are very different to the other runs due to the differences in geometry and cannot be directly compared to them.
- The JMMC in Run 1 shows high uplift values in the north- (~1200 m) and southwestern (~800 m) corners which decrease towards the center (~50 m).
- The N JMMC in the other runs has experienced maximum uplift at the northwestern corner and values decrease towards the south east. The maximum and minimum values for the runs are slightly different but the difference between them is similar (~1000 m).
- The S JMMC in Runs 2 to 4 also shows the same trend in subsidence values with the minimum value recorded at the southwestern edge and the maximum value towards the center of the northern part. The difference in these values is again similar (~800 m).

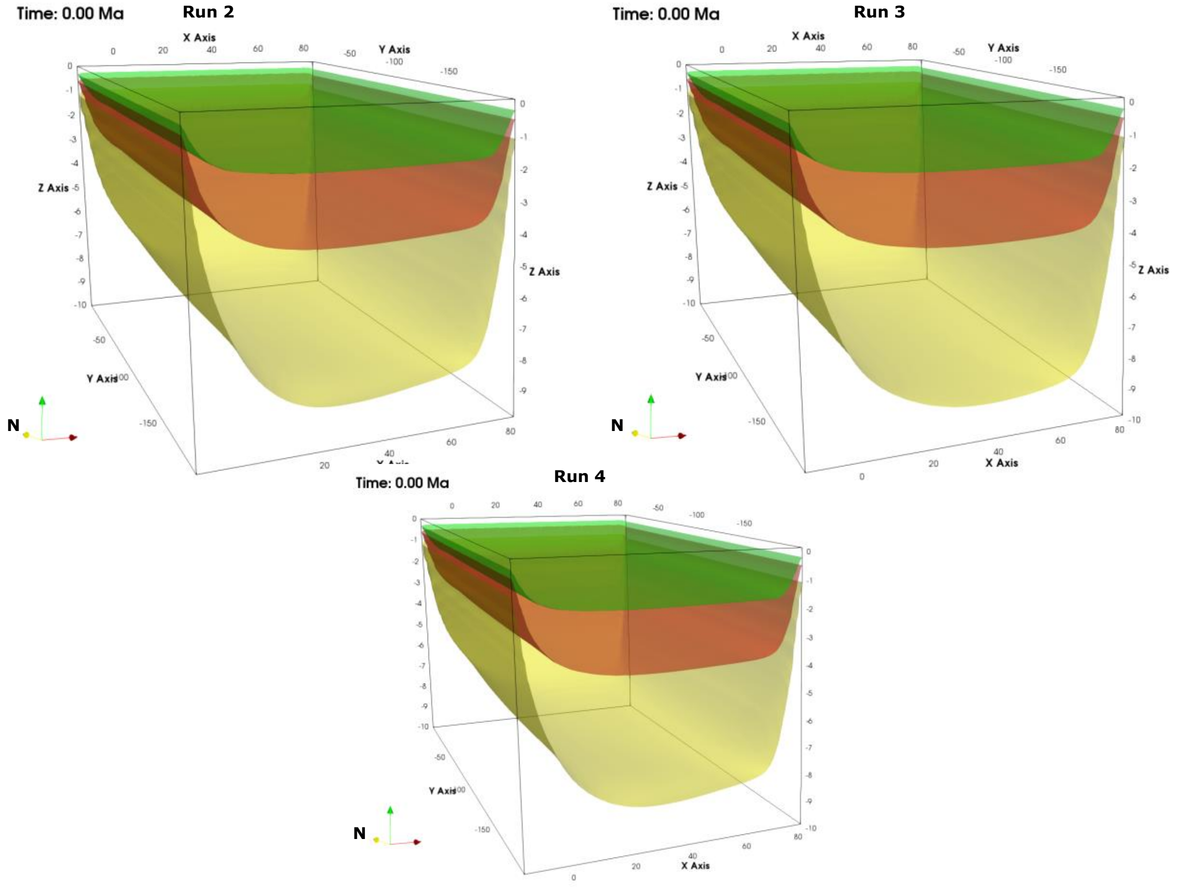
Comparison with Bathymetry







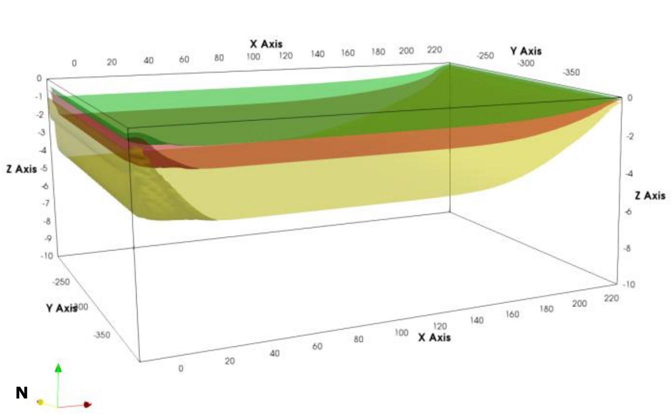
Model Results Comparison – HC Windows (N)



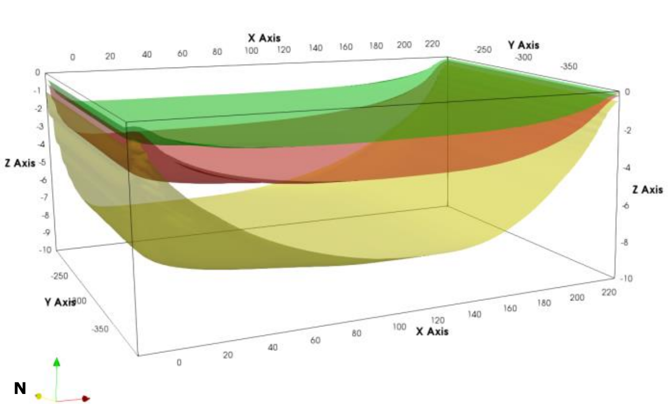
- The results from Run 1 are very different to the other runs due to the differences in geometry and cannot be directly compared to them.
- The oil and gas windows in the central regions are ~1800 and 4000 m deep, respectively.
- The oil and gas windows are uplifted in the northern, western and eastern edges due to the influences of the Mohns, Kolbeinsey and Aegir ridges, respectively.

Model Results Comparison – HC Windows (S)

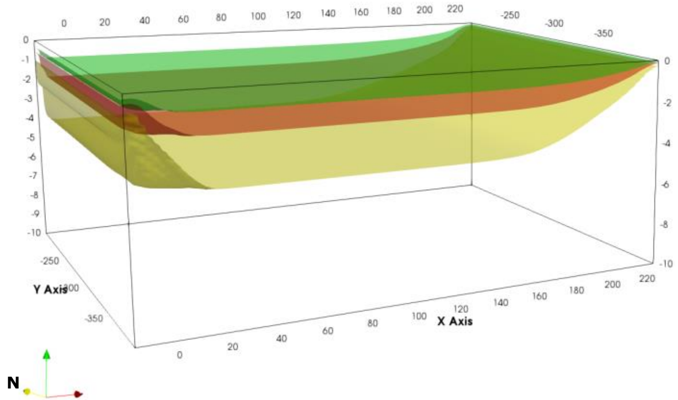
Time: 0.00 Ma **Run 2**



Time: 0.00 Ma **Run 3**



Run 4



- The results from Run 1 are very different to the other runs due to the differences in geometry and cannot be directly compared to them.
- The HC window depths in Runs 2 and 4 are closer to each other than to Run 3 as the S JMMC in Run 3 is stretched to a lesser extent during rifting.
- Run 2: The oil and gas windows in the central regions are 1000 and 2000 m deep, respectively.
- Run 3: The oil and gas windows in the central regions are 1600 and 3500 m deep, respectively.
- Run 4: The oil and gas windows in the central regions are 900 and 1850 m deep, respectively.
- All Runs: The oil and gas windows are uplifted in the eastern and western edges due to the influence of the Aegir and Kolbeinsey ridges, respectively. The windows are also uplifted close to the southwestern edge due to the influence of the Kolbeinsey ridge that crosscuts the Icelandic Plateau.