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Supplement of

Thrusts control the thermal maturity of accreted sediments

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Supplementary Figures

Fig. S1:

Typical Distribution of thermal conductivity in wedge

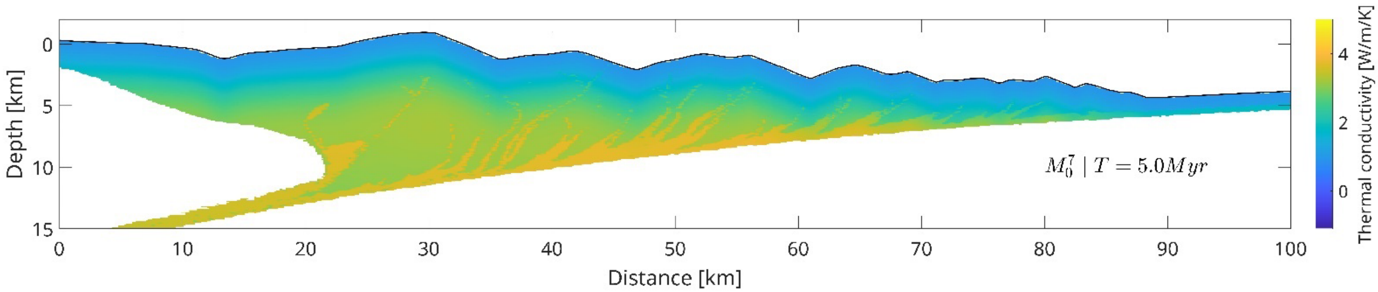

Fig. S2:

Scheme of trench sedimentation in models (taken from (Mannu et al., 2017))

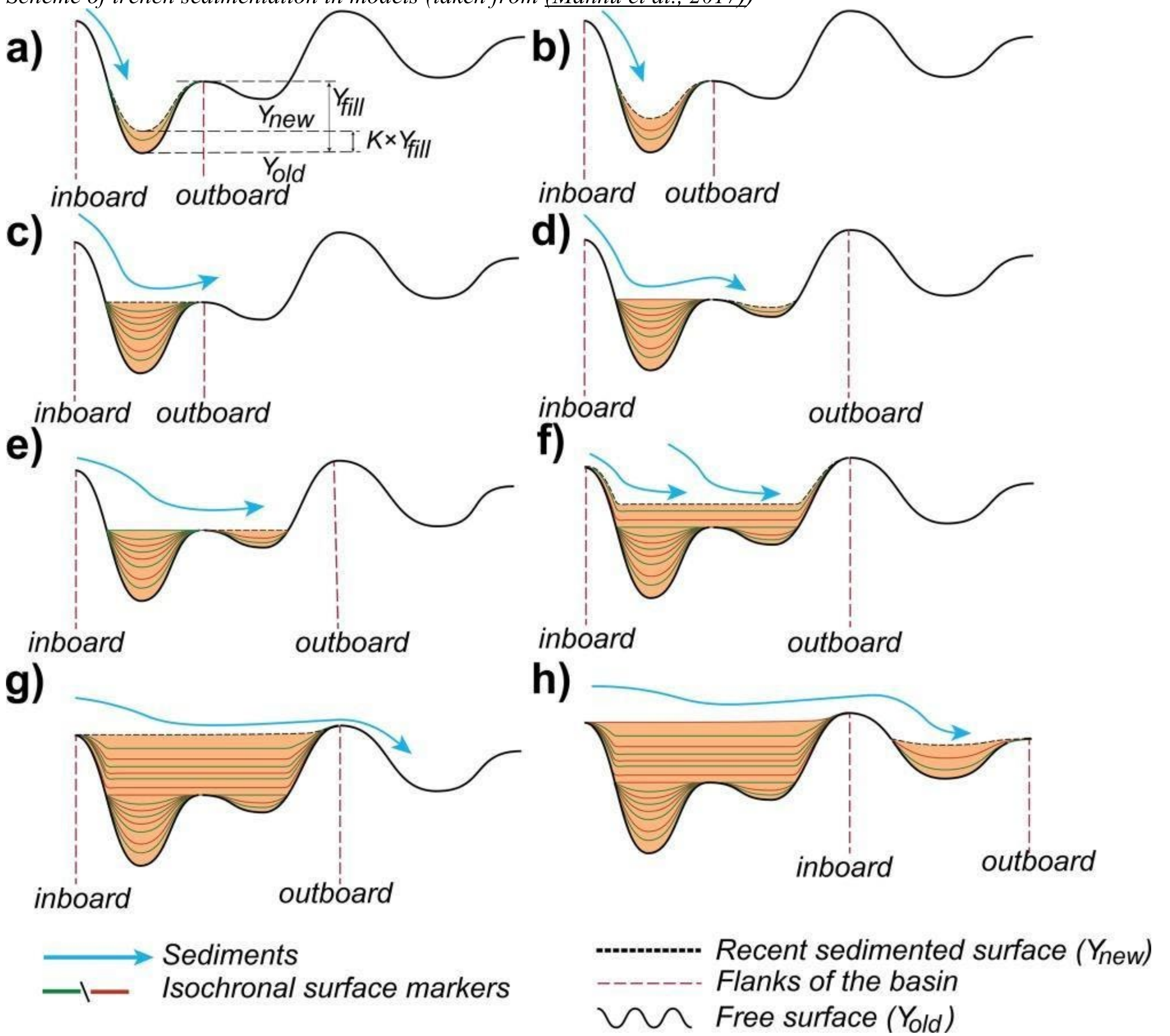

Fig. S3:

Plot of Temperature vs Depth profile in for water-sediment interaction using the data from the International Argo Program and the national programs that contribute for the location(represented by the white square) given in the inset The magenta circle ***represents*** *the Temperature vs Depth profile from the data while the black line is the fitted thermocline used in our models for water-sediment thermal interaction.*

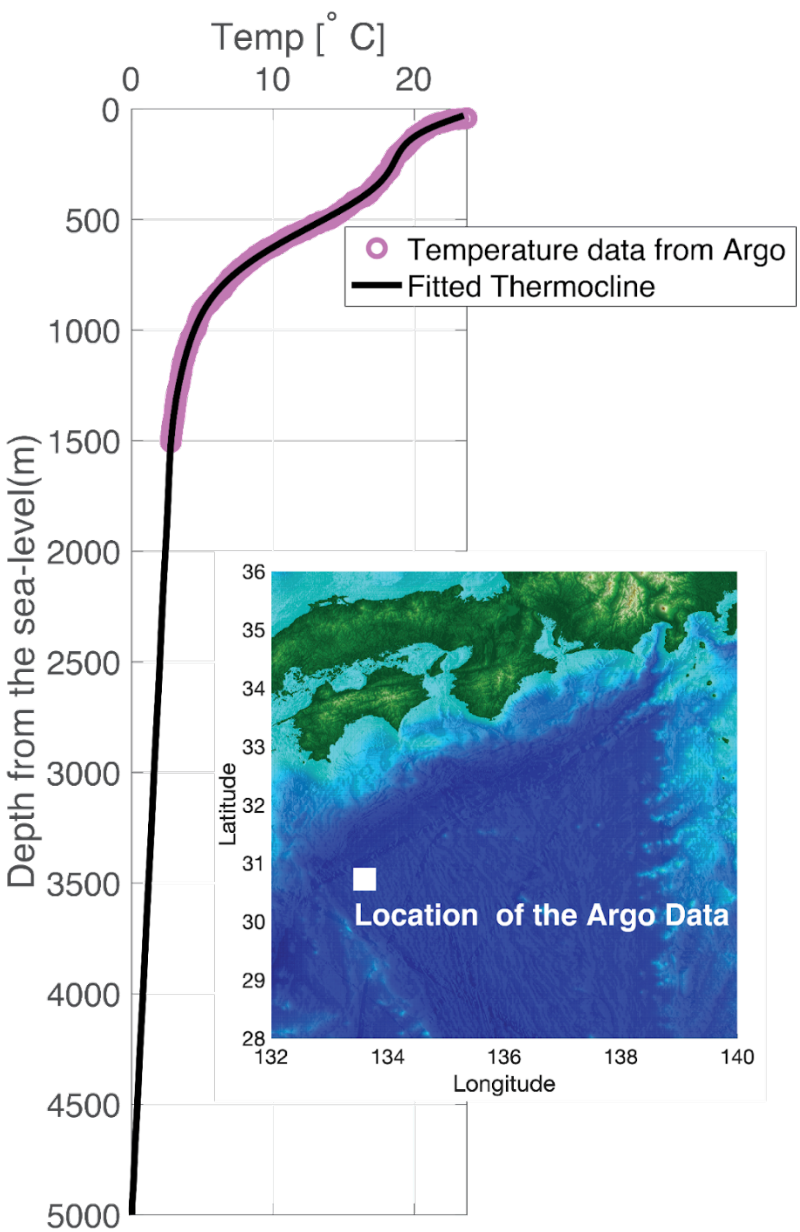

Fig. S4:

Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M_0^{4.5}}$ *at 0.5 Myr, 2.5 Myr, 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-D). The dashed white lines represent the contours of the temperature field. The colormap for the first 4 panels is same as Figure 1. The last panel represents thermal maturity values at ~7.5 Myr computed using Easy%*R_o*. The colormap for Panel E is same as that of Figure 3.*

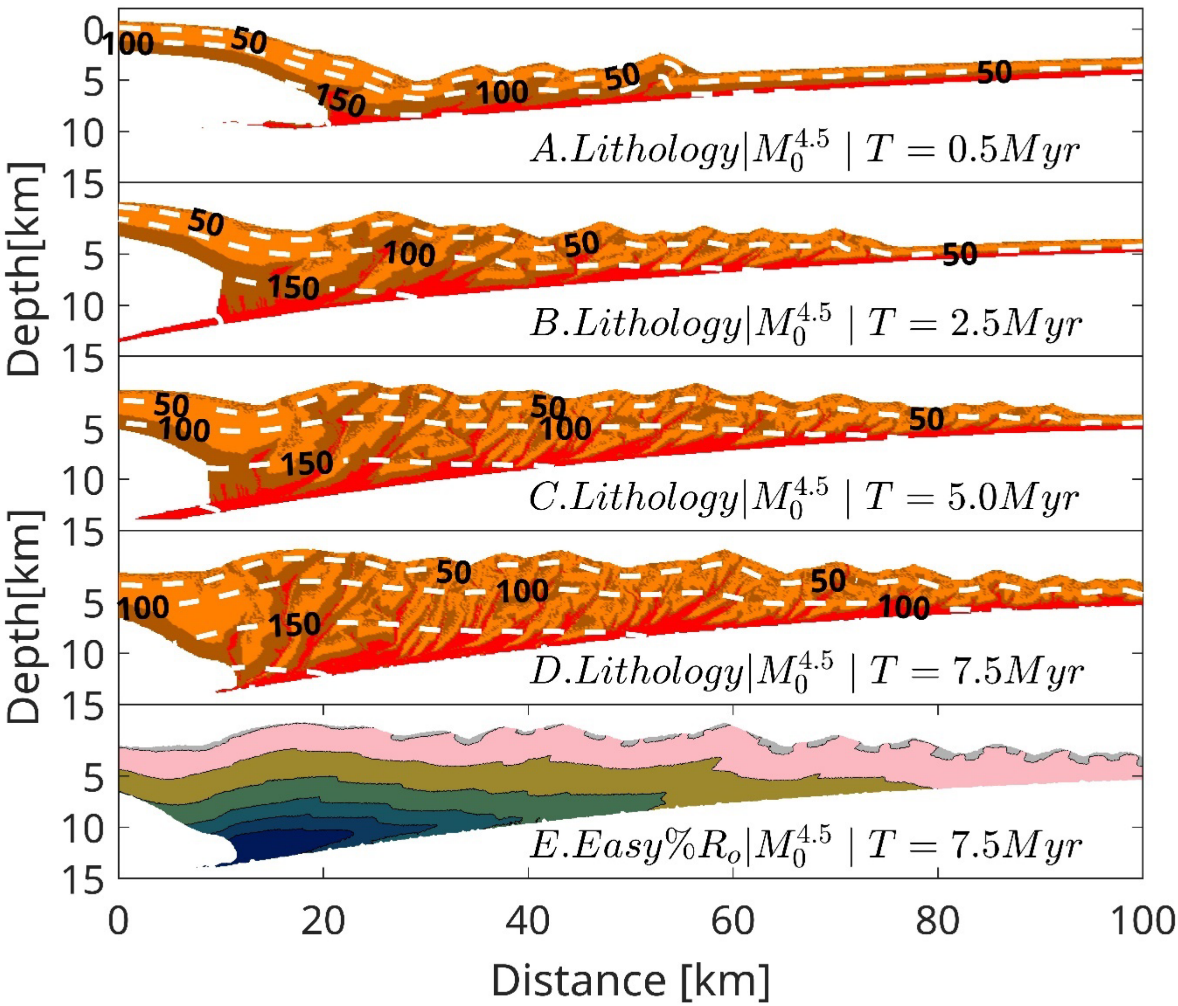

Fig. S5:

Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M_0^7}$ *at 0.5 Myr, 2.5 Myr, 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-D). The dashed white lines represent the contours of the temperature field. The colormap for the first 4 panels is same as Figure 1. The last panel represents thermal maturity values at ~7.5 Myr computed using Easy%R_o. The colormap for Panel E is same as that of Figure 3.*

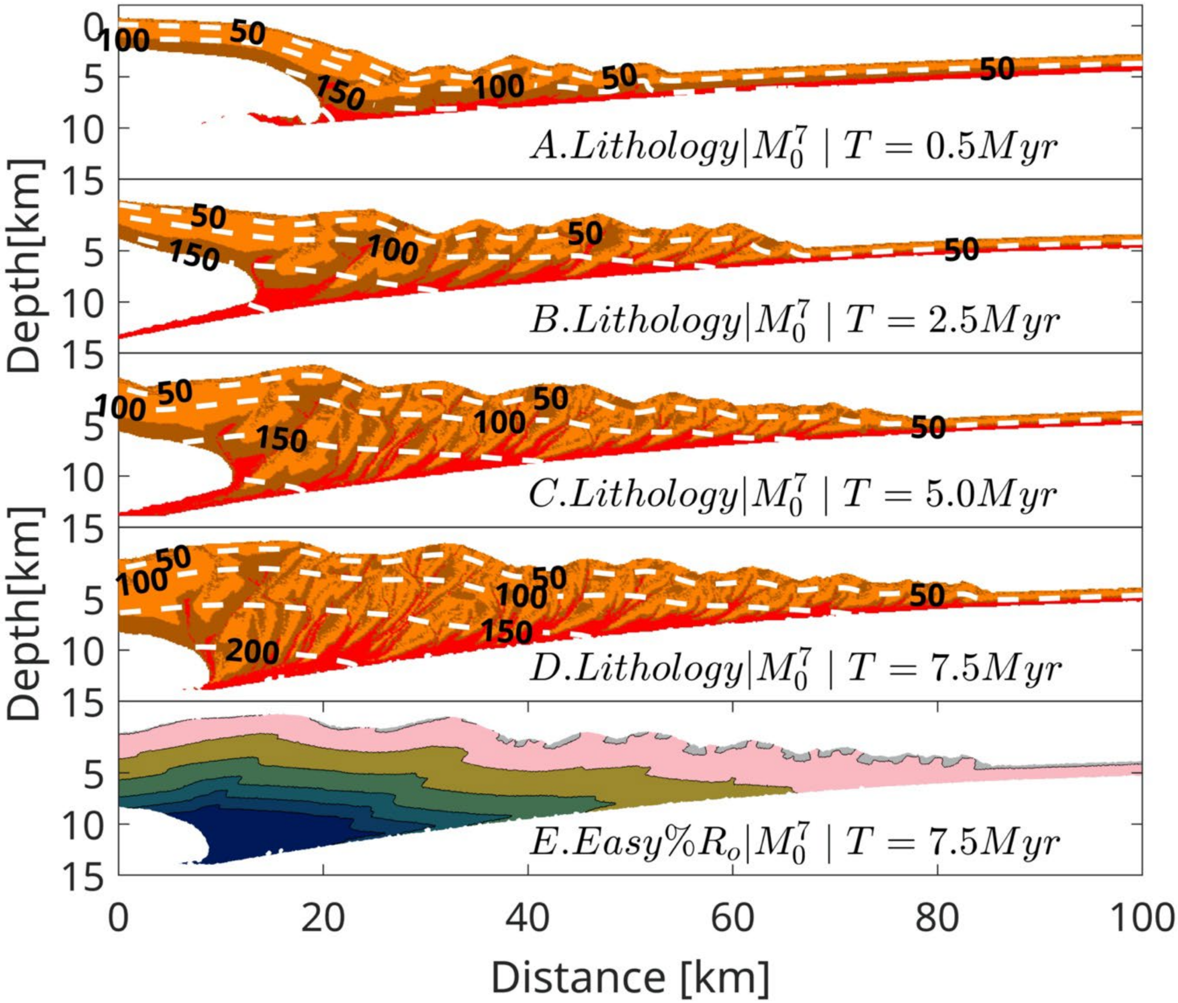

Fig. S6:
Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M_0^{9.5}}$ *at 0.5 Myr, 2.5 Myr, 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-D). The dashed white lines represent the contours of the temperature field. The colormap for the first 4 panels is same as Figure 1. The last panel represents thermal maturity values at ~7.5 Myr computed using Easy%*R_o*. The colormap for Panel E is same as that of Figure 3.*

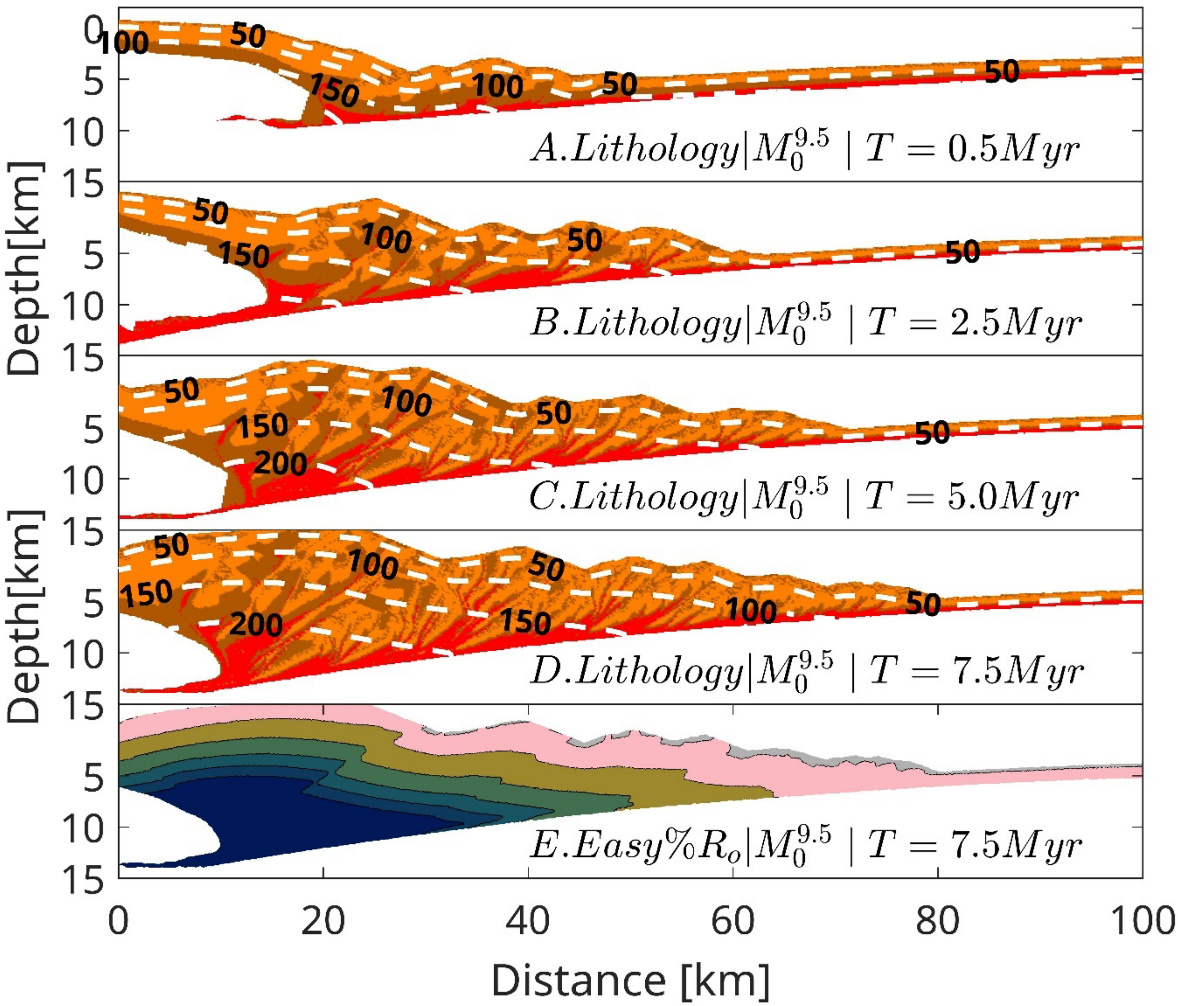

Fig. S7:

Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M_0^{12}}$ *at 0.5 Myr, 2.5 Myr, 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-D). The dashed white lines represent the contours of the temperature field. The colormap for the first 4 panels is same as Figure 1. The last panel represents thermal maturity values at ~7.5 Myr computed using Easy%R*$_o$*. The colormap for Panel E is same as that of Figure 3.*

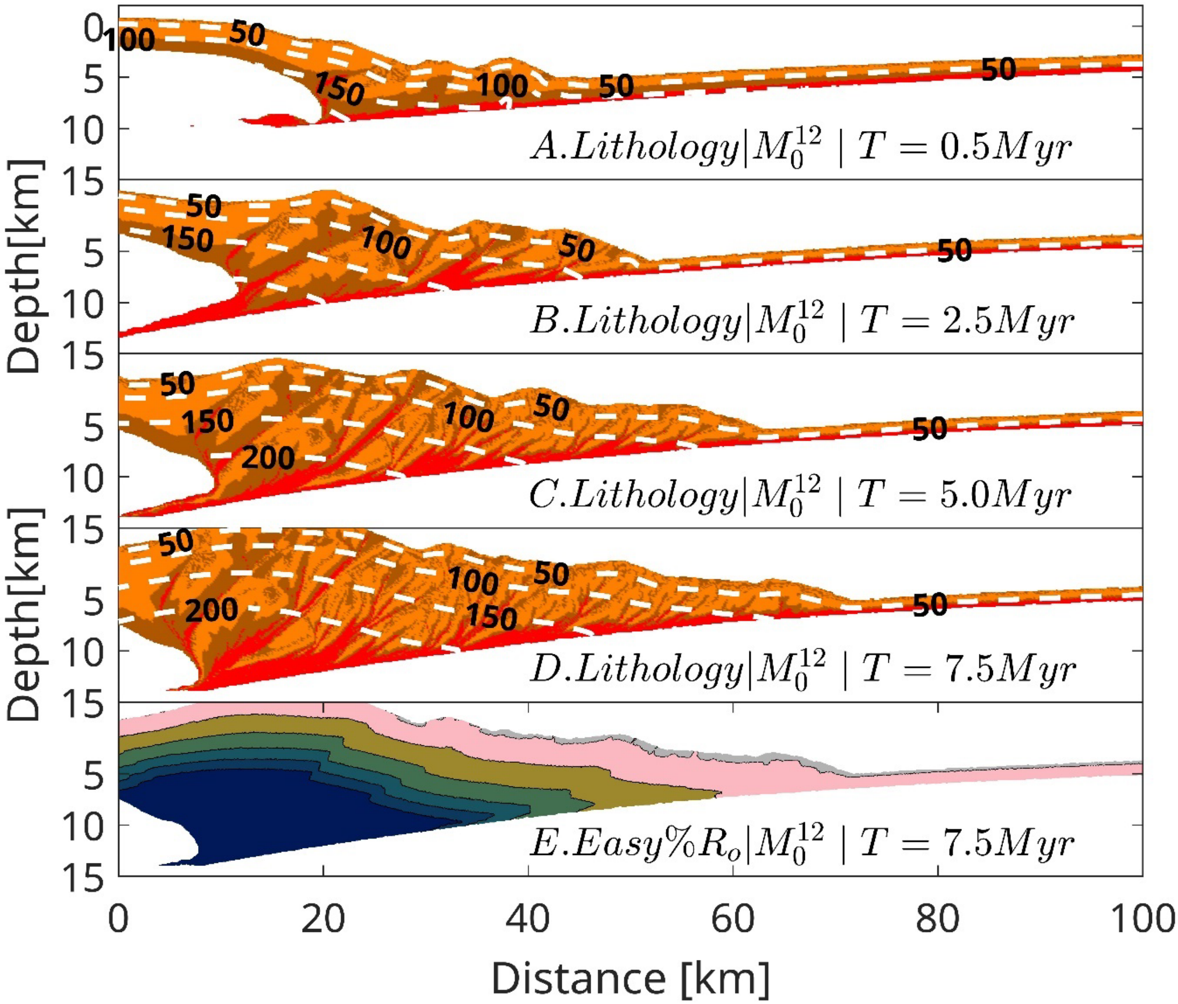

Fig. S8:
Typical thermomechanical evolution of the accretionary wedge for model $\boldsymbol{M_0^{14.5}}$ *at 0.5 Myr, 2.5 Myr, 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-D). The dashed white lines represent the contours of the temperature field. The colormap for the first 4 panels is same as Figure 1. The last panel represents thermal maturity values at ~7.5 Myr computed using Easy%R_o. The colormap for Panel E is same as that of Figure 3.*

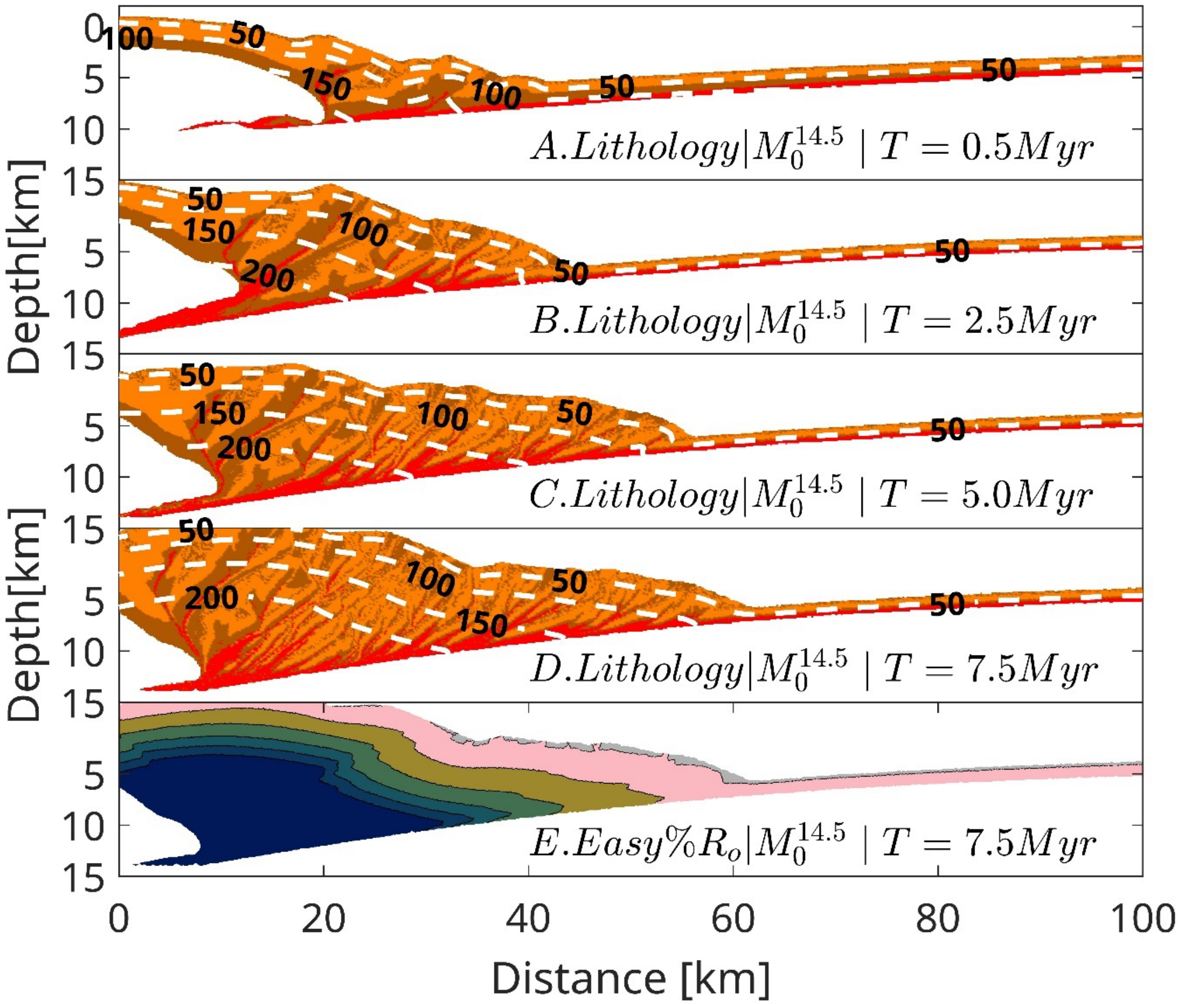

Fig. S9:

Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M_{0.1}^{9.5}}$ *at 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-B). The dashed white lines represent the contours of the temperature field. The colormap for the first 2 panels is same as Figure 1. The Panel C represents thermal maturity values at ~7.5 Myr computed using Easy%R*$_o$*. The colormap for Panel E is same as that of Figure 3.*

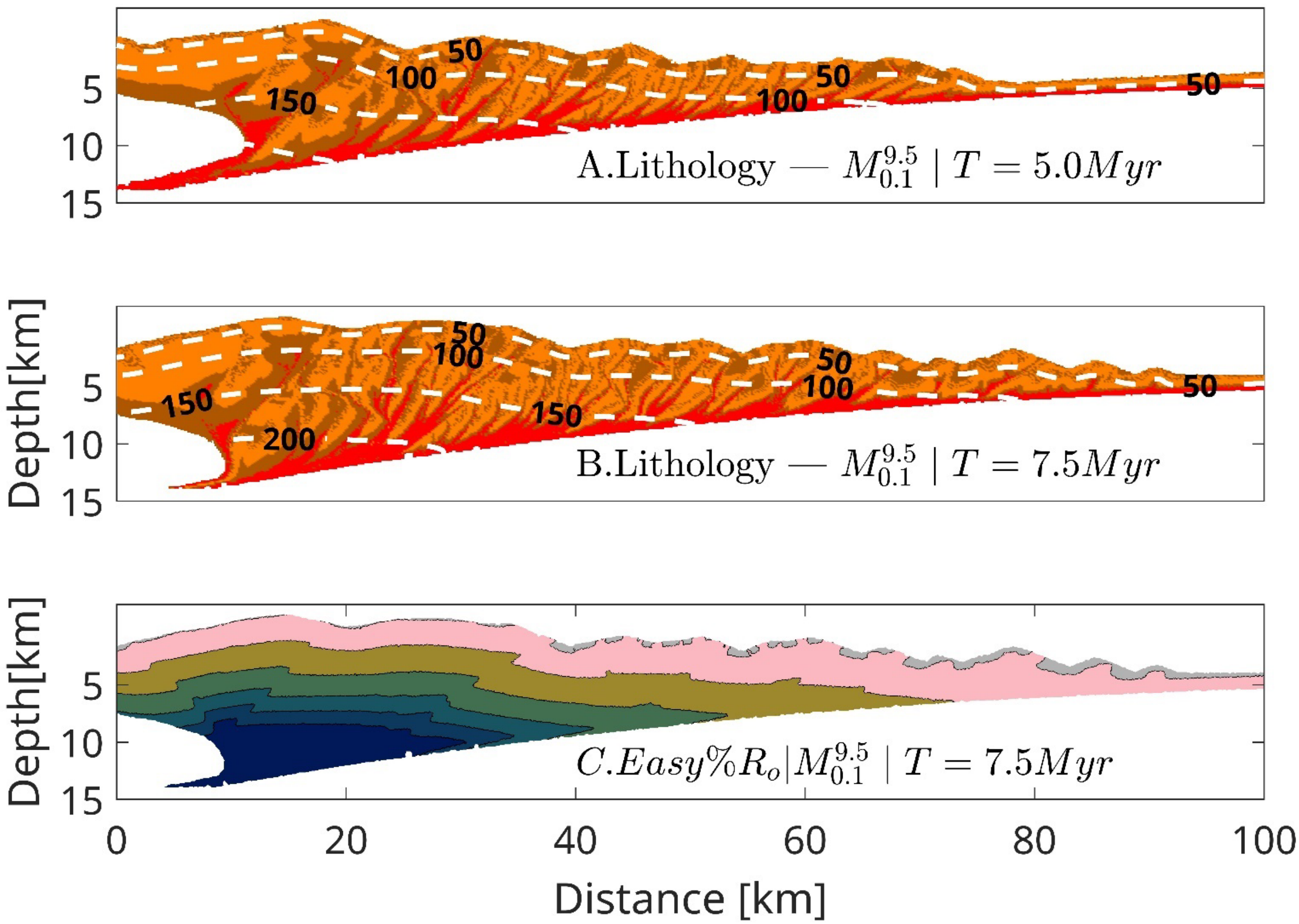

Fig. S10:

Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M}_{0.3}^{9.5}$ *at 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-B). The dashed white lines represent the contours of the temperature field. The colormap for the first 2 panels is same as Figure 1. The Panel C represents thermal maturity values at ~7.5 Myr computed using Easy%*R_o*. The colormap for Panel E is same as that of Figure 3.*

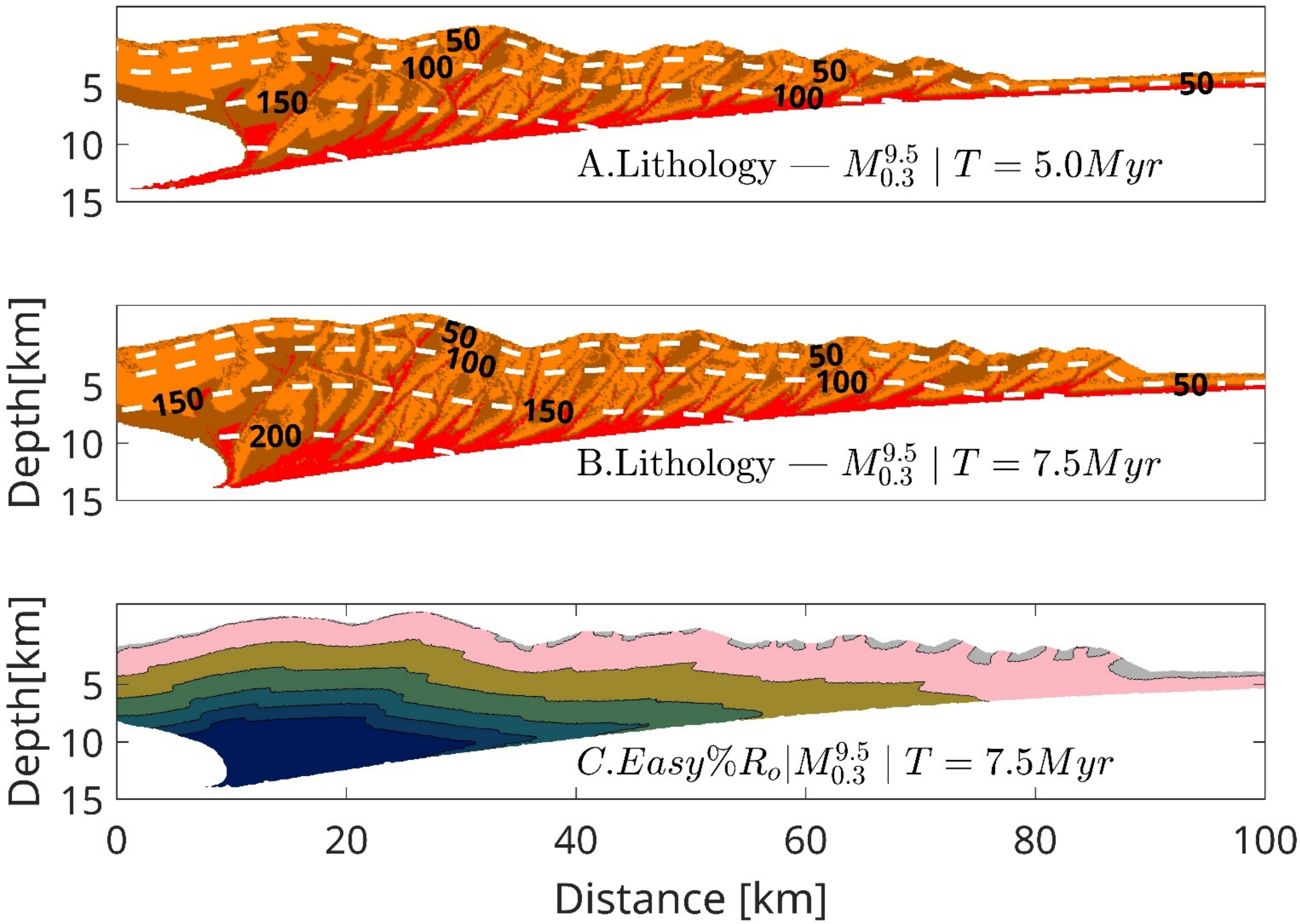

Fig. S11:

Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M}_{0.5}^{4.5}$ *at 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-B). The dashed white lines represent the contours of the temperature field. The colormap for the first 2 panels is same as Figure 1. The Panel C represents thermal maturity values at ~7.5 Myr computed using Easy%*R_o*. The colormap for Panel E is same as that of Figure 3.*

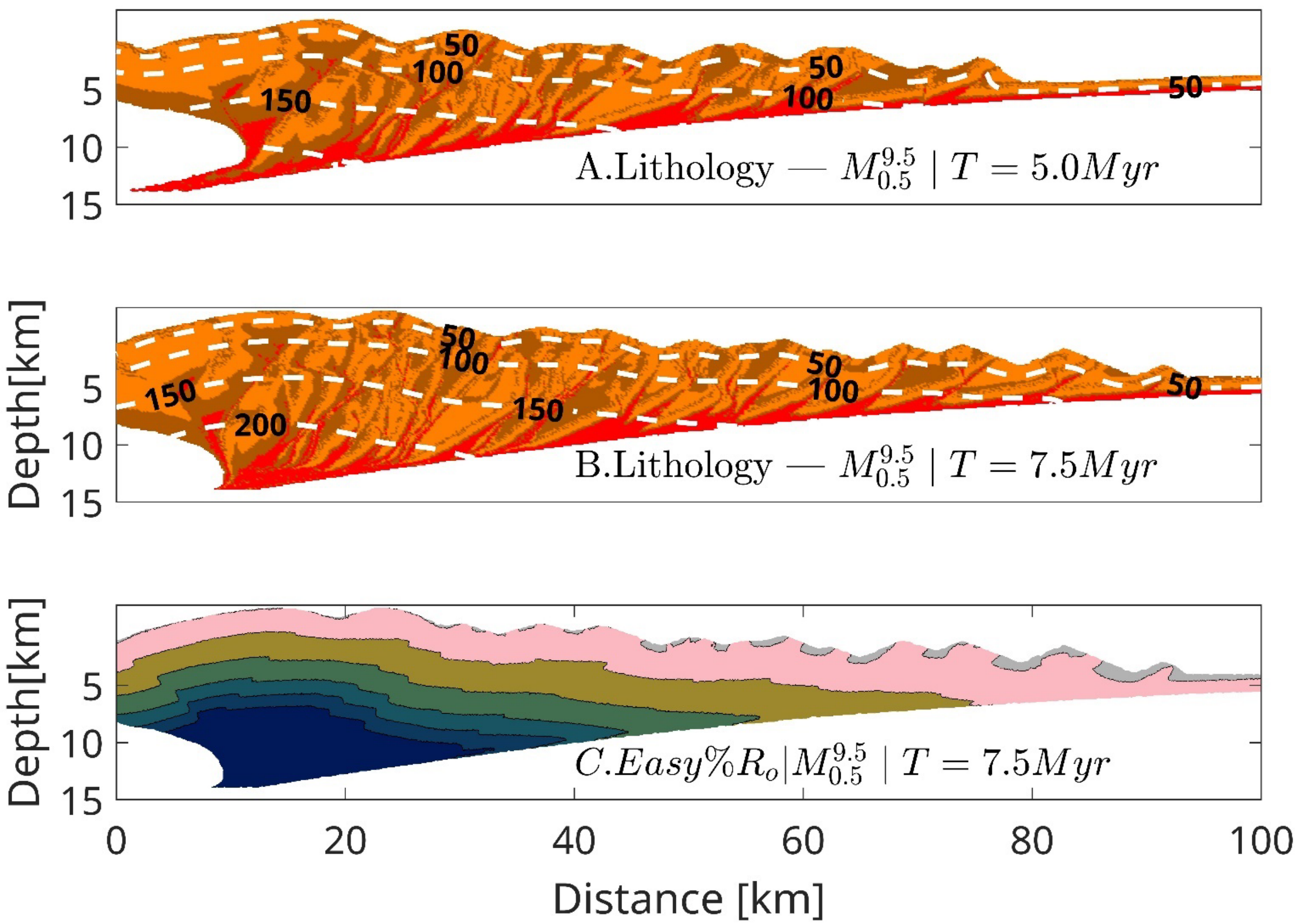

Fig. S12:

Typical thermomechanical evolution of the accretionary wedge for model $\boldsymbol{M^{9.5}_{0.7}}$ *at 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-B). The dashed white lines represent the contours of the temperature field. The colormap for the first 2 panels is same as Figure 1. The Panel C represents thermal maturity values at ~7.5 Myr computed using Easy%*R_o*. The colormap for Panel E is same as that of Figure 3.*

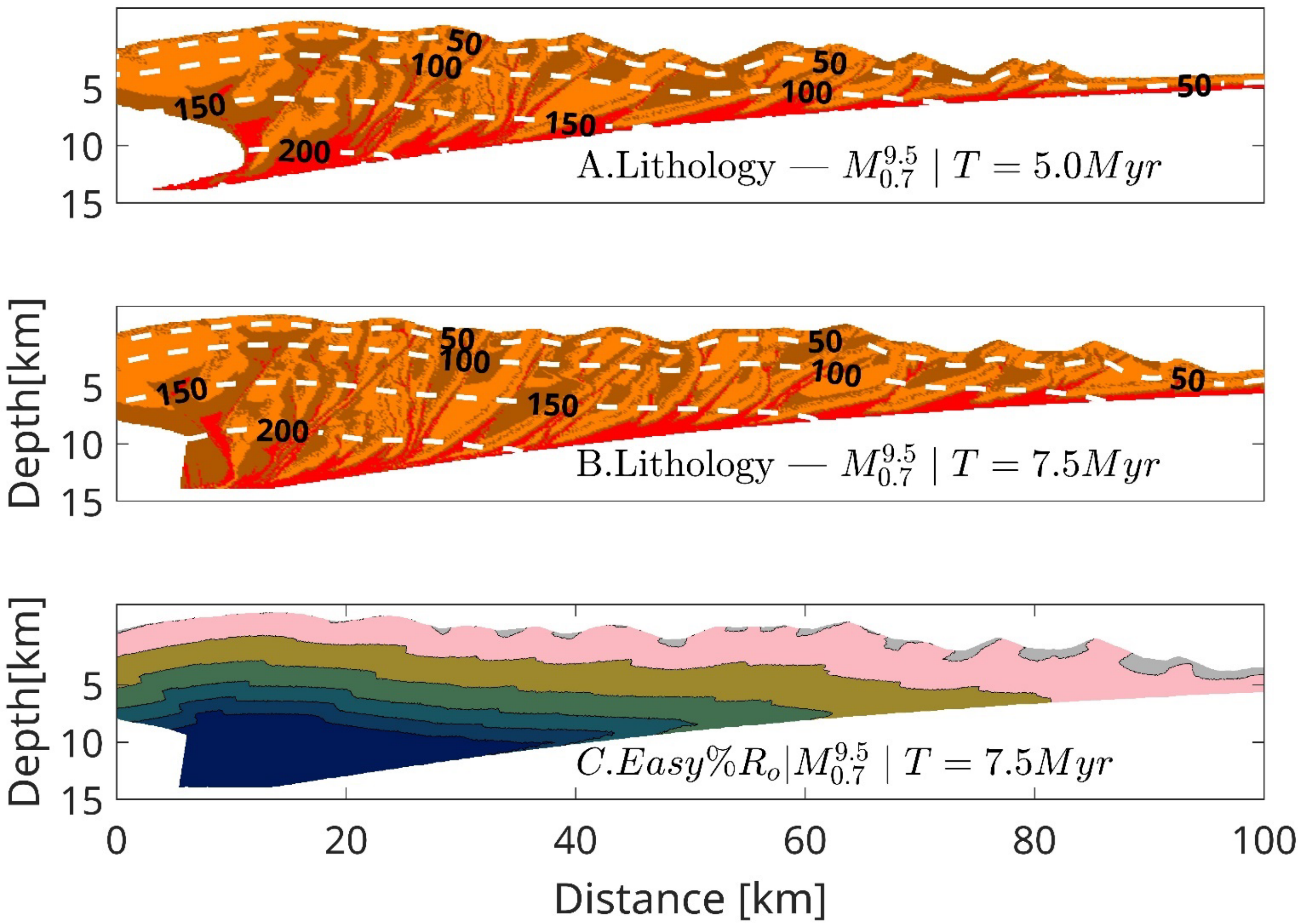

Fig. S13:

Typical thermomechanical evolution of the accretionary wedge for model $\mathbf{M}_{0.9}^{9.5}$ *at 5.0 Myr and 7.5 Myr of lithological evolution (Panel A-B). The dashed white lines represent the contours of the temperature field. The colormap for the first 2 panels is same as Figure 1. The Panel C represents thermal maturity values at ~7.5 Myr computed using Easy%*R_o*. The colormap for Panel E is same as that of Figure 3.*

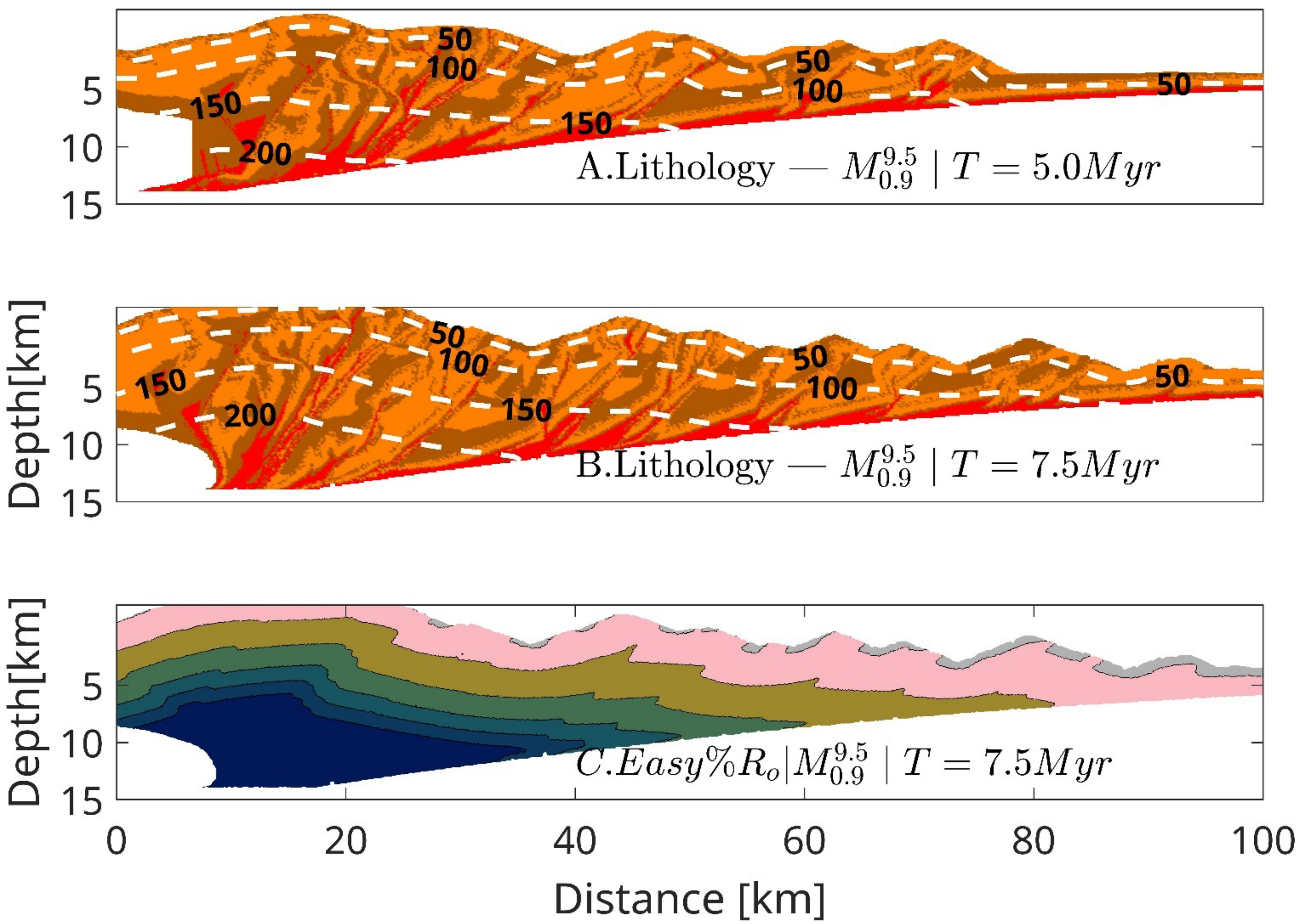

Fig. S14:
Plot of Temperature vs Depth profile in all models compared to Temperature-depth profile based on in-situ temperature from the long-term borehole monitoring system (indicated red patch is the range of temperature estimated by (Sugihara et al., 2014)*). The temperature vs depth profiles for the models are computed for 20 kms from the backstop as shown in the inset.*

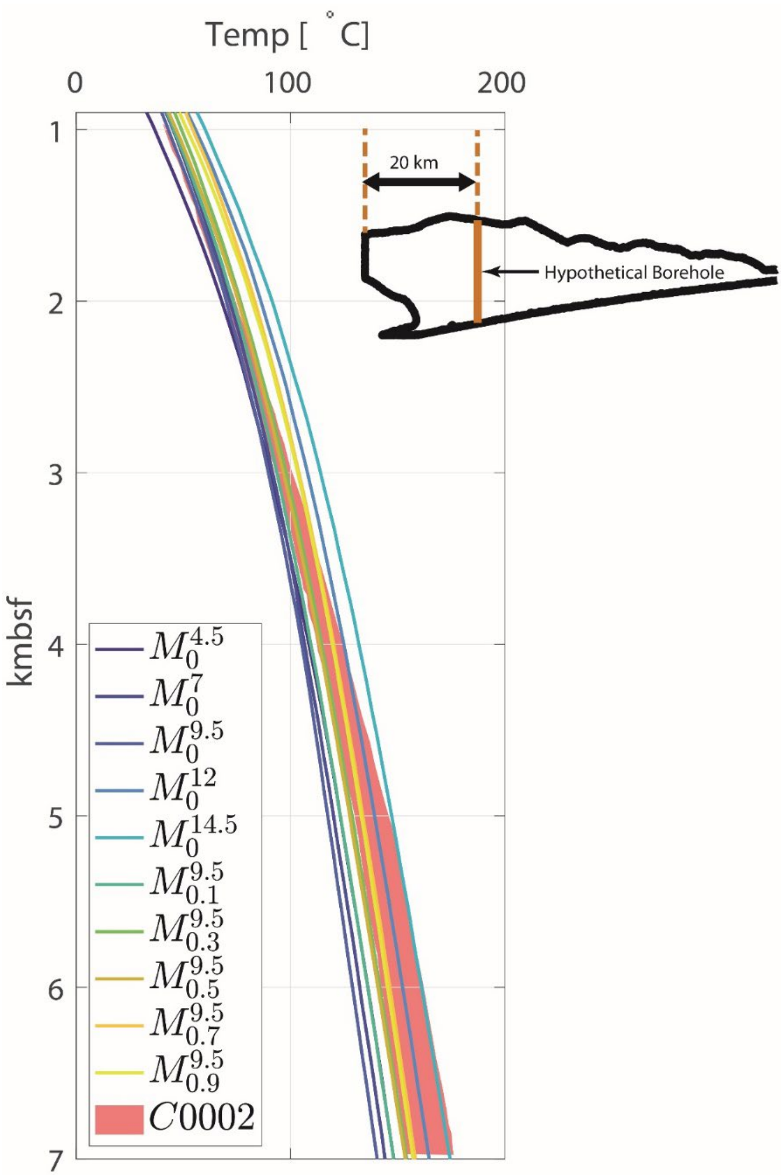

Fig. S15

Trajectory of sediments in model. The wedge on top shows the location of individual boreholes relative to the position of the trench at 2.5 Myr. In each borehole, A-L 10 points are plotted for their trajectories between 2.5 Myr and 7.5 Myr. The color of markers in the trajectories represent the evolution of thermal maturity on individual sediment markers while undergoing evolution. The image of the wedge on top is a representative image showing the relative location of boreholes with respect to the trench and each other. We present 4 set of boreholes (each having 3 boreholes separated by a km), one of which lies in the wedge itself at 2.5 Myr and 3 lies in the incoming sediments as a distance of 1 km, 50km and 100 kms from trench.

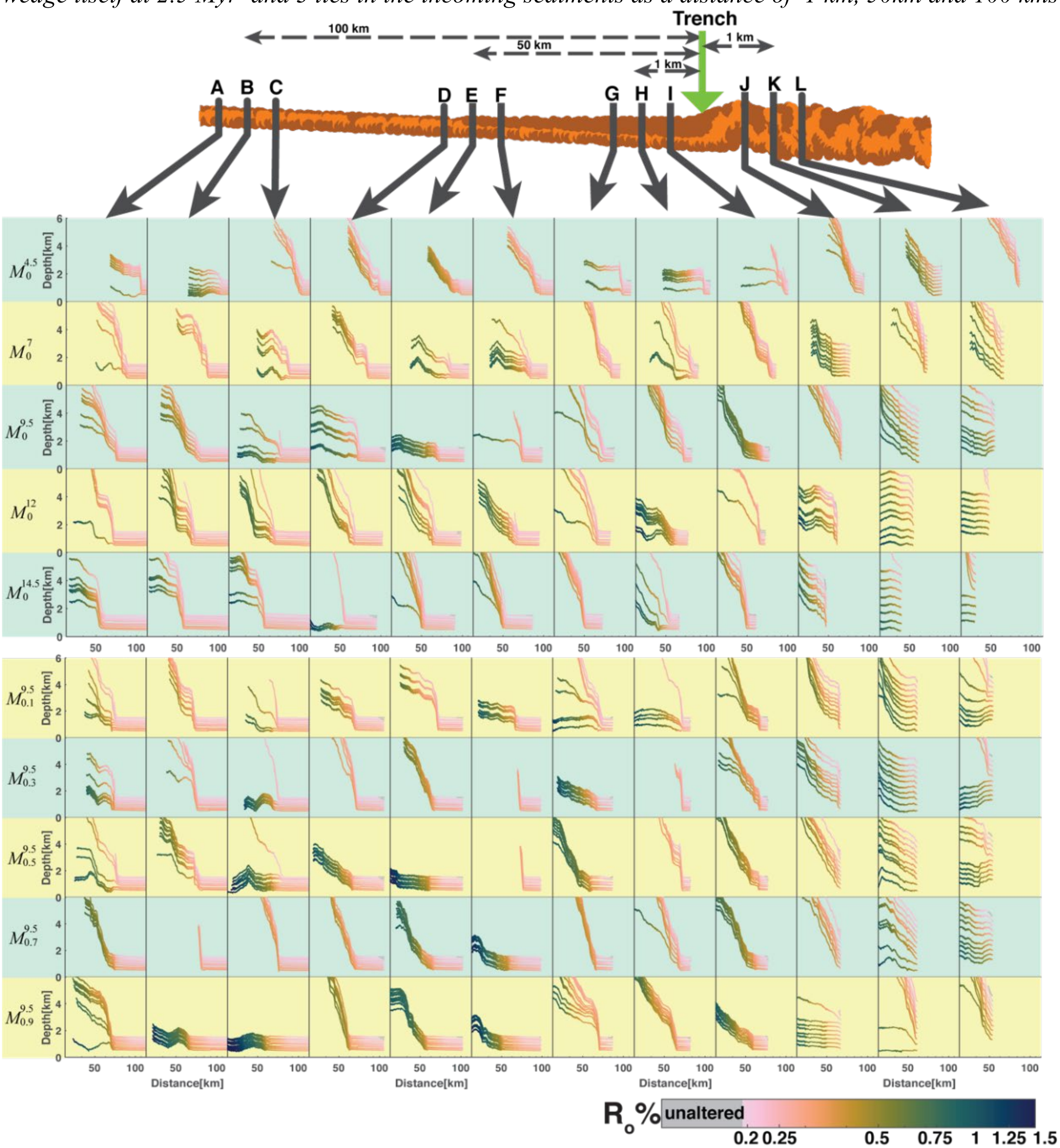

Fig. S16

Vitrinite Reflectance(%R_o) vs Maximum Exposure temperature in models. Panel A, B and C show the Temperatures as a function of %R_o computed from Easy%R_o , Simple%R_o, Basin%R_o for models $\mathbf{M_0^{4.5} - M_0^{14.5}}$. *Similarly panels D, E and F show the Temperatures as a function of %R_o computed from Easy%R_o , Simple%R_o, Basin%R_o for models* $\mathbf{M_{0.1}^{9.5} - M_{0.9}^{9.5}}$.

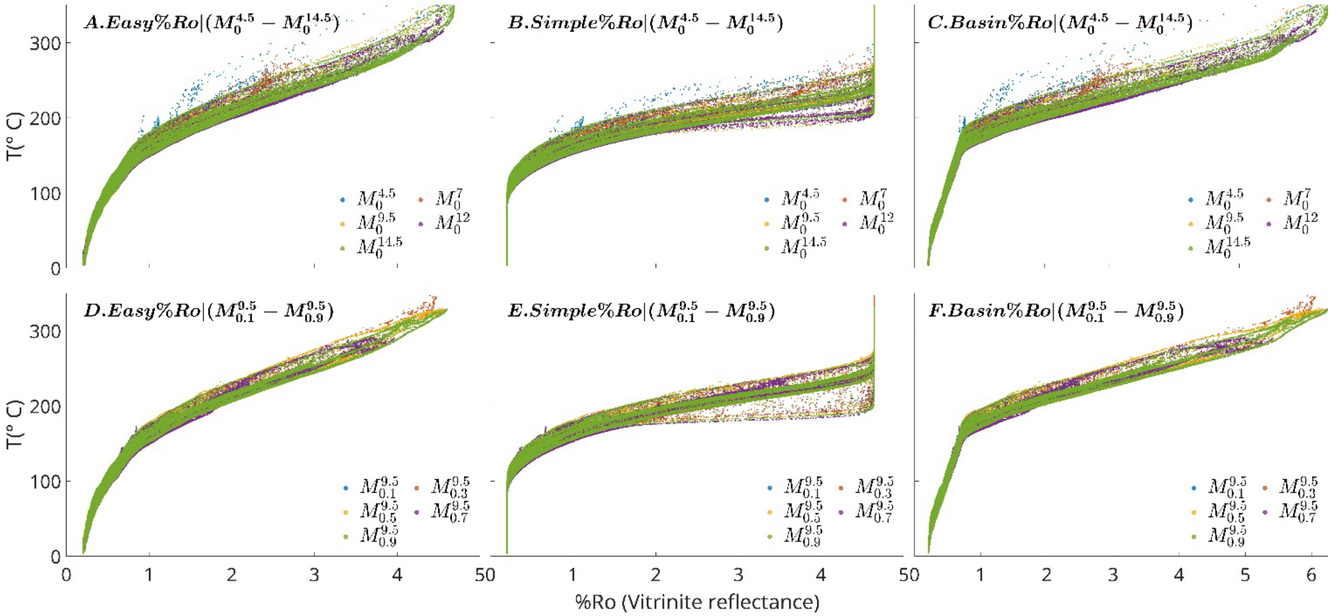

Fig. S17:

Panel A shows %R_o vs T for model (shown by smaller markers) and C0002 borehole (shown by large circular markers) (Fukuchi et al., 2017). Y_n is the depth of the marker from the surface normalized by the thickness (vertical extent) of the wedge at the location of the marker as illustrated in Panel B.

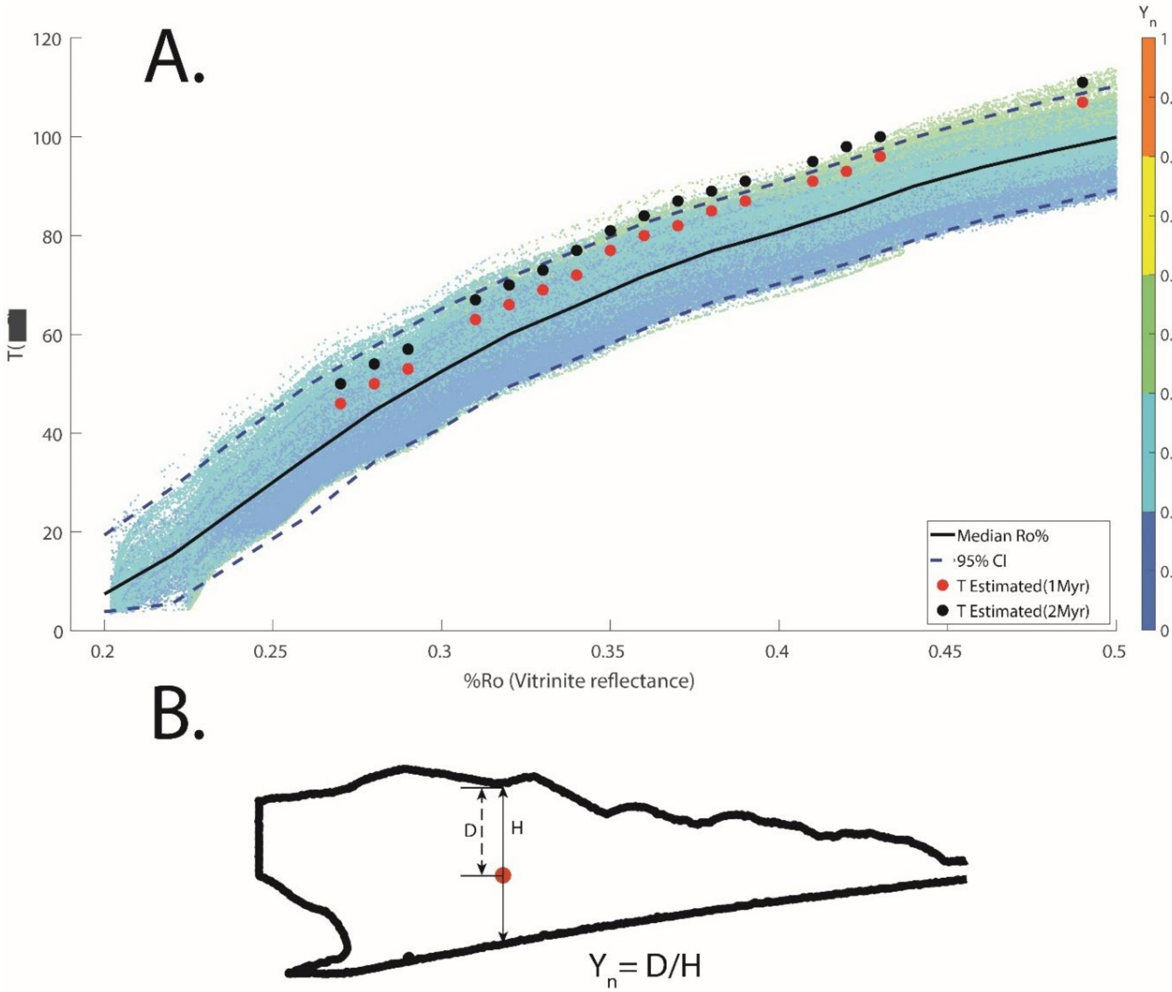

Fig. S18:

Illustration to show the measurement of L (length of wedge), α (surface slope), ***β***(basal dip and, D(Distance between the first and second frontal thrust).

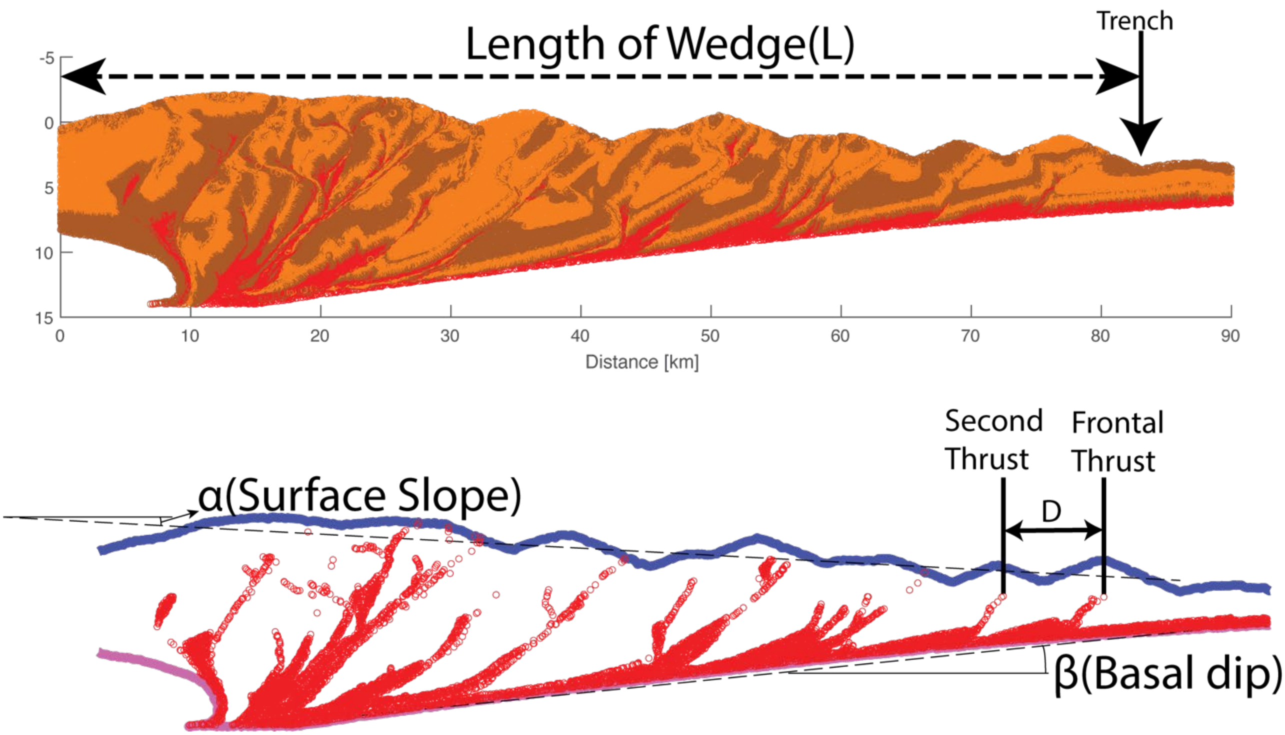

Fig S19:

Evolution of %R_o for constant temperatures with time (computed using Simple %R_o)

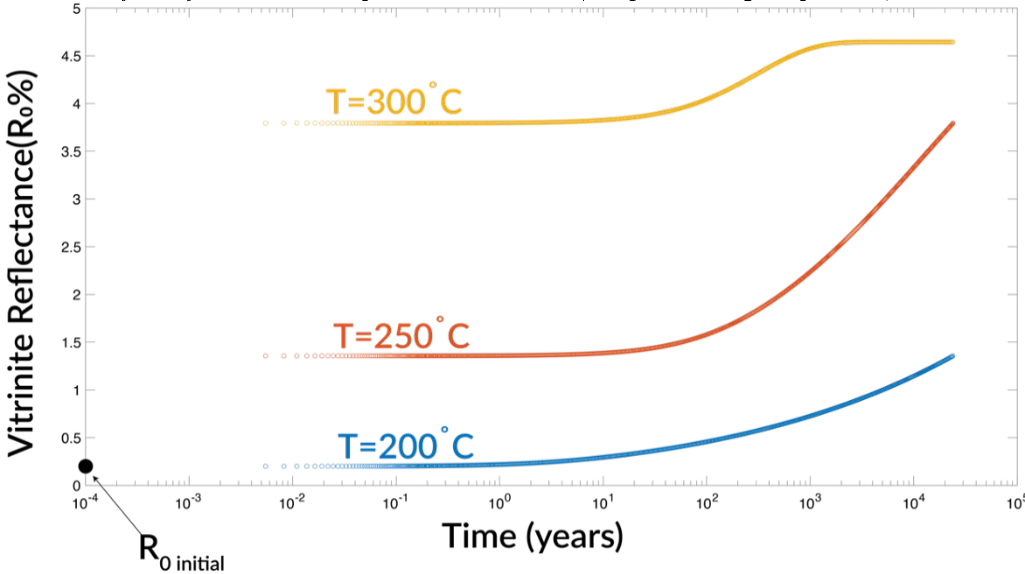

Fig S20:

Thermal maturity distribution in two models with different convergent velocity. Panel A and B shows a models with convergent velocity of 5 cm/yr and 7.5 cm/yr respectively. The colormap for the images is same as for Figure 3. The comparison between the models has been shown for different time to keep the volume of incoming sediments ($T*V_{conv}$) similar.

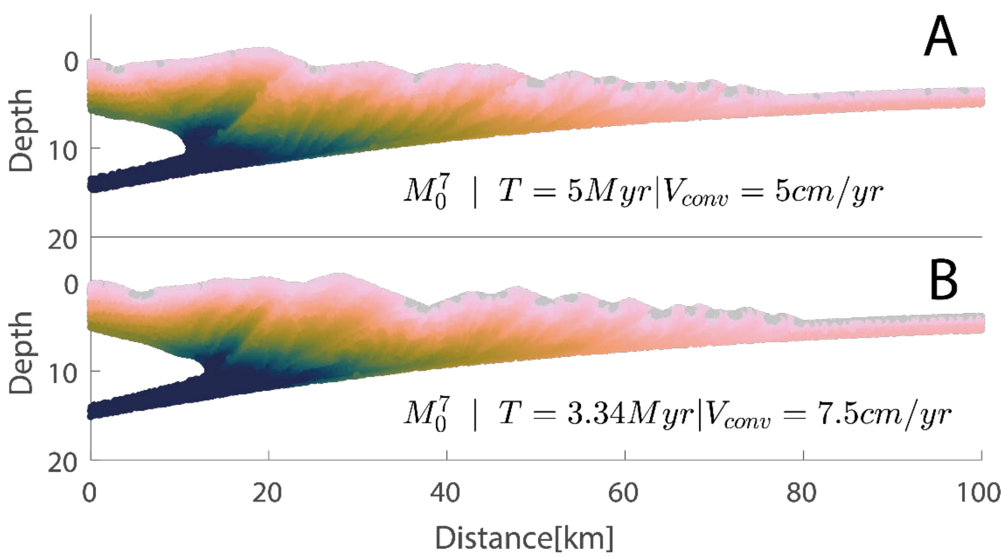

Fig S21:

Distribution of viscosity in a representative model at 0.5 Myr, 2.5 Myr, 5.0 Myr and 7.5 Myr.