

# AGB Figures

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## ABSTRACT

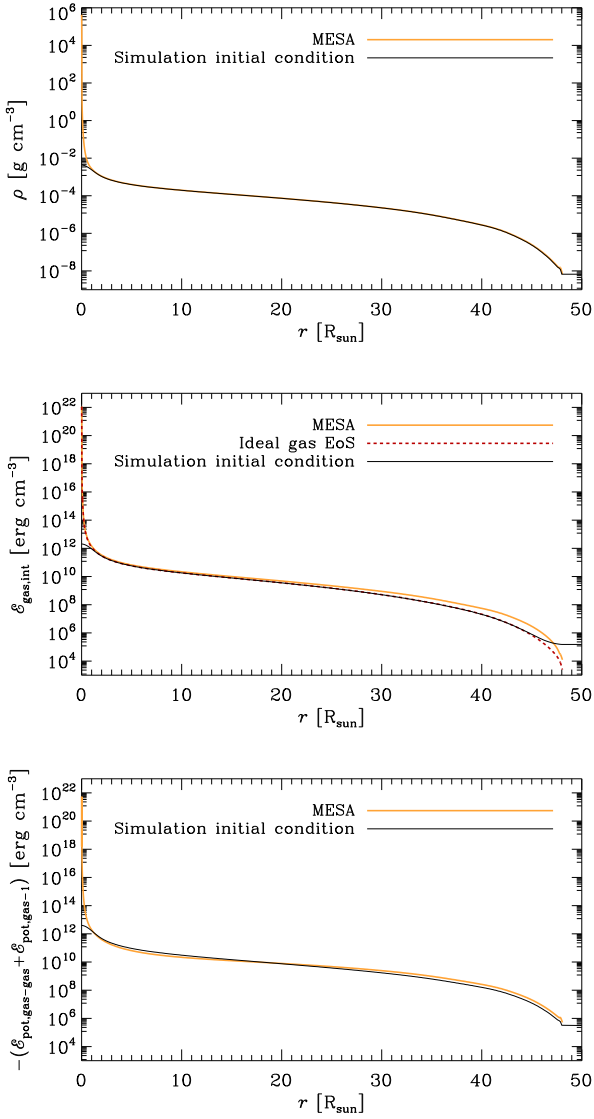
Figures

**Key words:** binaries: close – stars: evolution – stars: kinematics and dynamics – stars: mass loss – stars: winds, outflows – hydrodynamics

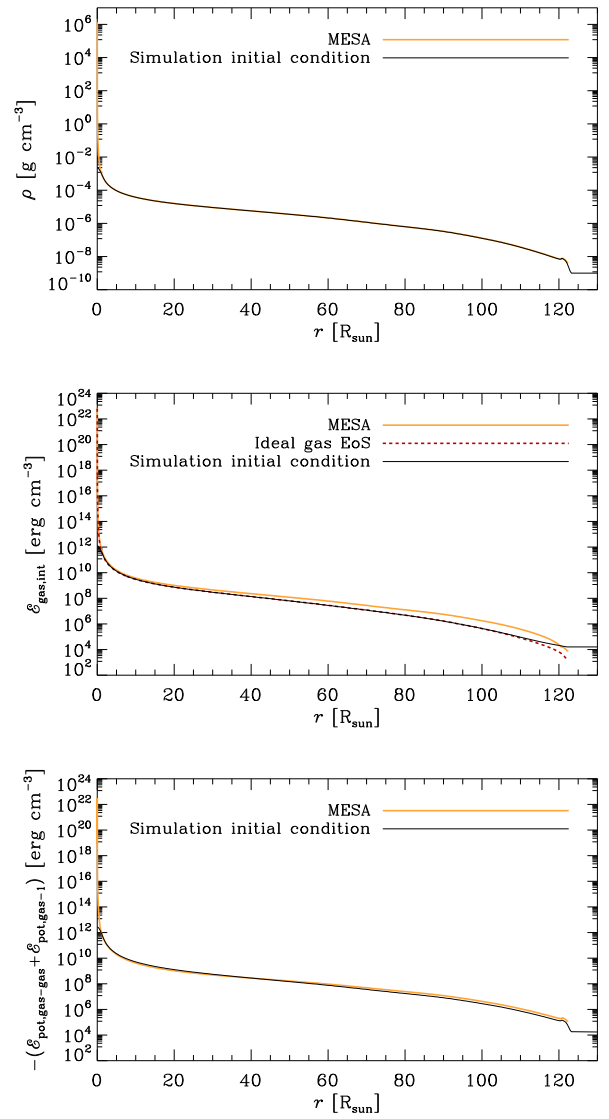
## References

MacLeod M., Antoni A., Murguia-Berthier A., Macias P., Ramirez-Ruiz E.,  
2017, *ApJ*, **838**, 56

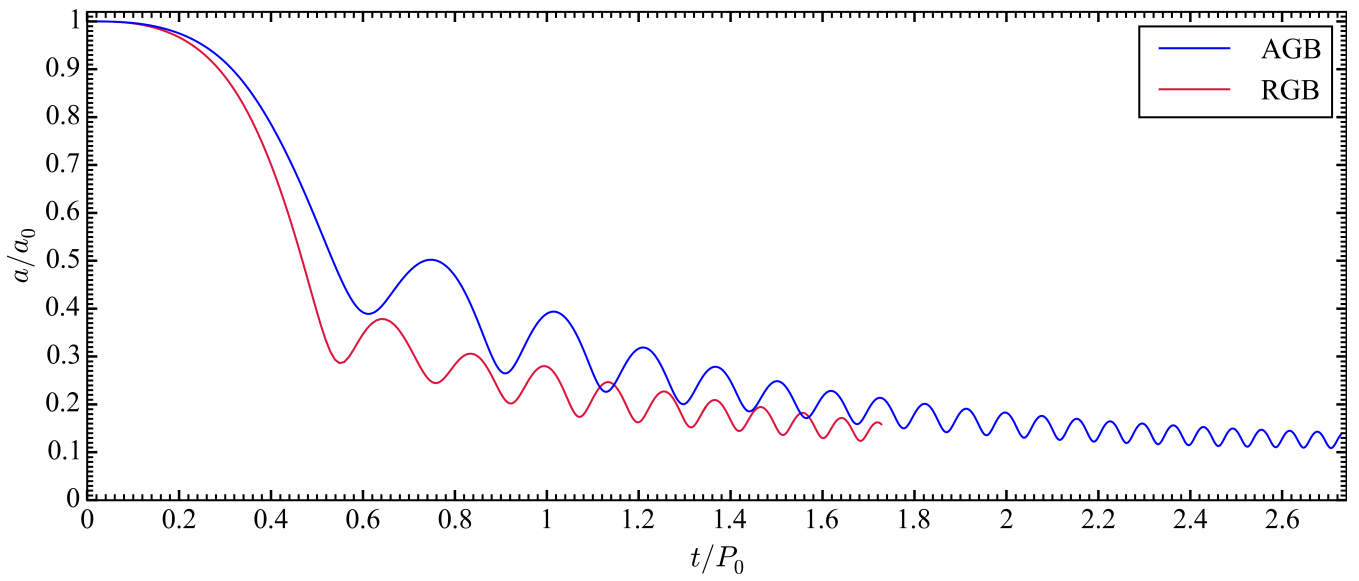
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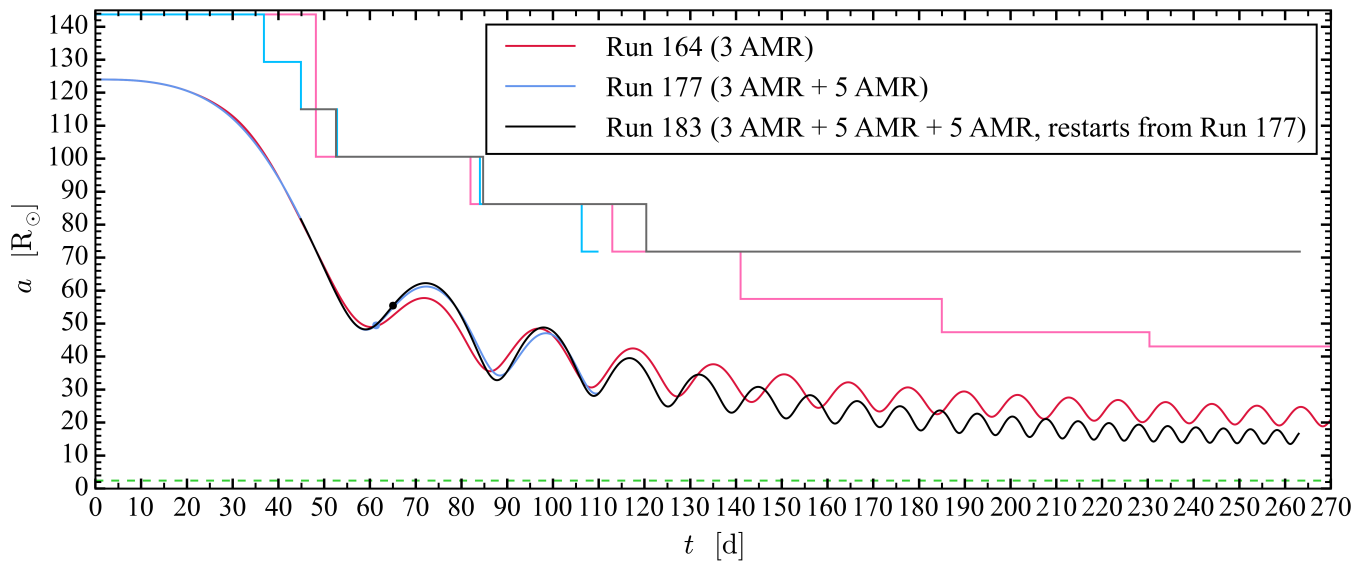
**Figure 1. Run 143:** *Top panel:* Radial profiles of gas density for the RGB star modeled using MESA (thick orange) and the profile of our 3D RGB star in the simulation at  $t = 0$  (thin black). *Middle panel:* Comparison of the internal energy density profiles in the MESA model, simulation initial condition, and MESA model with the equation of state replaced with an ideal gas equation of state, as in the simulation (dashed red). *Bottom panel:* Comparison of (negative of) potential energy density profiles in the MESA model and simulation initial condition. See Paper II appendix for the same figure.



**Figure 2.** Same as Fig. 1 but now for Run 183.



**Figure 3.** Inter-particle separation as a function of time for Runs 183 and 143.



**Figure 4.** Inter-particle separation as a function of time for Runs 164, 177 and 183.

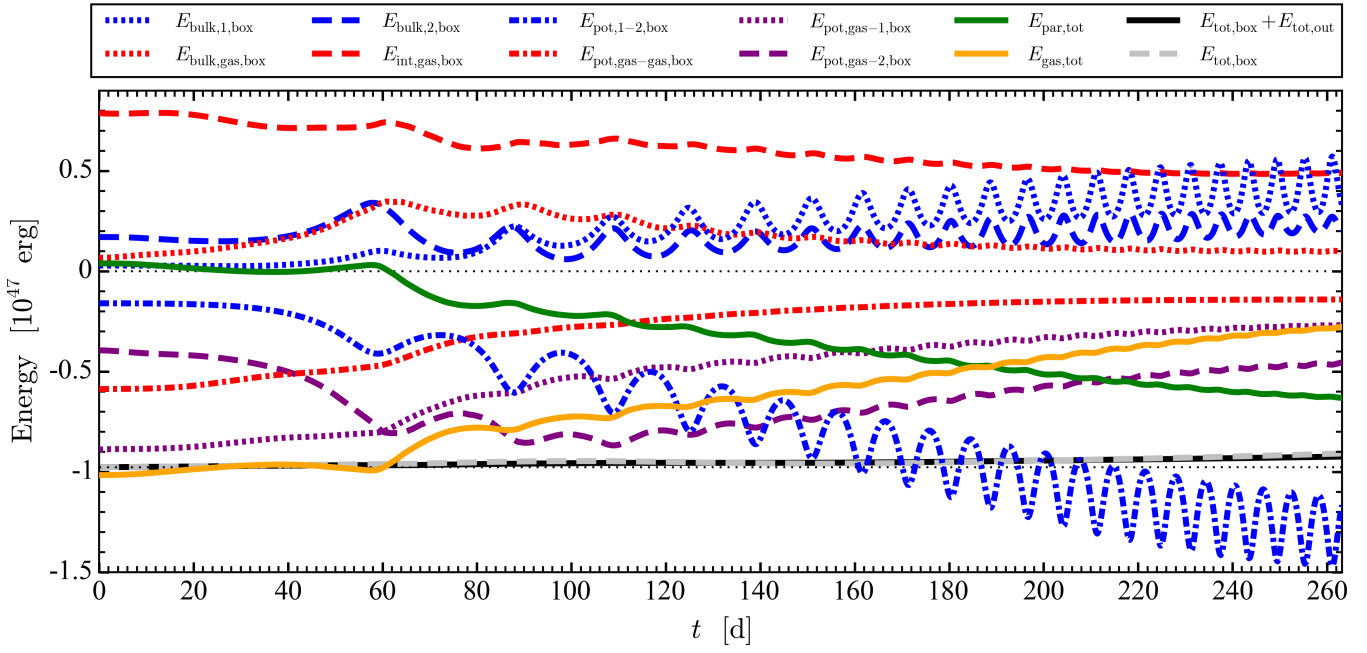


Figure 5. Energy terms Run 183.

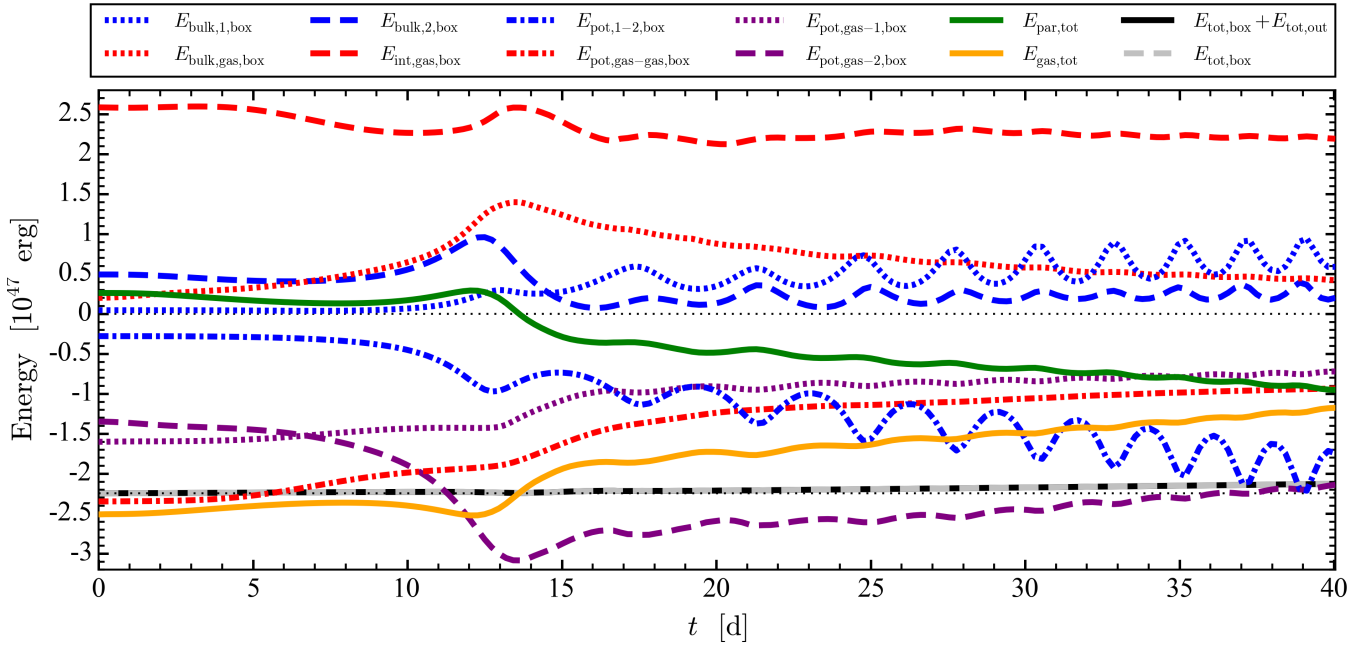


Figure 6. Energy terms Run 143.

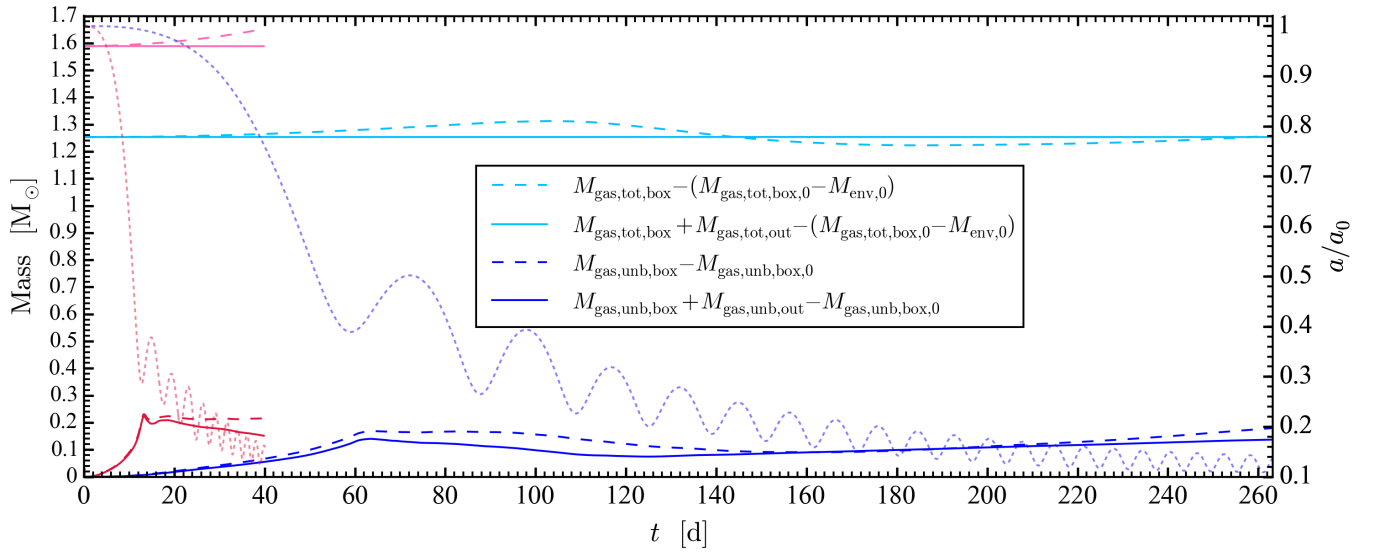


Figure 7. Mass Run 183 and Run 143.

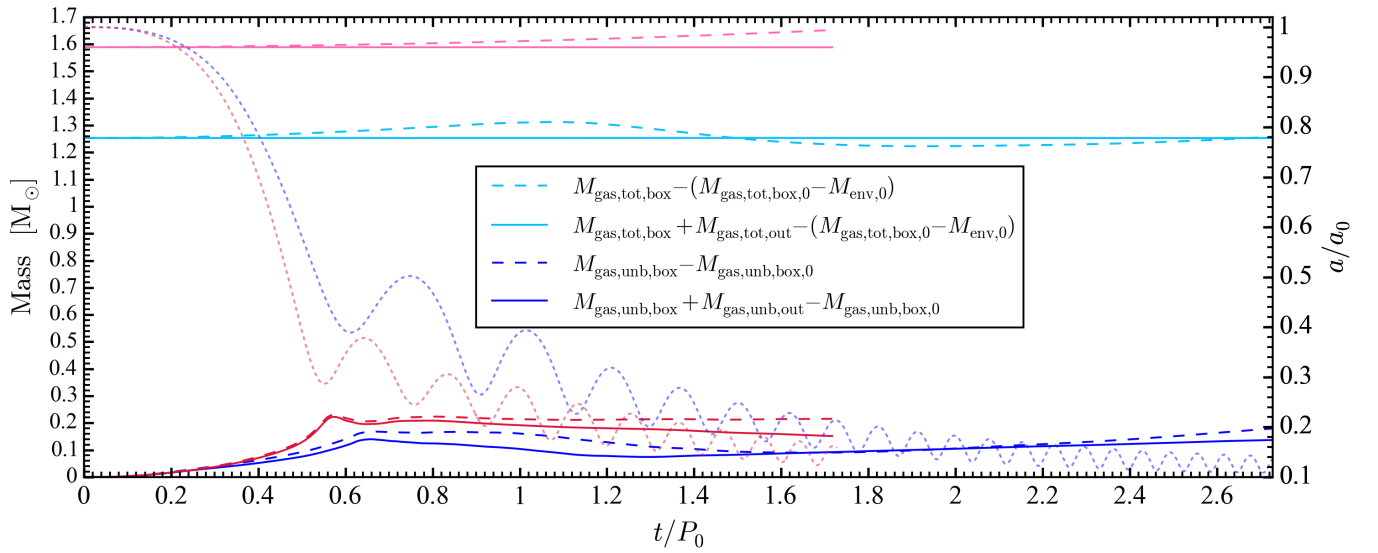
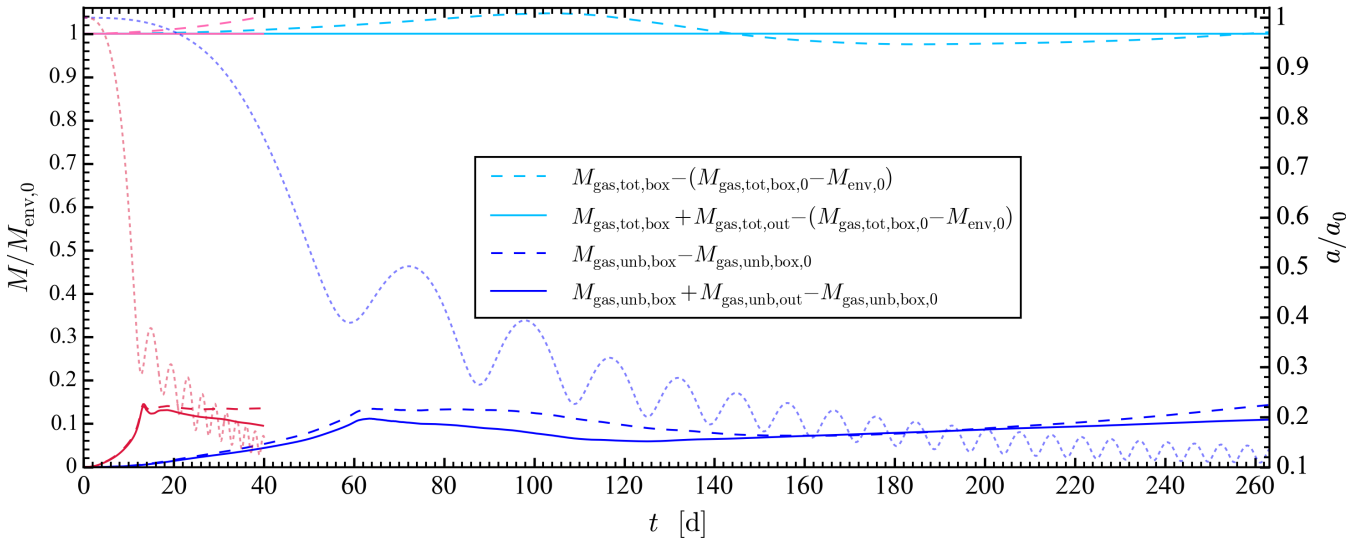
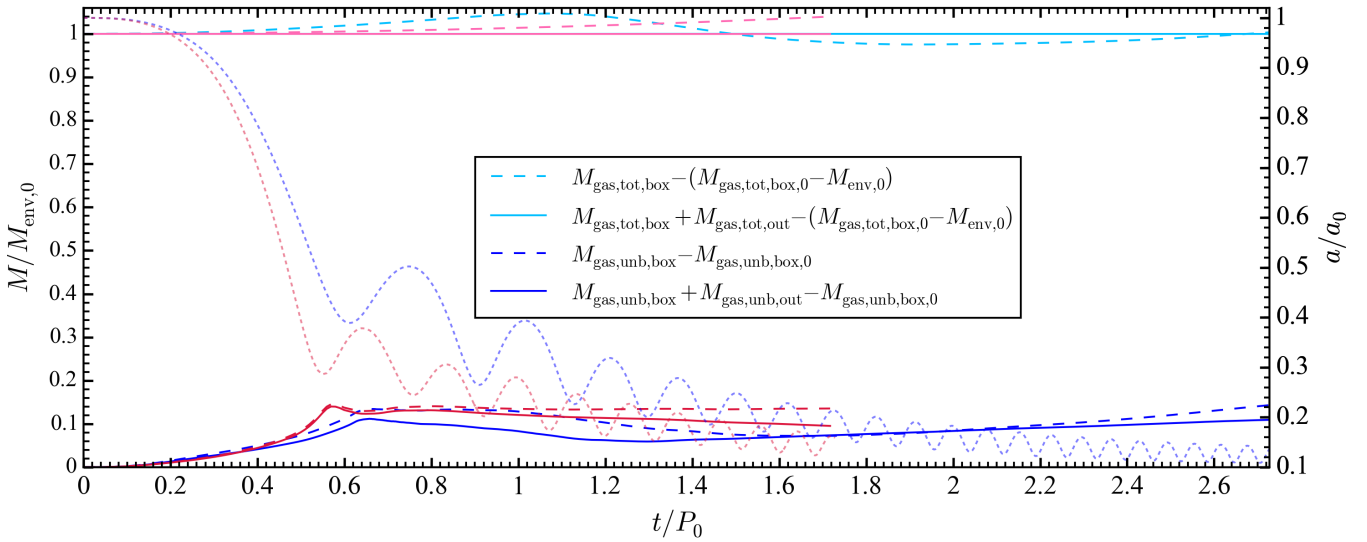


Figure 8. Mass Run 183 and Run 143 (time axis normalized).



**Figure 9.** Mass Run 183 and Run 143 (mass axis normalized).



**Figure 10.** Mass Run 183 and Run 143 (time axis normalized and mass axis normalized).

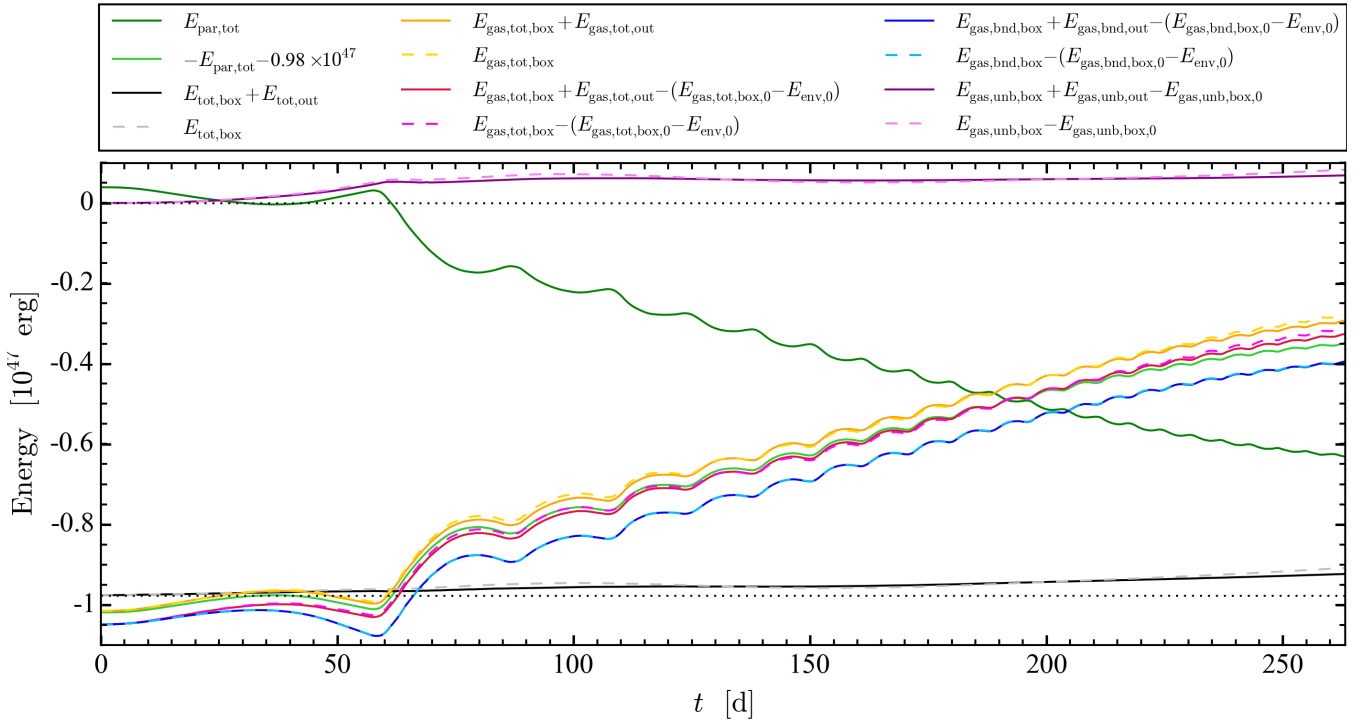


Figure 11. Energy Run 183.

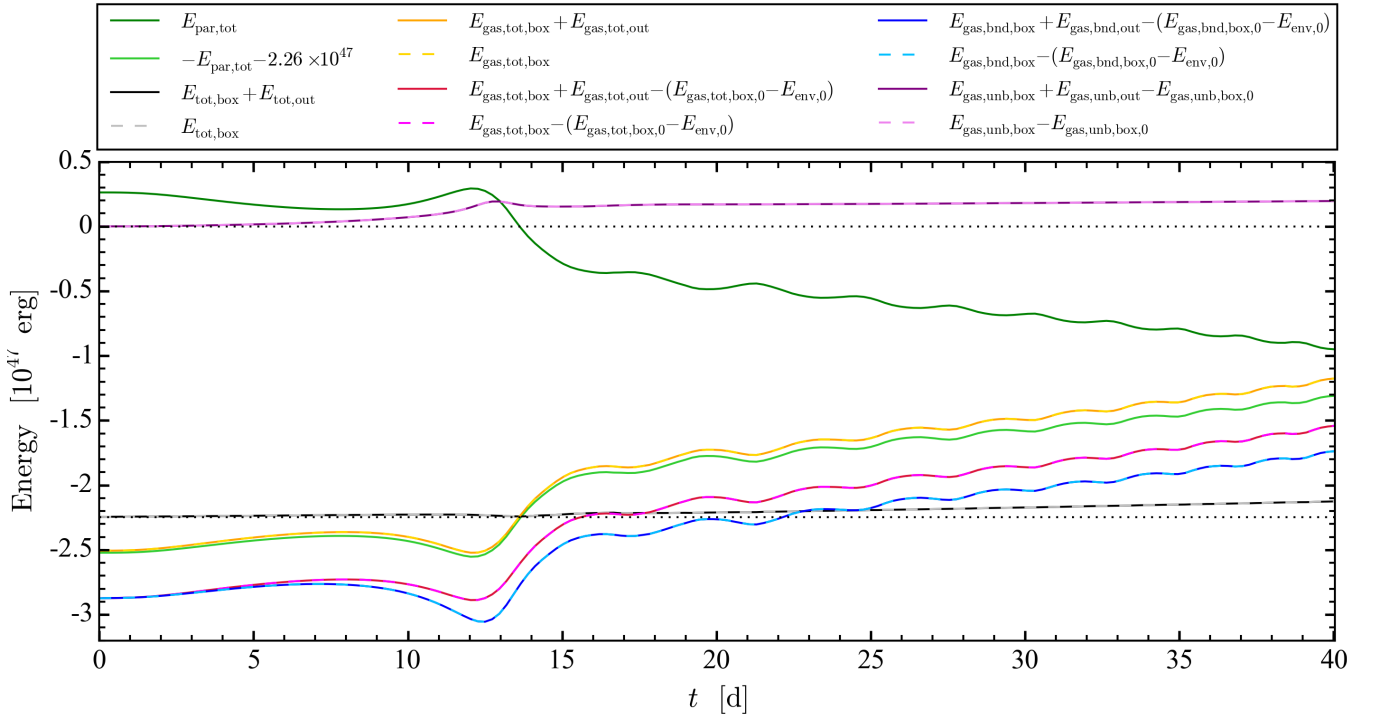
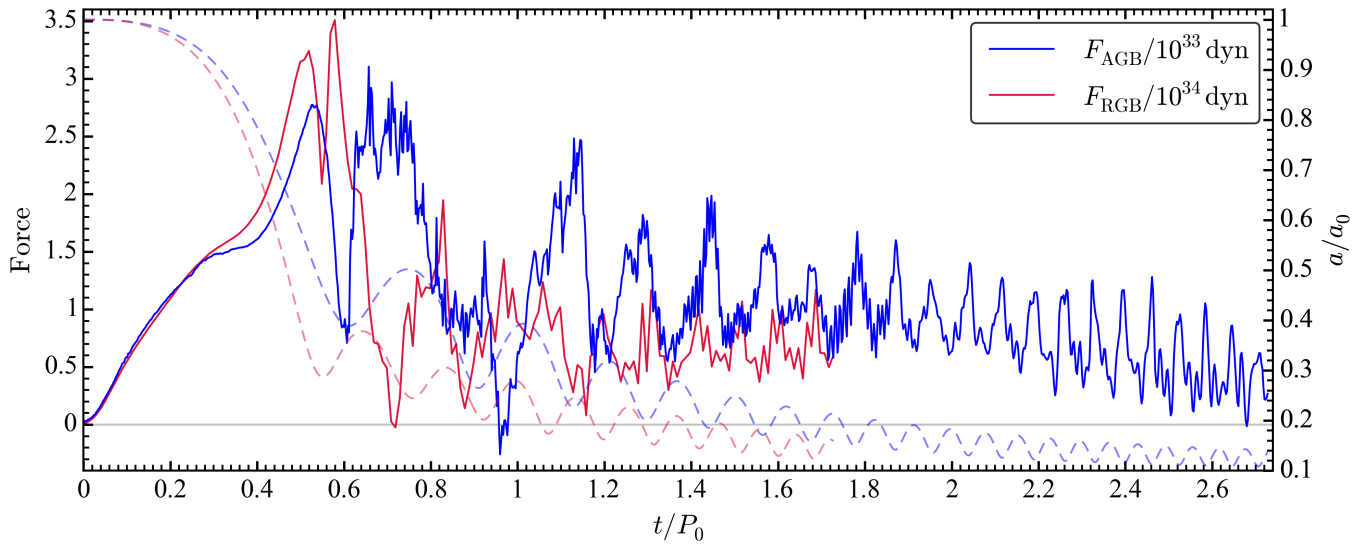
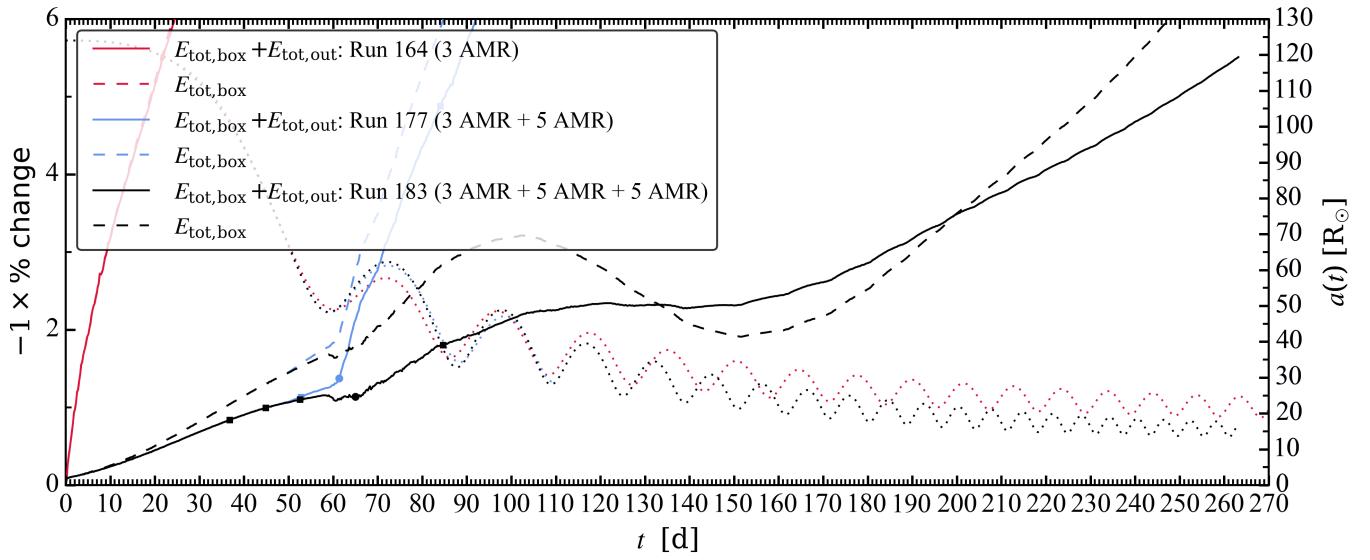


Figure 12. Energy Run 143.

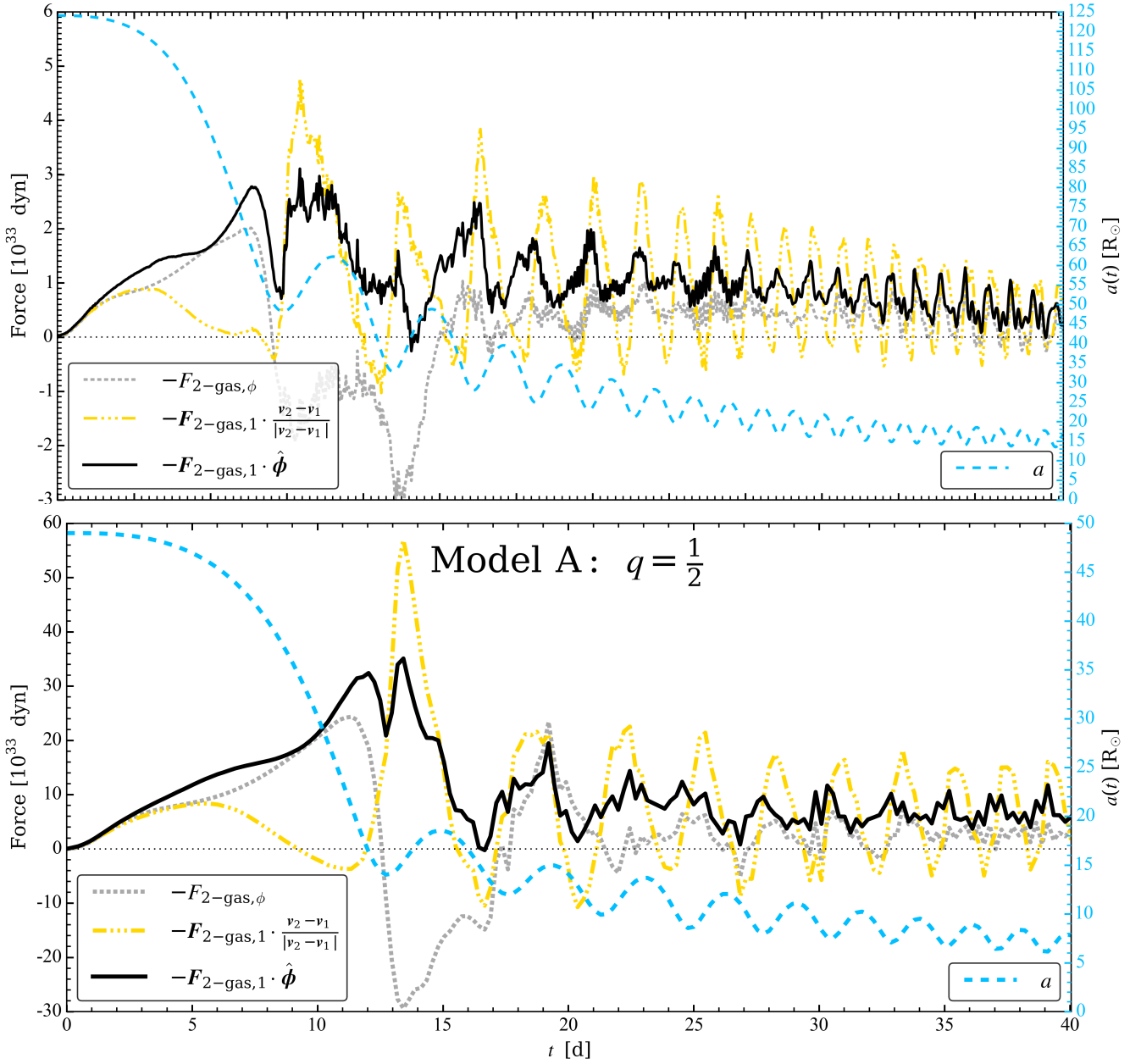


**Figure 13.** Force on particle 2 in reference frame of particle 1 for Runs 183 and 143.

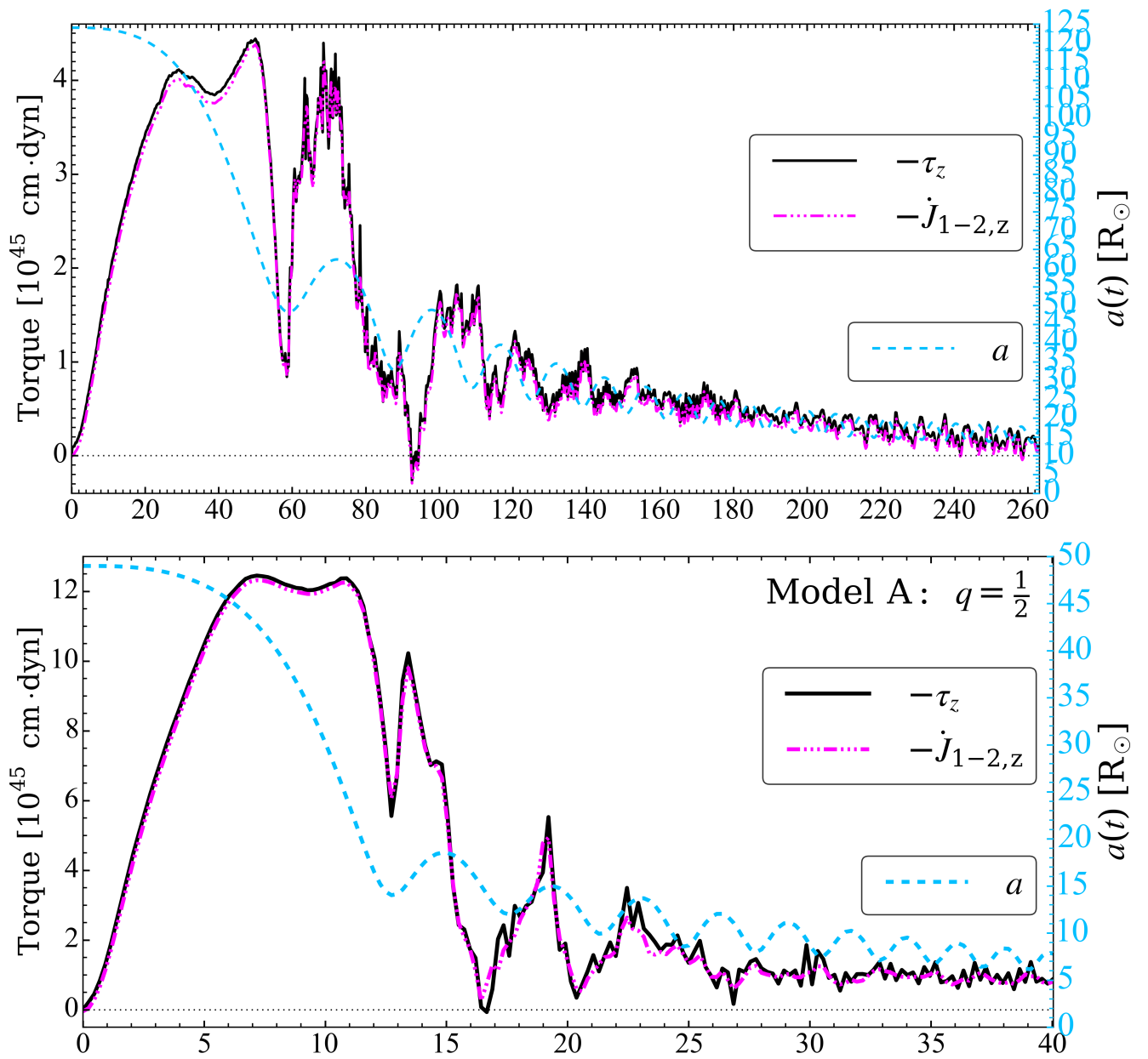


**Figure 14.** Energy percent change.

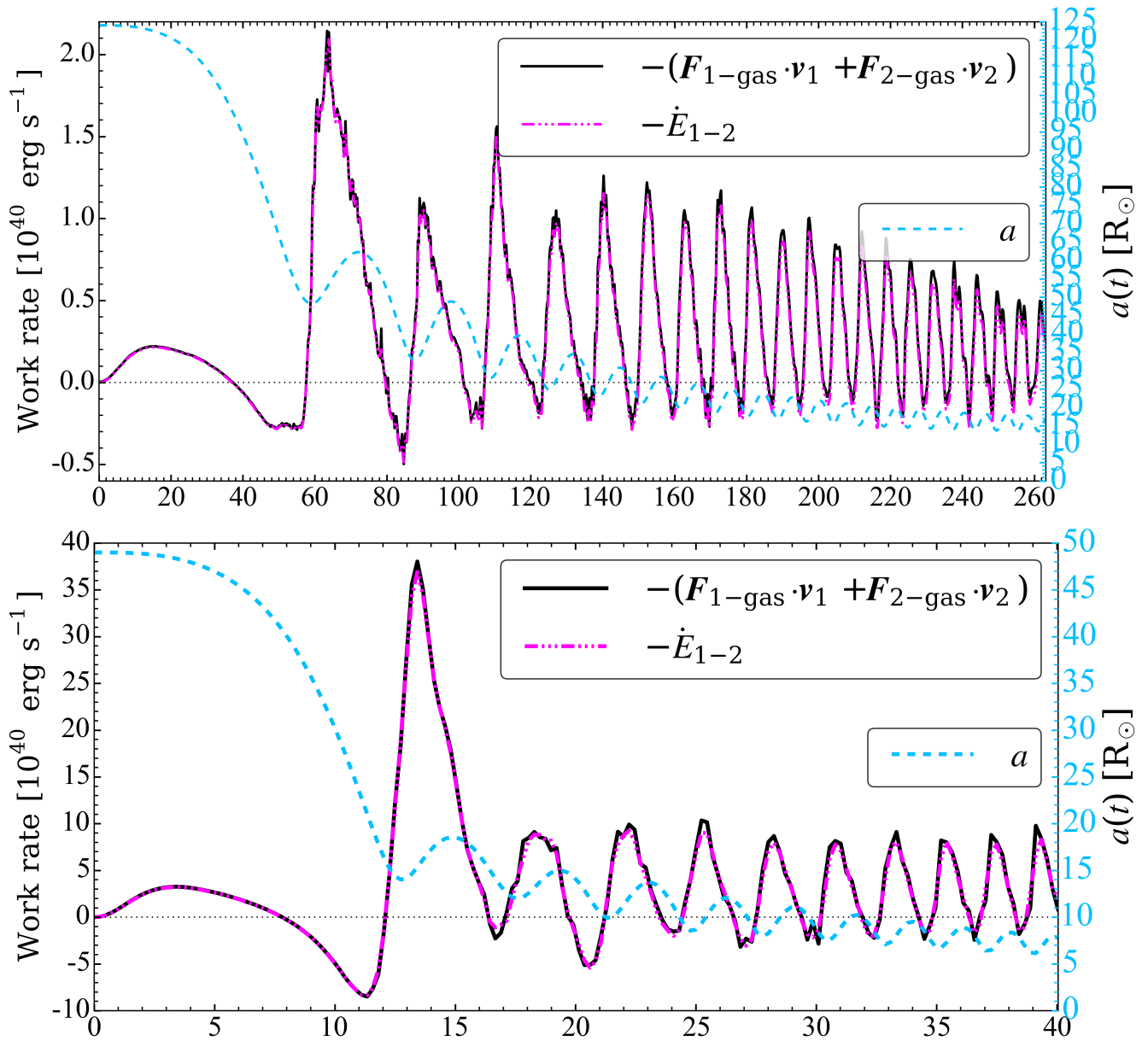




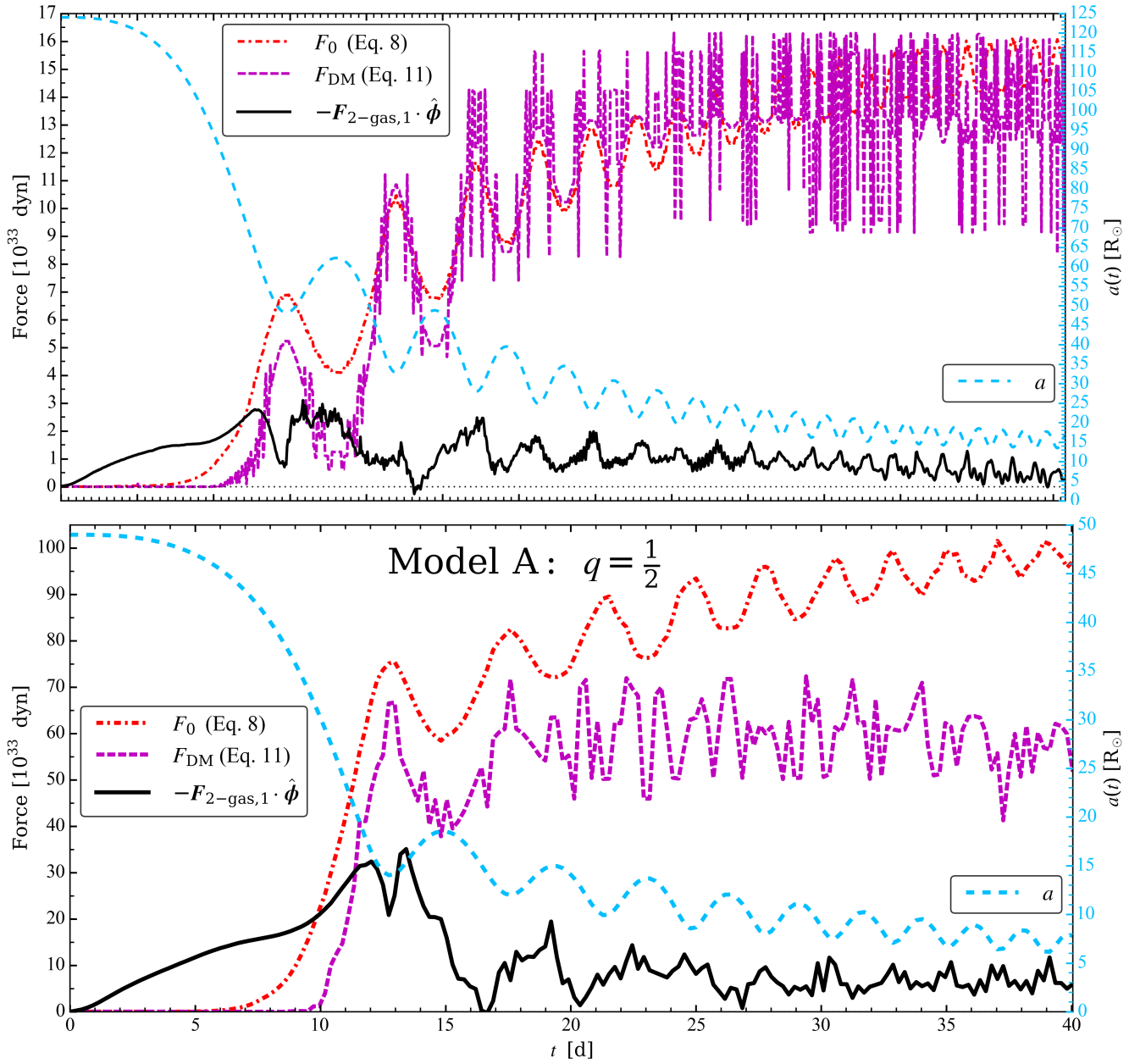
**Figure 15.** Top: Run 183. Bottom: Run 143. Azimuthal ( $\phi$ ) component of the net force on particle 2 due to the gas in the non-inertial rest frame of particle 1, computed from the simulation (solid black), component of this force along the relative velocity of particle 2 with respect to particle 1 (dash-triple-dotted gold), and contribution to the  $\phi$ -component from the force on particle 2 in the lab frame, without the fictitious force (dotted grey). The inter-particle separation (dashed light blue) is plotted using the right axis, for reference.



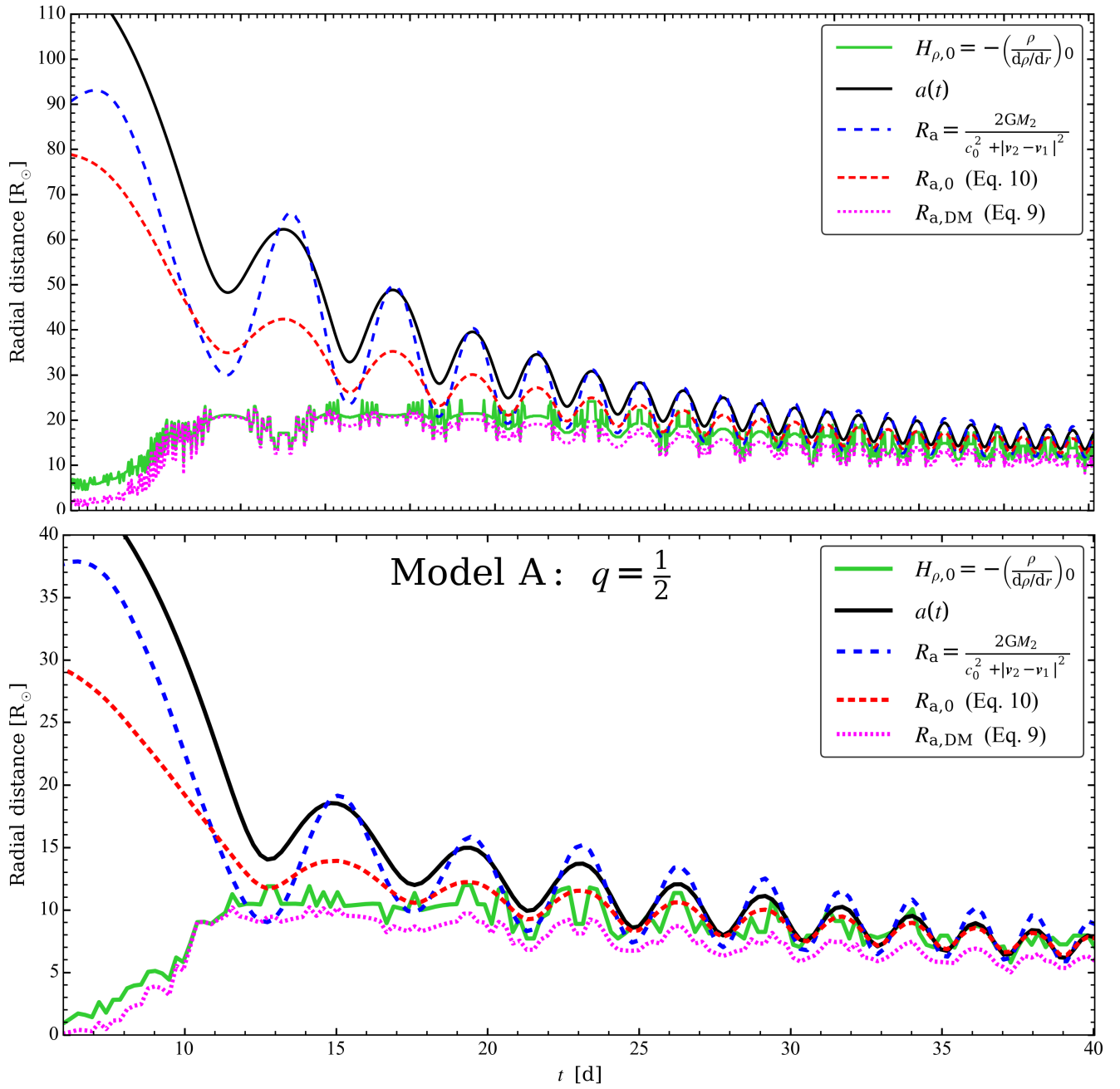
**Figure 16.** Top: Run 183. Bottom: Run 143. Torque on particles about the particle centre of mass. The torque computed from the forces is shown solid black, while that computed from the rate of change of the particle angular momentum is shown dash-triple-dotted magenta.



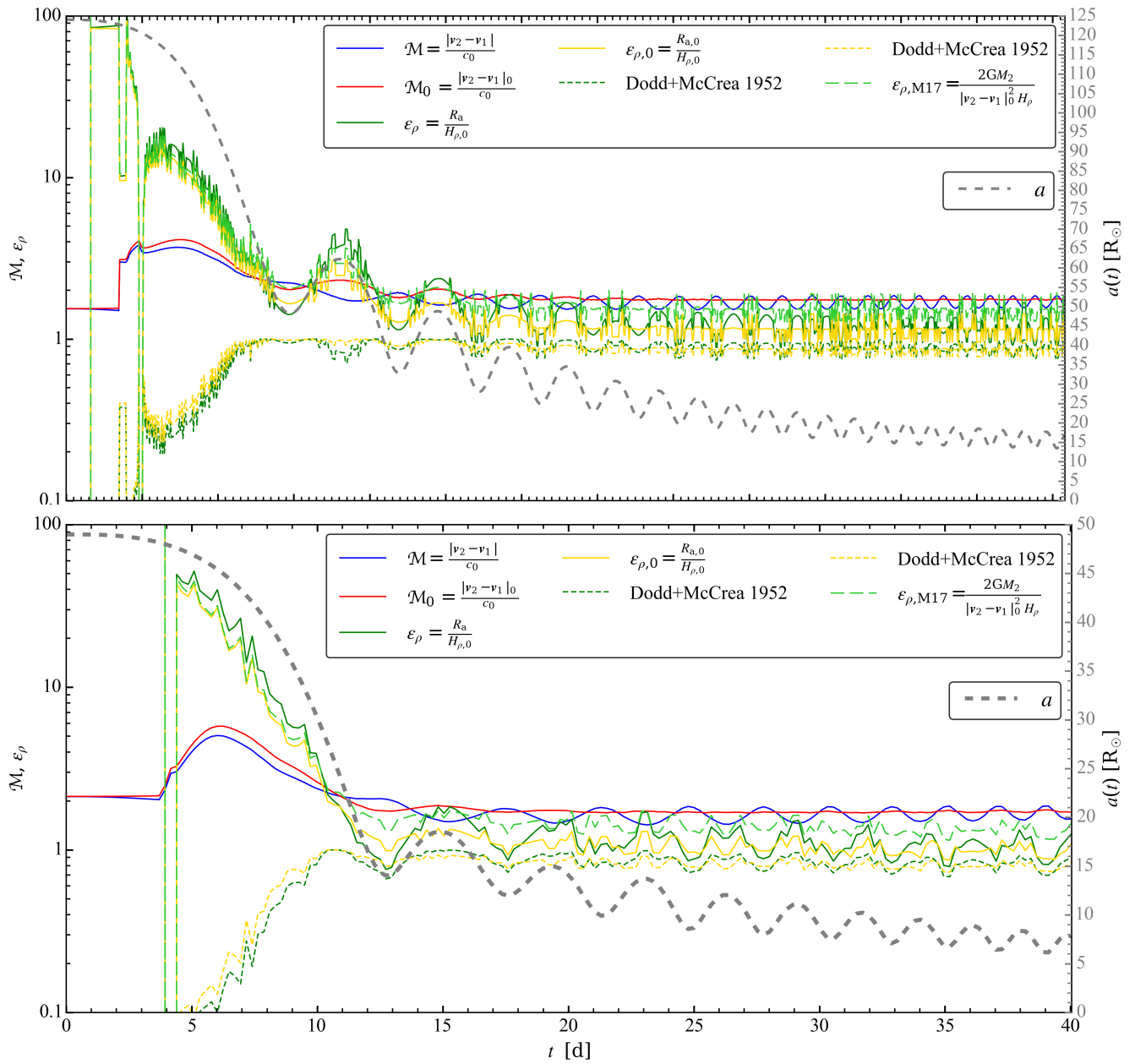
**Figure 17.** Top: Run 183. Bottom: Run 143. Similar to Fig. 16 but now showing the rate of change of work done by gas on particles in the inertial frame, computed from the forces or the rate of change of the orbital energy.



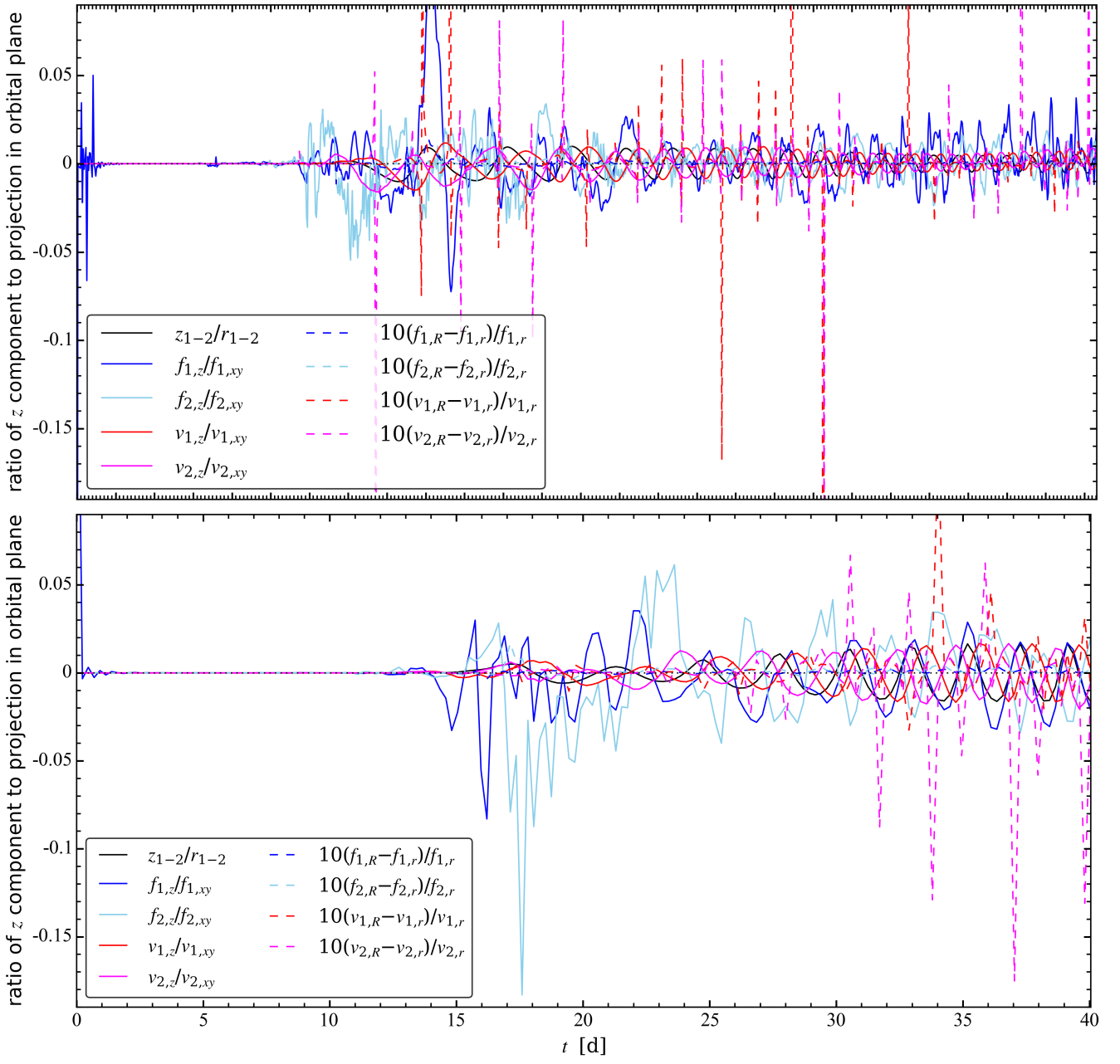
**Figure 18.** Top: Run 183. Bottom: Run 143. Azimuthal component of the net force on particle 2 due to the gas in the non-inertial rest frame of particle 1 (as in Fig. 15), along with model predictions.



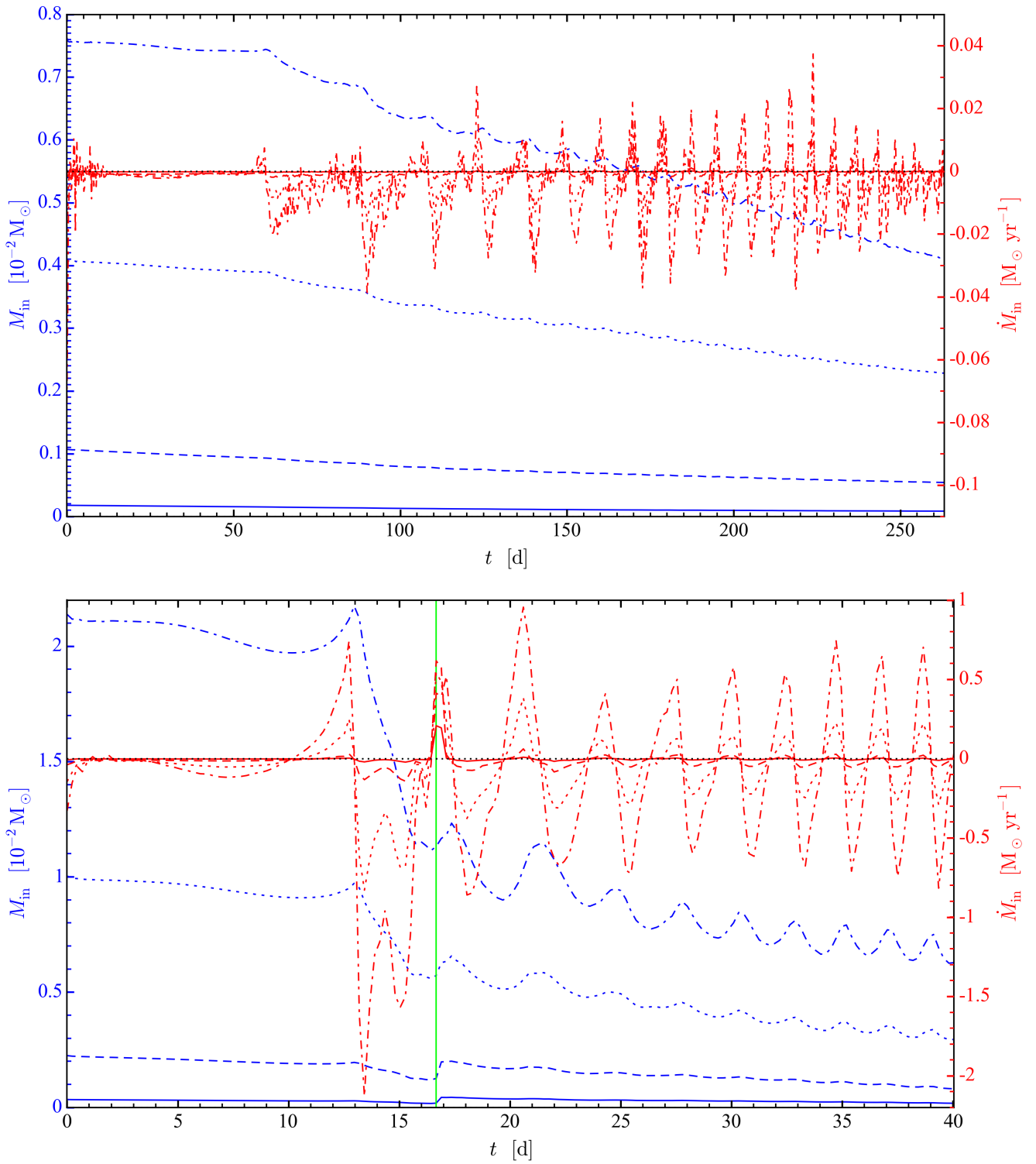
**Figure 19.** Top: Run 183. Bottom: Run 143. Comparison between various relevant length scales, plotted against time.



**Figure 20.** Top: Run 183. Bottom: Run 143. Mach number and density stratification index, plotted against time.



**Figure 21.** Top: Run 183. Bottom: Run 143.  $z$ -component of various quantities, plotted against time.



**Figure 22.** Mass accretion around particle 1 for Run 183 (top) and Run 143 (bottom).



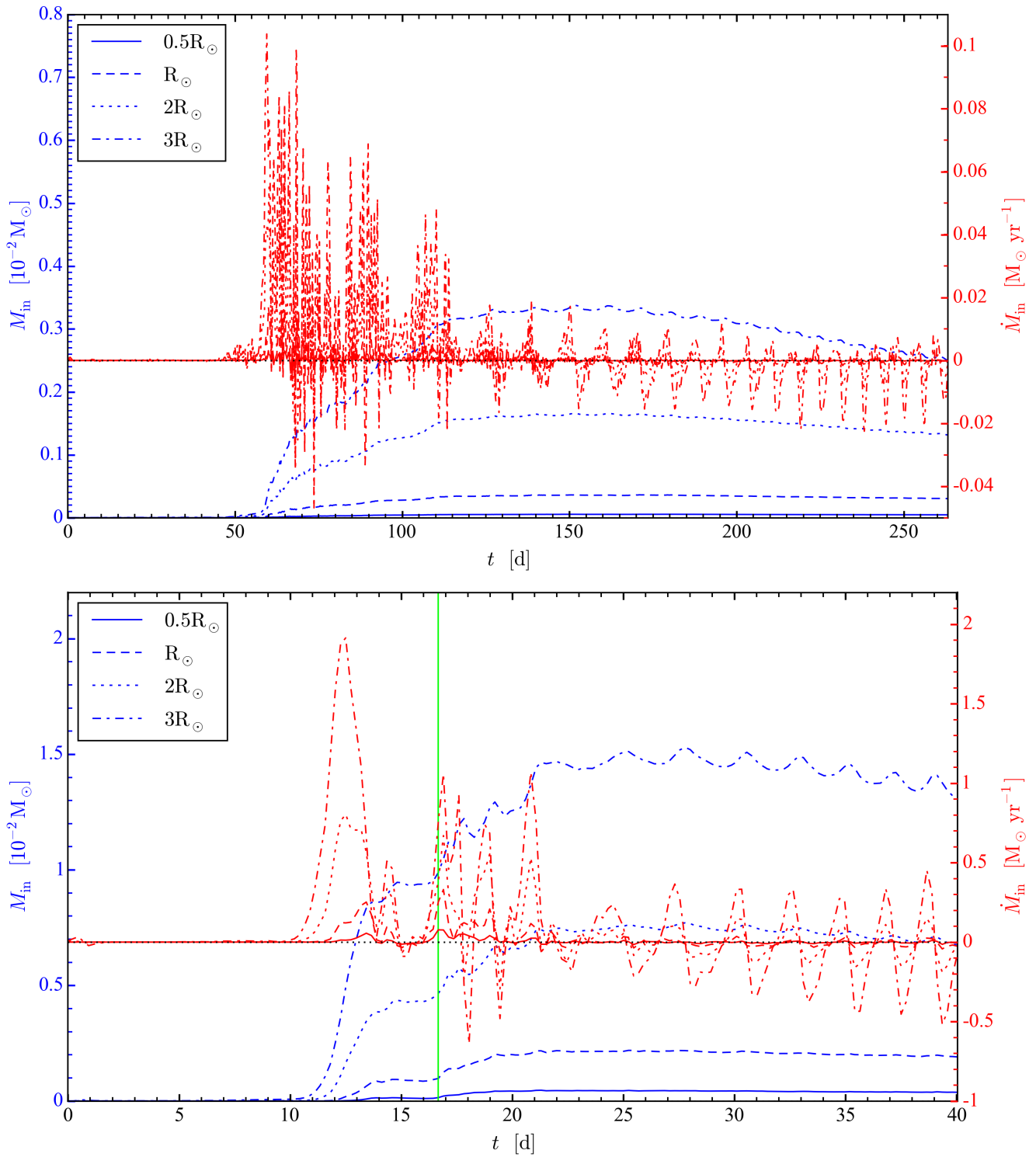
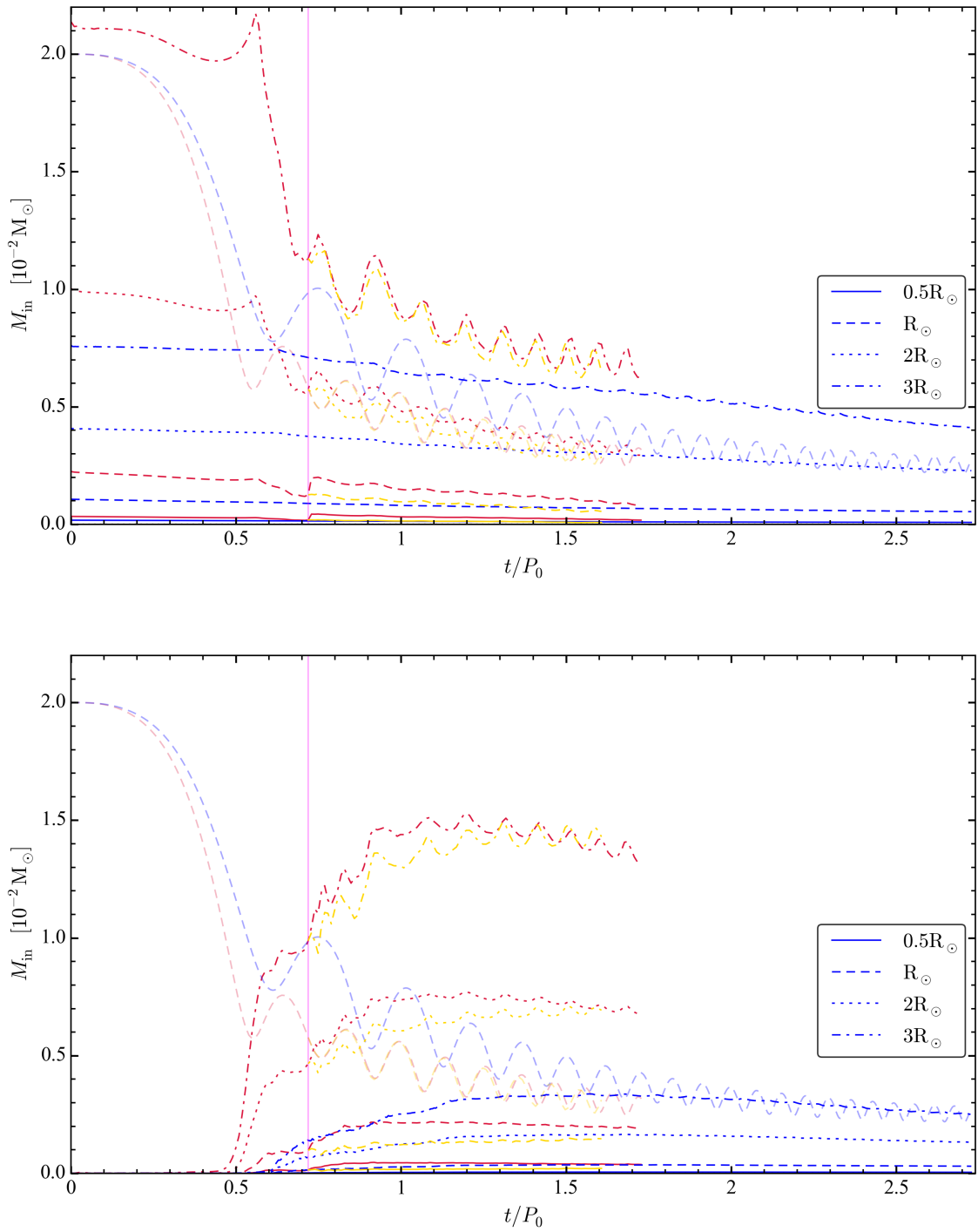
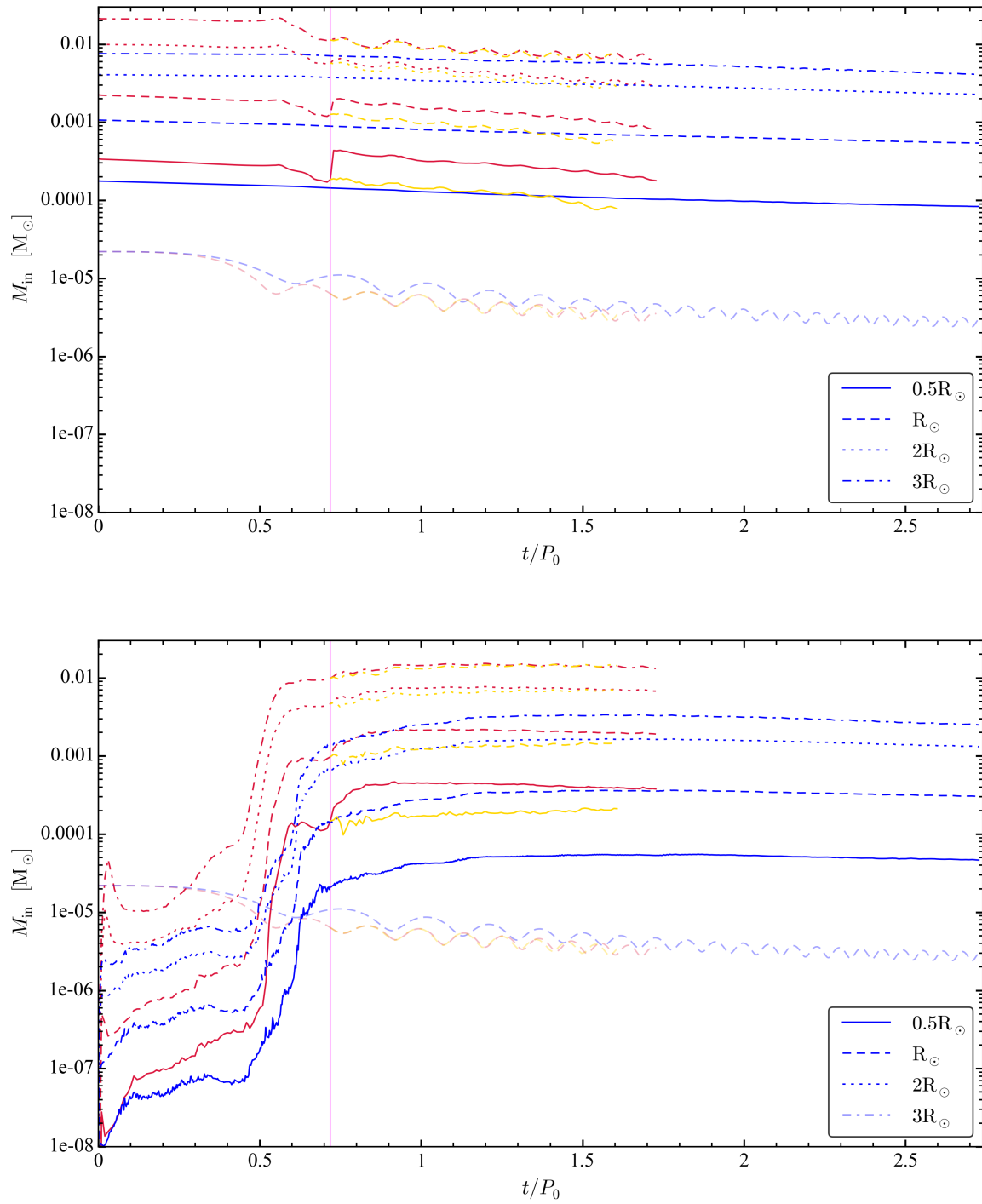


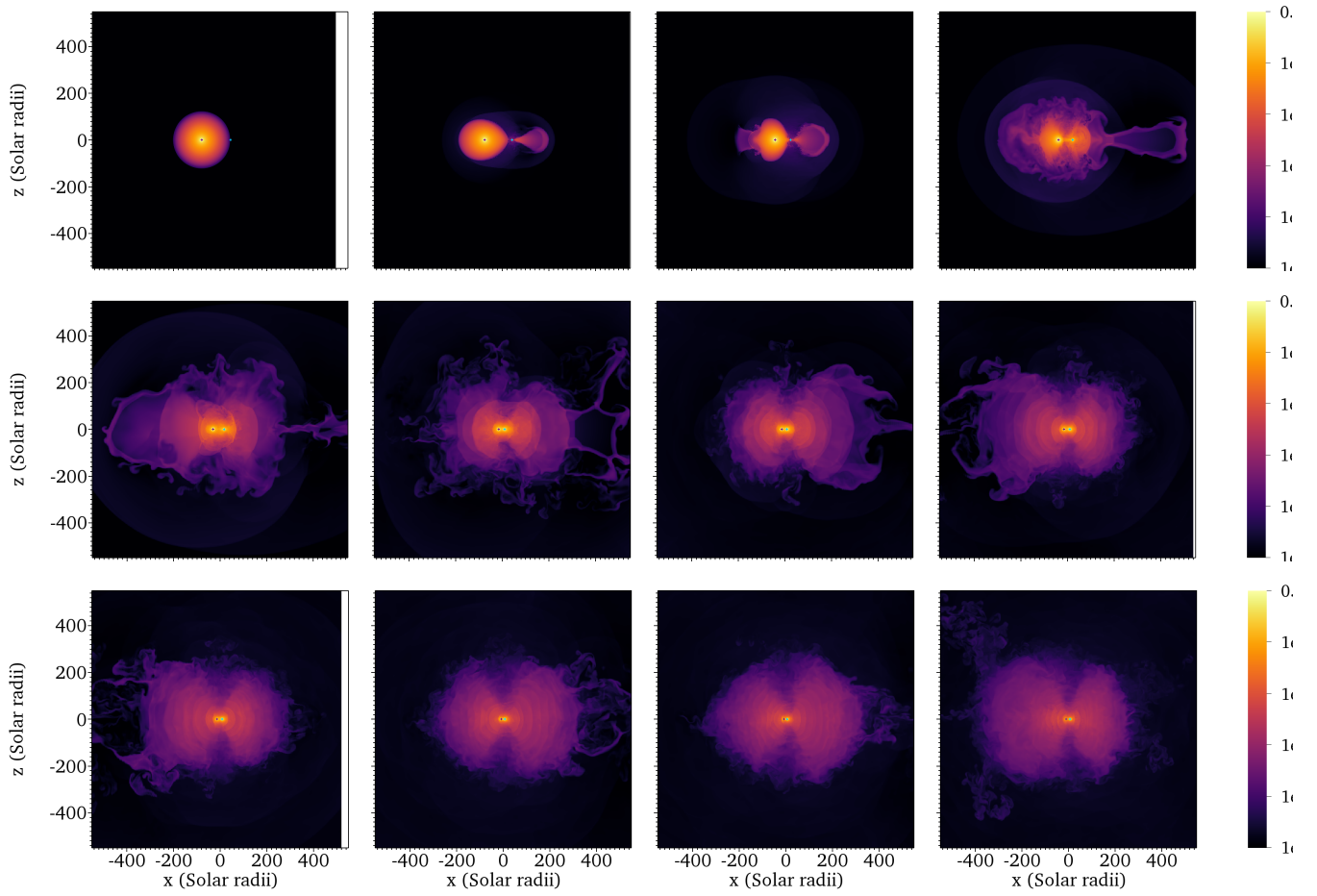
Figure 23. Mass accretion around particle 2 for Run 183 (top) and Run 143 (bottom).



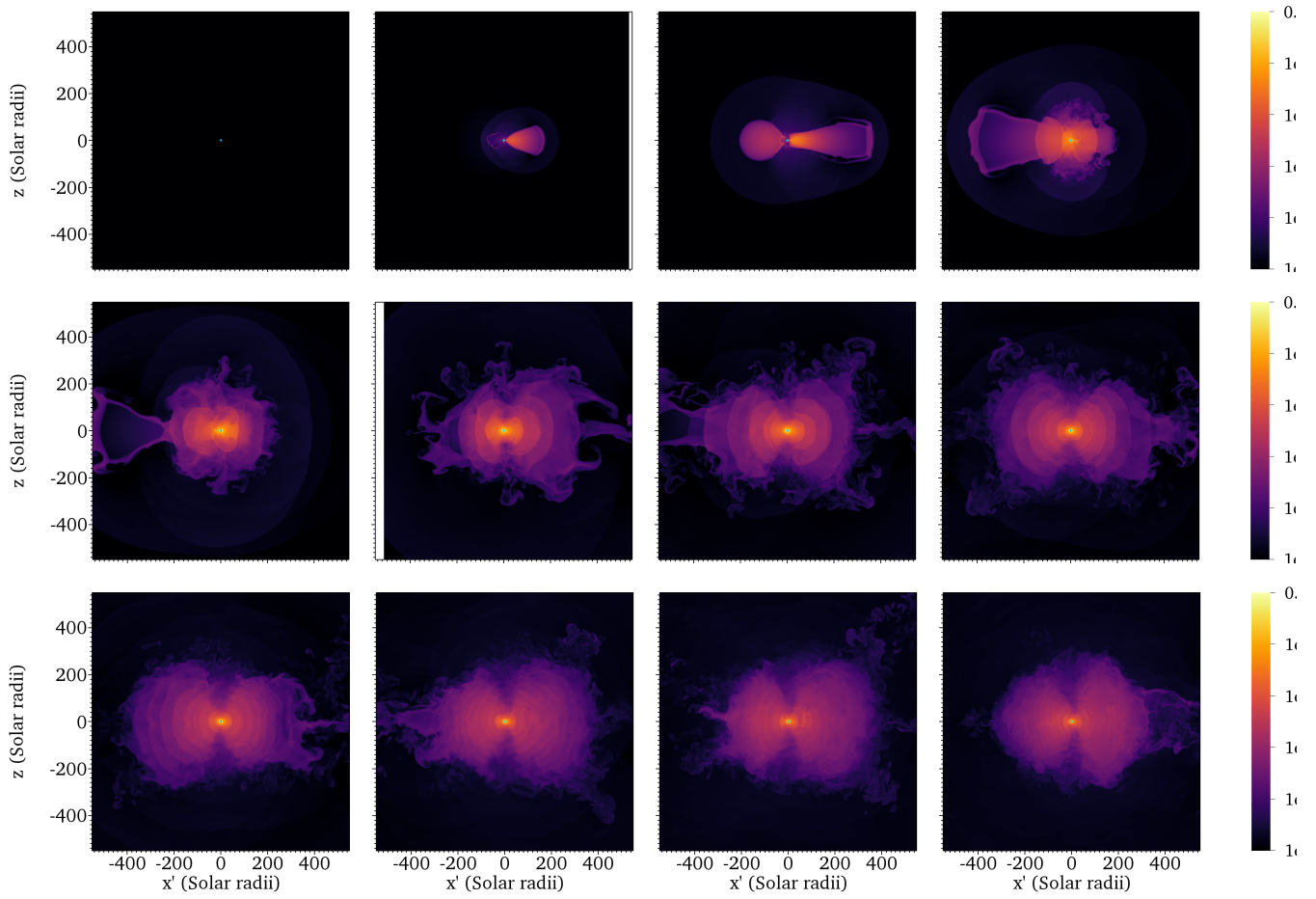
**Figure 24.** Mass accretion around particle 1 (top) and particle 2 (bottom) for Run 183 (blue) and Run 143 (red).



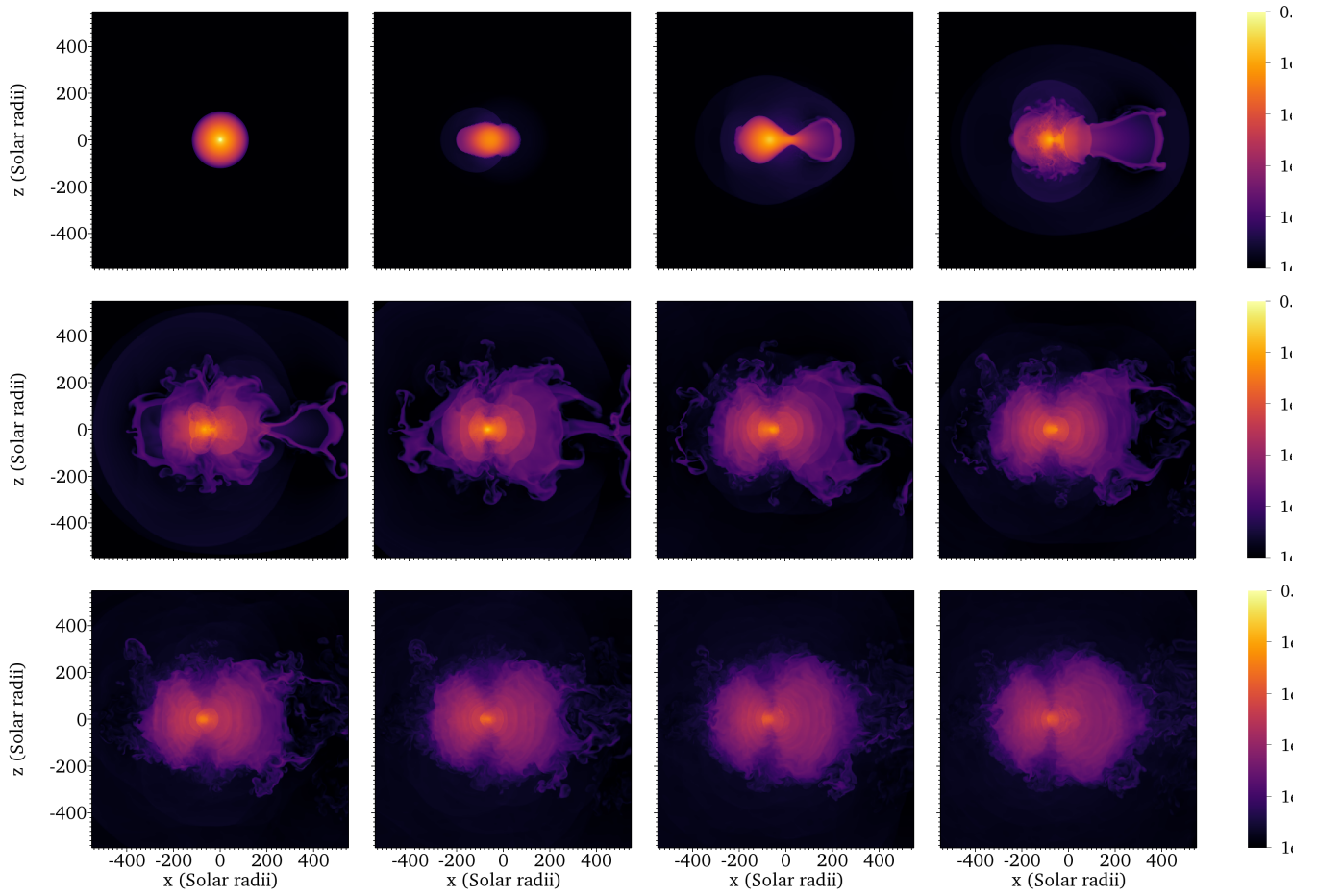
**Figure 25.** Similar to Fig. 24 but now using a logarithmic scale.



**Figure 26.** Density edge on through particles (center=particle CM)



**Figure 27.** Density edge on view from P1 (center=P2)



**Figure 28.** Density edge on along x-axis

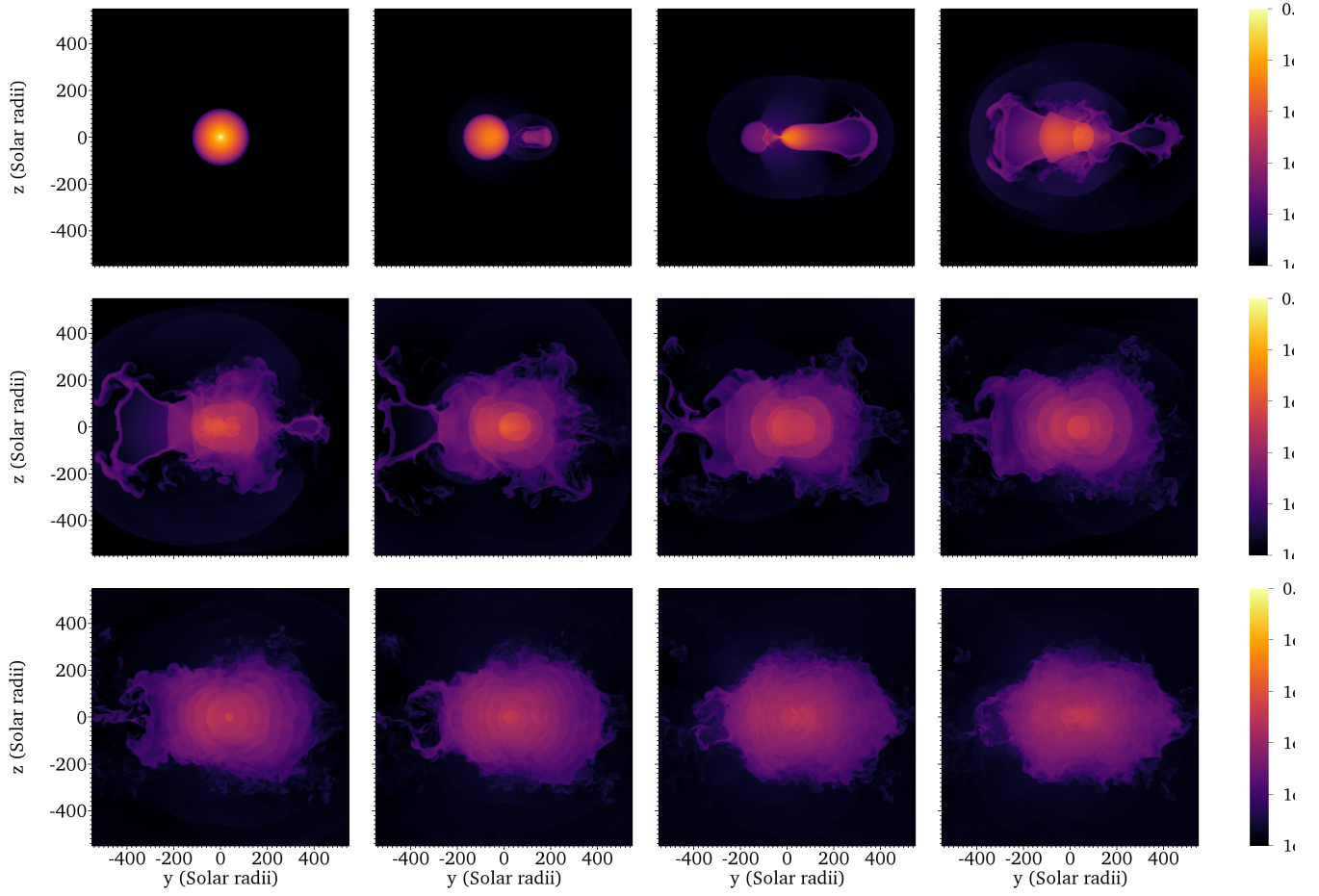
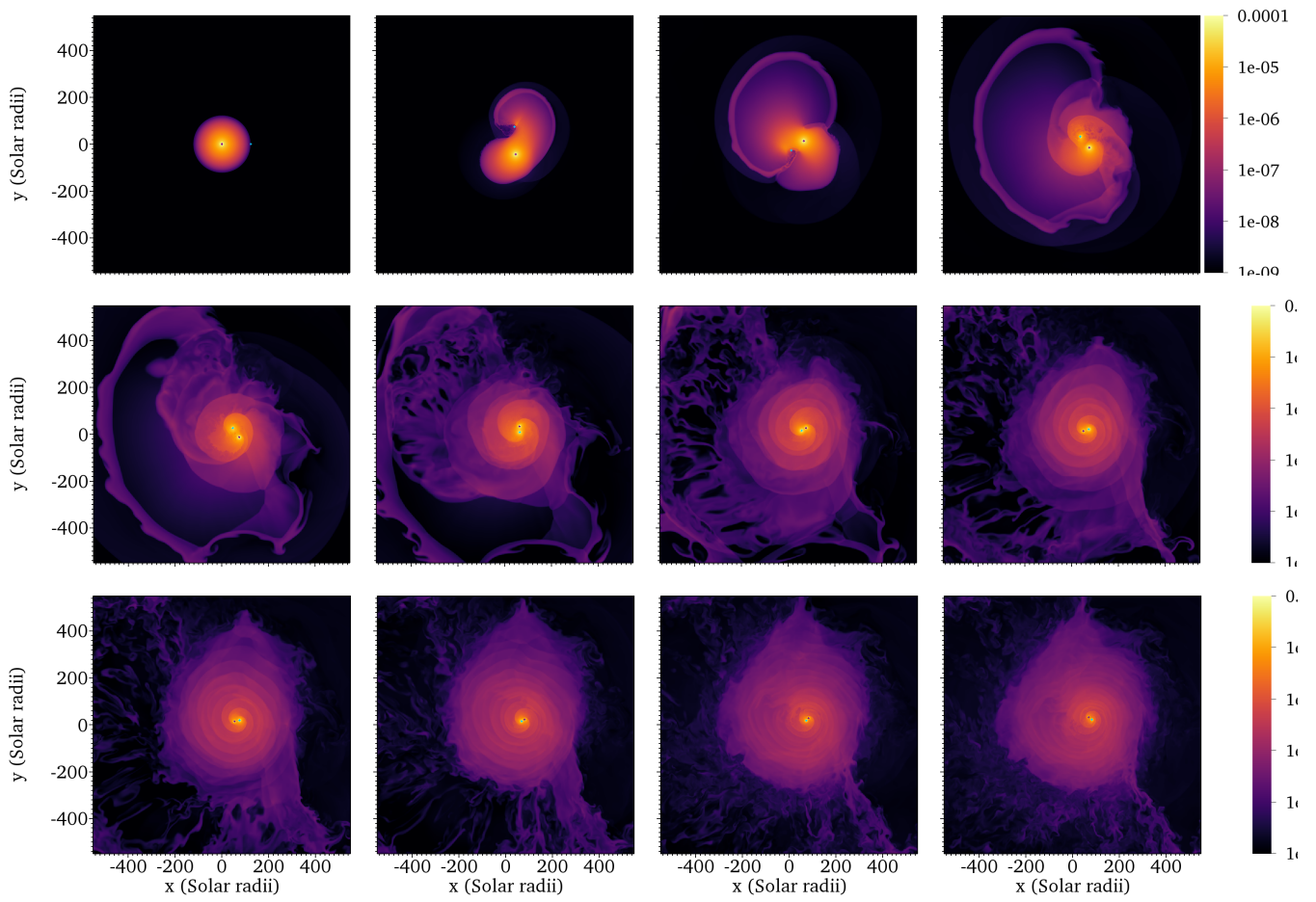


Figure 29. Density edge on along y-axis



**Figure 30.** Density face-on (center=origin)



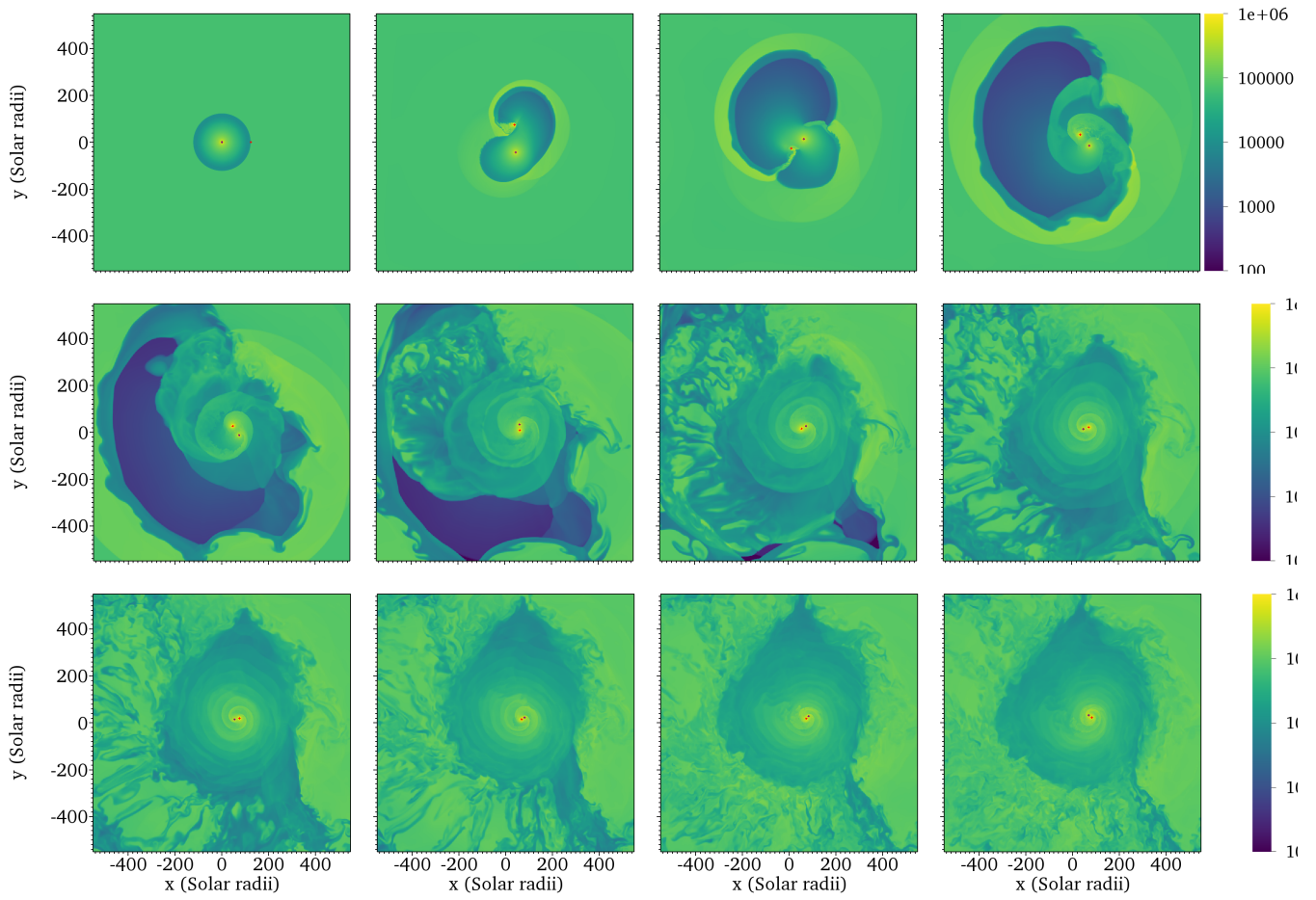
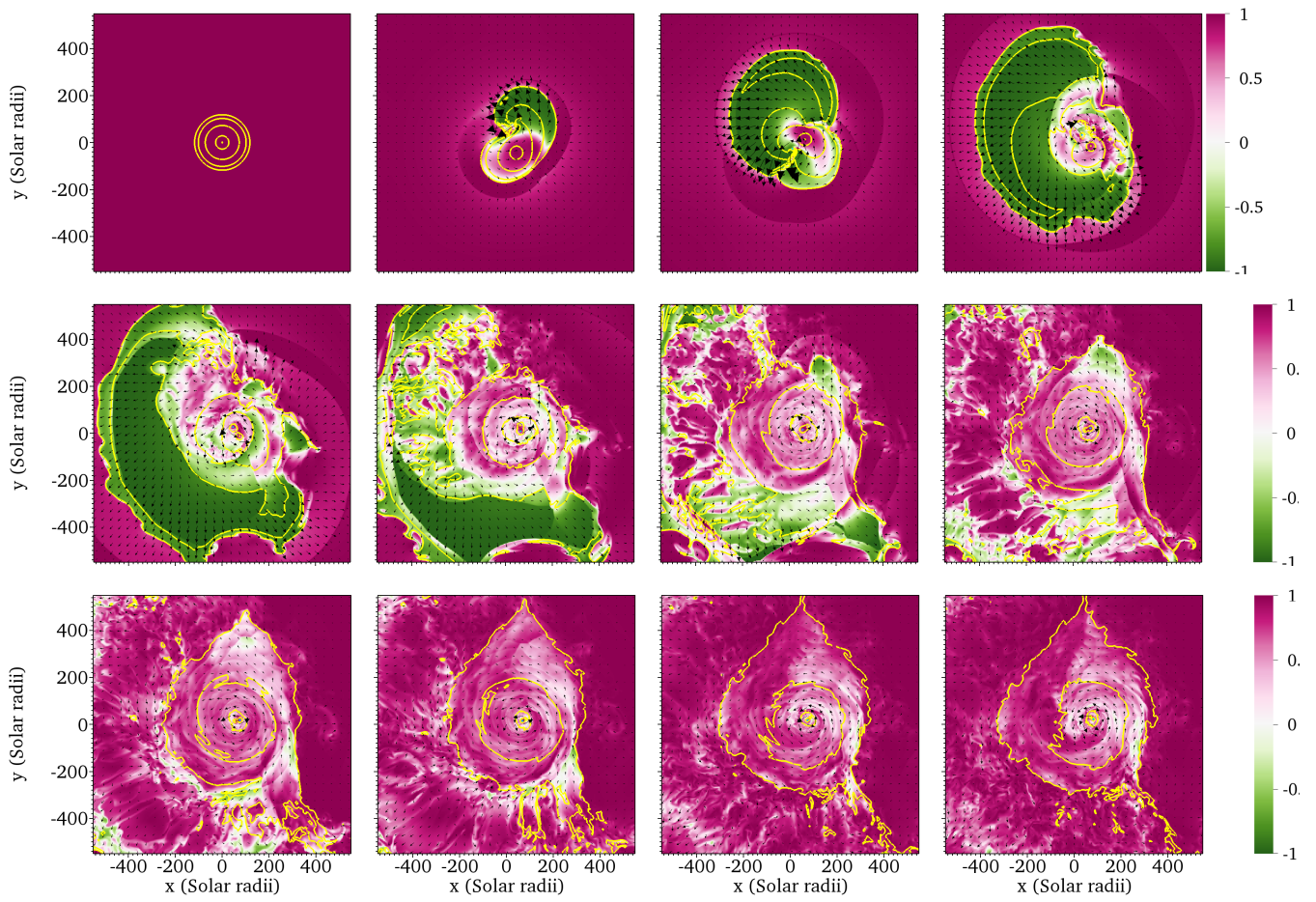


Figure 31. Temperature



**Figure 32.** Normalized kinetic (green) vs internal (magenta) energies

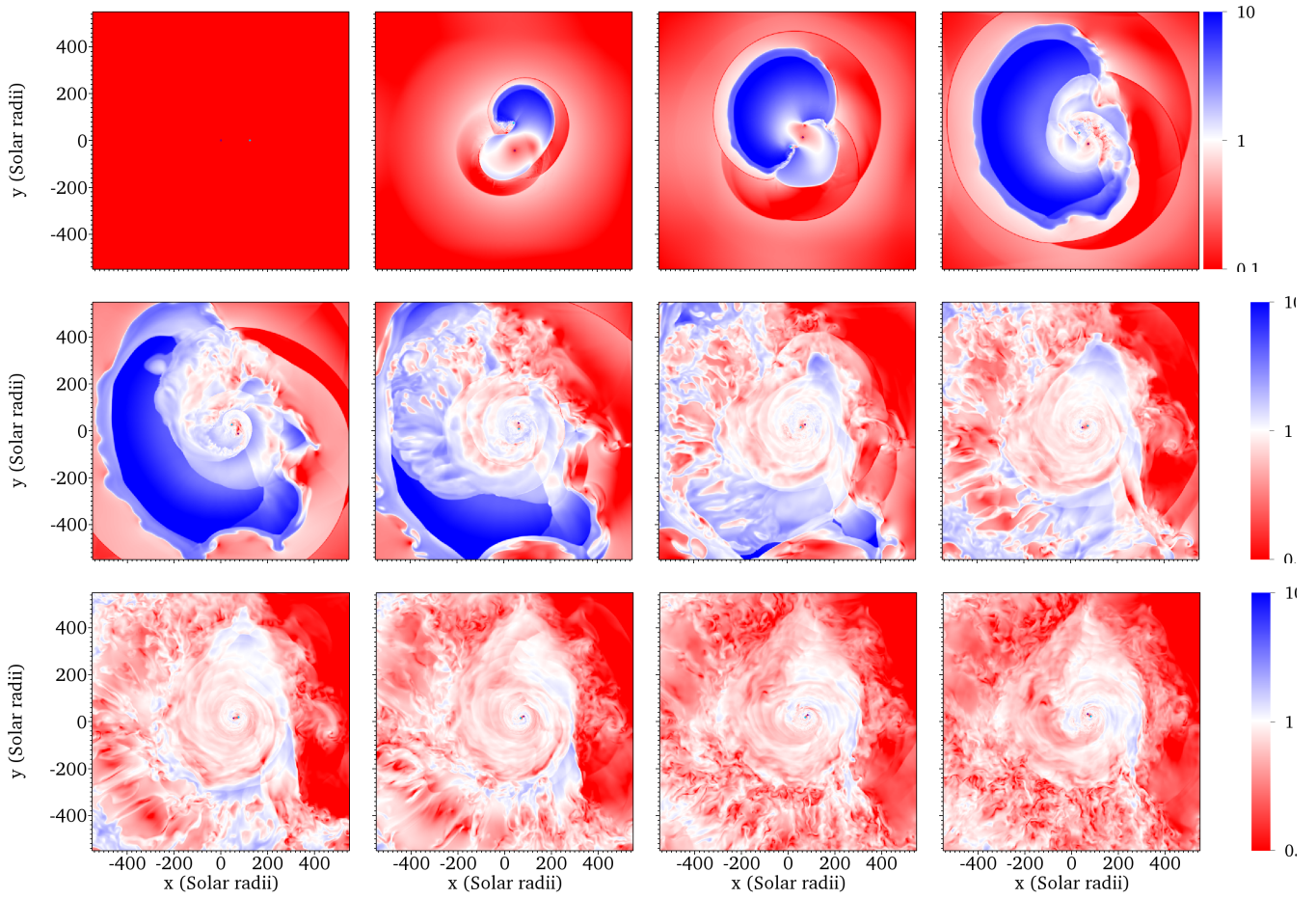
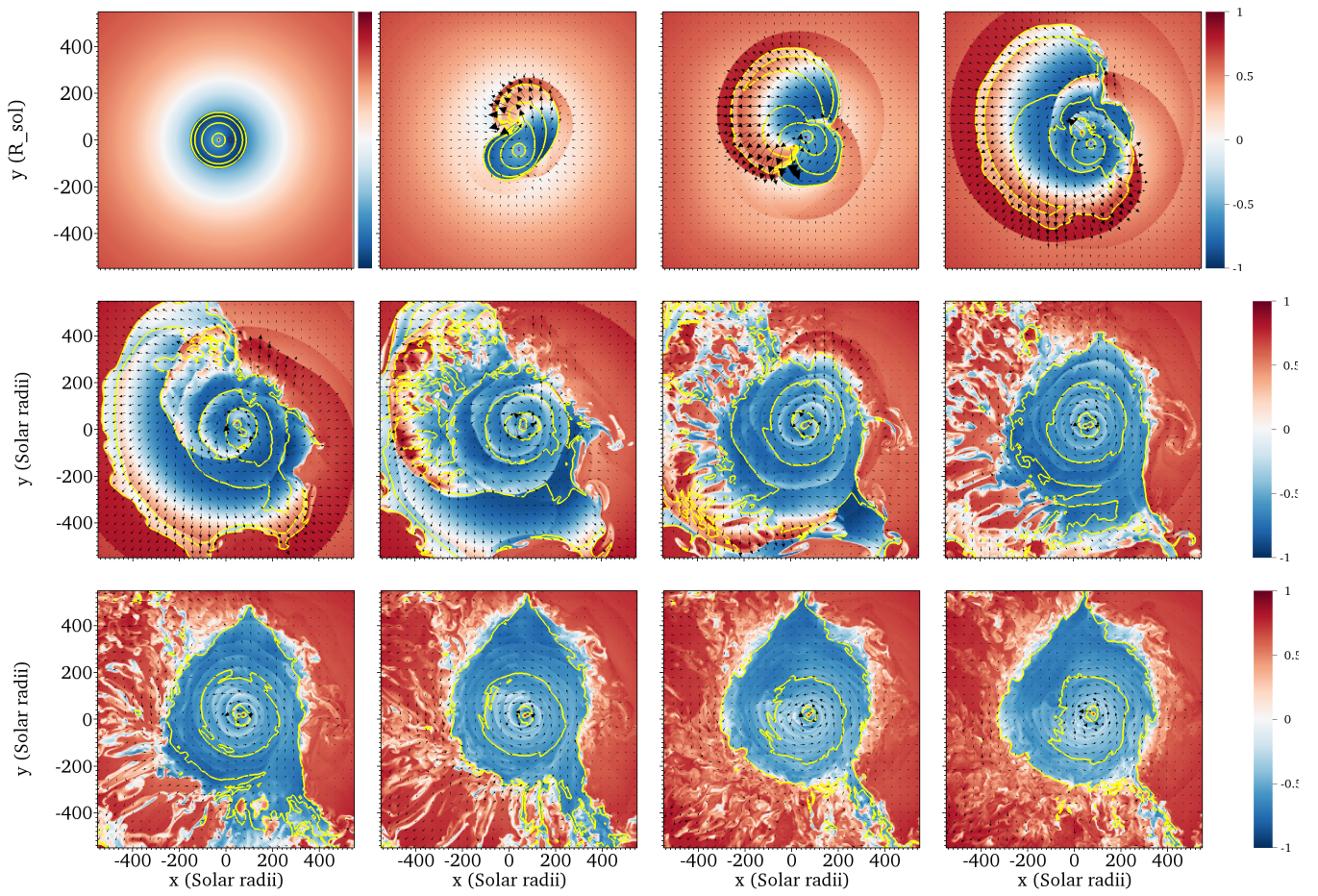


Figure 33. Mach number



**Figure 34.** Normalized gas energy

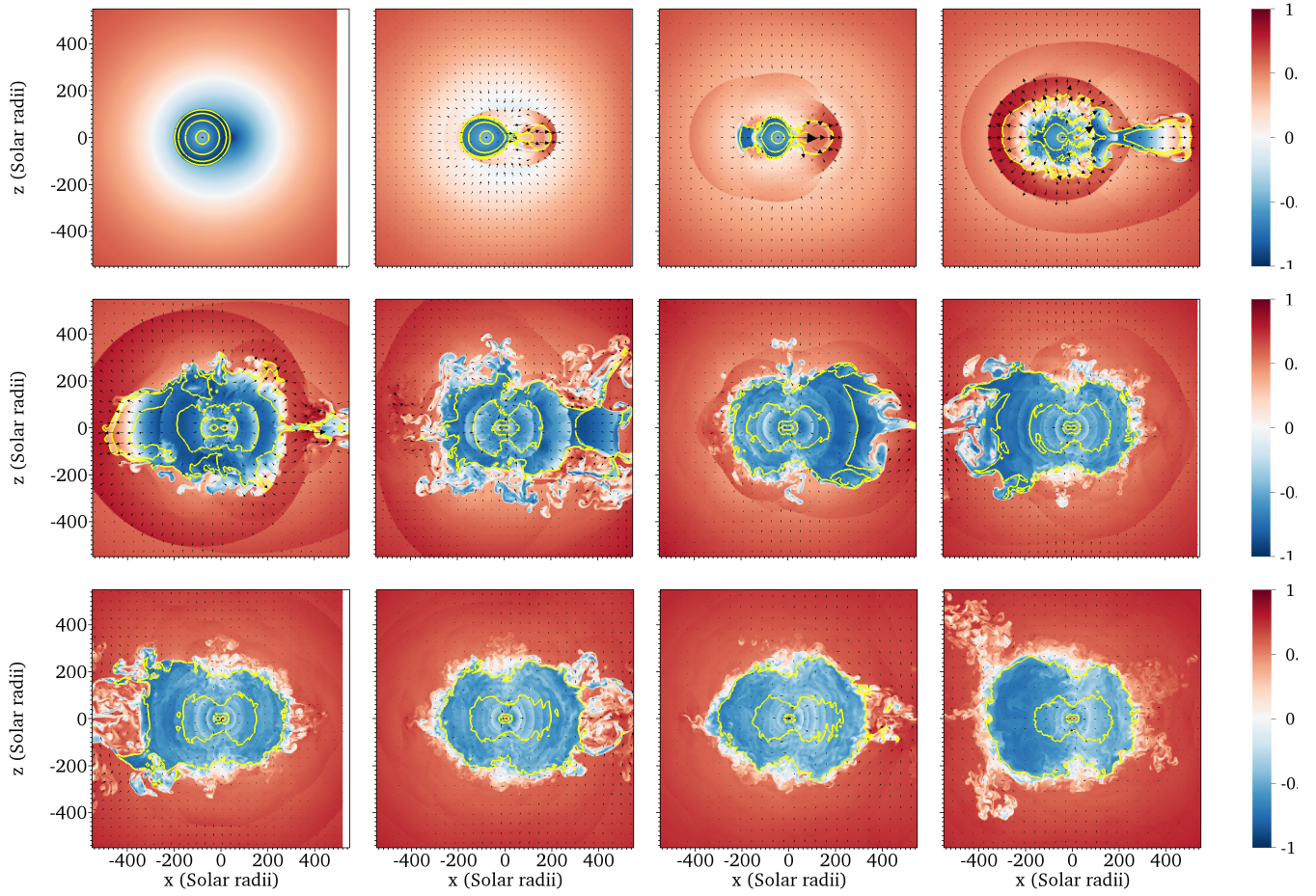
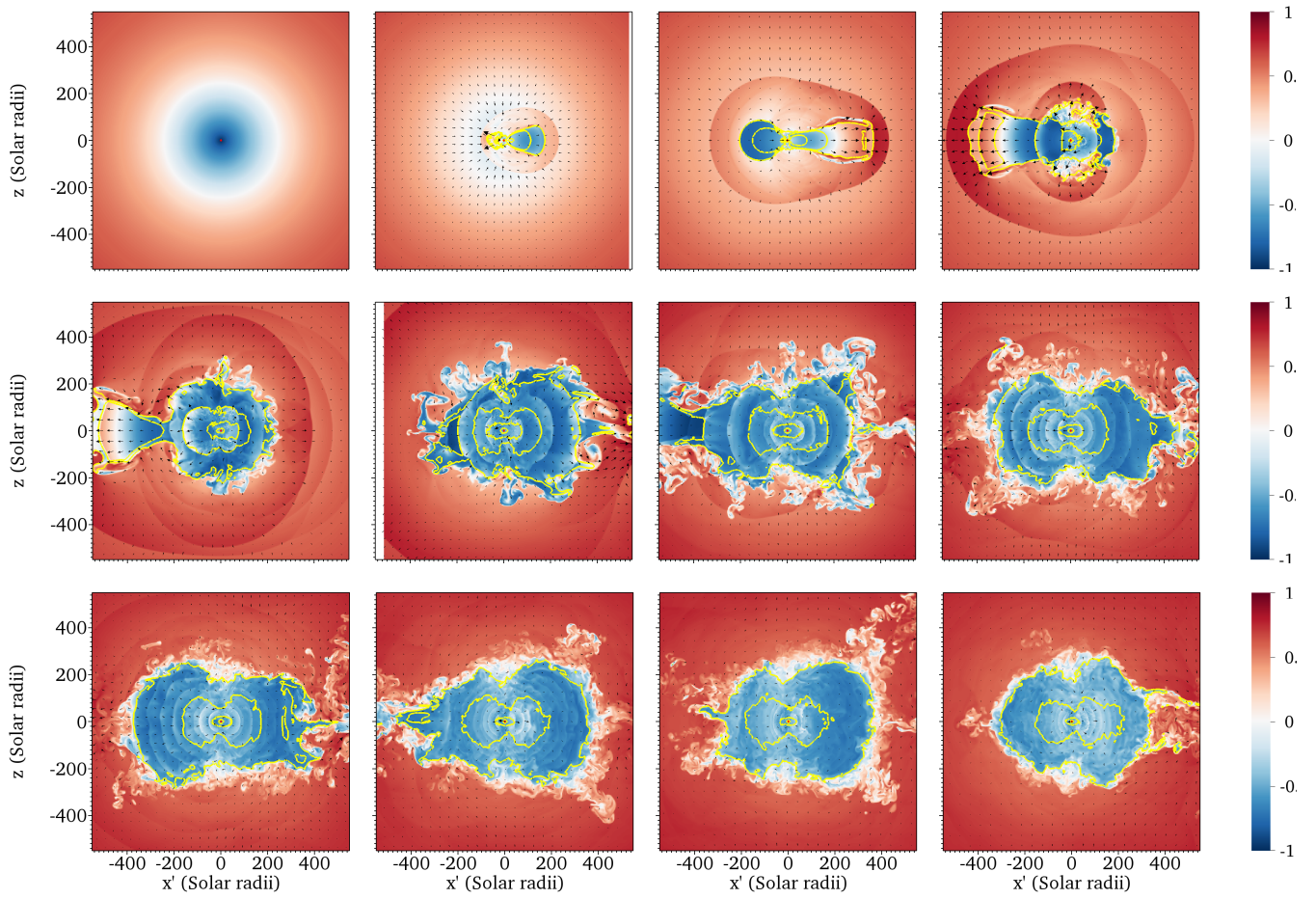
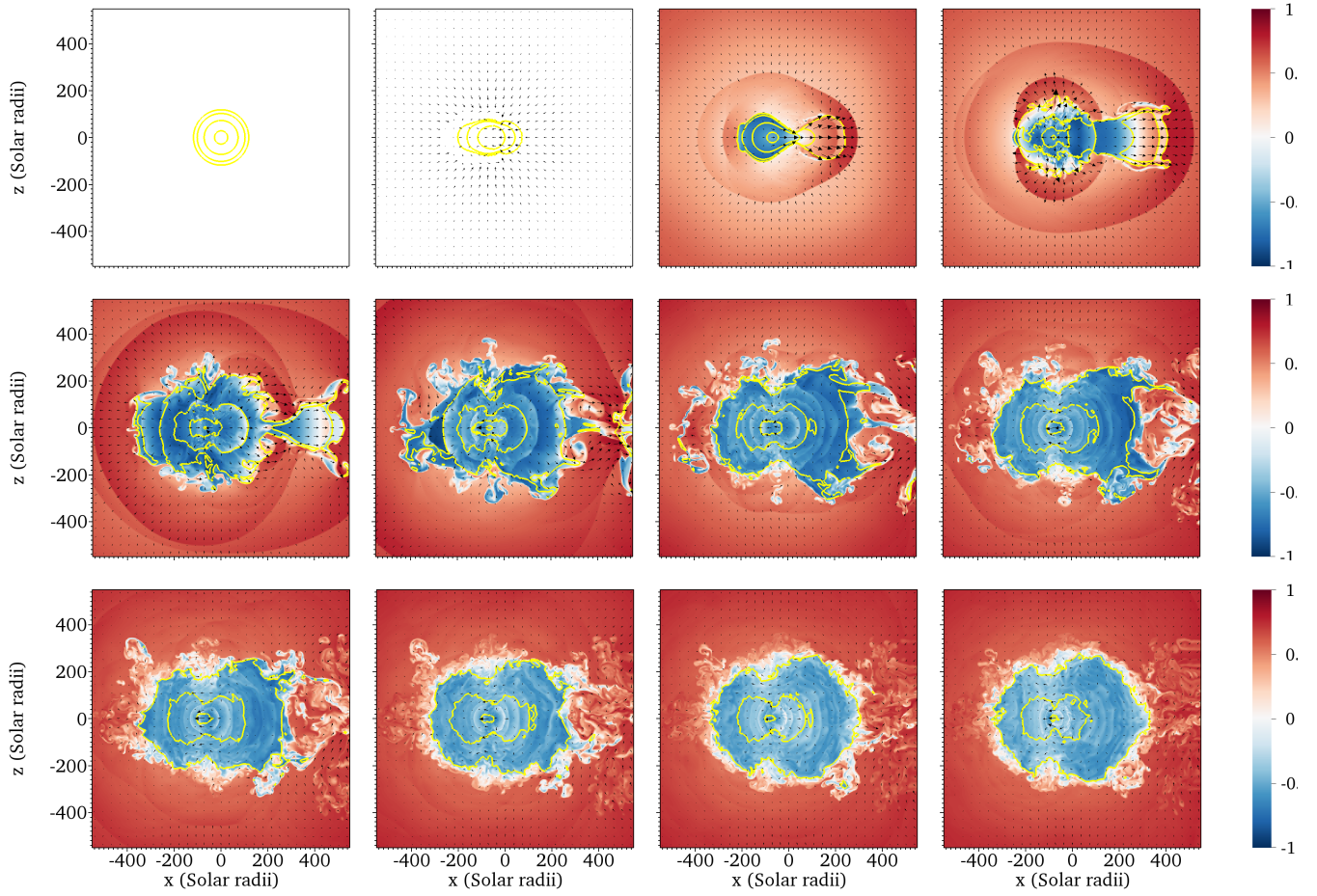


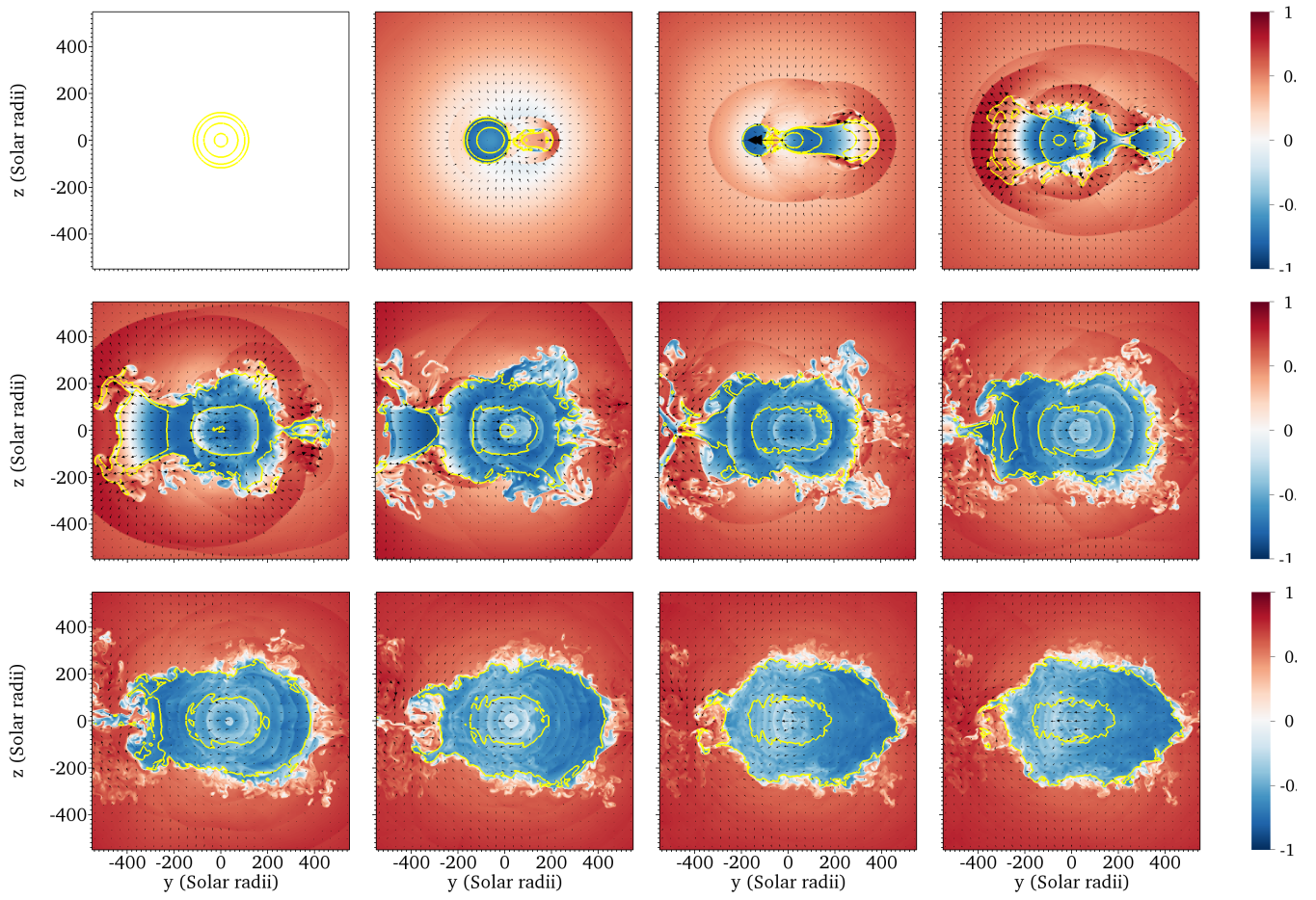
Figure 35. Normalized gas energy (edge-on through particles)



**Figure 36.** Normalized gas energy (edge-on view from P1)



**Figure 37.** Normalized gas energy (edge-on along x-axis)



**Figure 38.** Normalized gas energy (edge-on along y-axis)