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EoS Figures

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ABSTRACT
Figures

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

1 RESULTS

1.1 Comparison with Ohlmann thesis 2016

1.2 Comparison with Prust+Chang 2019

1.3 Comparison with Reichardt+ 2020

1.4 Comparison with Nandez+Ivanova 2016

1.5 Comparison with Lau+ 2021

2 DISCUSSION

2.1 What else can we do with current runs?

- Plot energy components as in Papers 2 and 4.
- Plot bound and unbound parts of energy components as in Paper 2.
- Use tracers to separate envelope and ambient.
- Use run with lower ambient to understand role of ambient.
- Use run with higher RGB core particle mass to understand role of numerics (can we improve energy conservation?).

2.2 What additional runs should we do?

- Ideal gas with same numerics as one of the MESA EOS runs, to enable apples-to-apples comparison
- MESA EOS without recombination energy (assumes released recom energy radiated away)
- MESA EOS without hydrogen recombination energy (assumes released hydrogen recom energy radiated away, but not helium recom energy)
- AGB run with MESA EOS (hard)
- AGB run without recom energy
- AGB run without hyd recom energy

References

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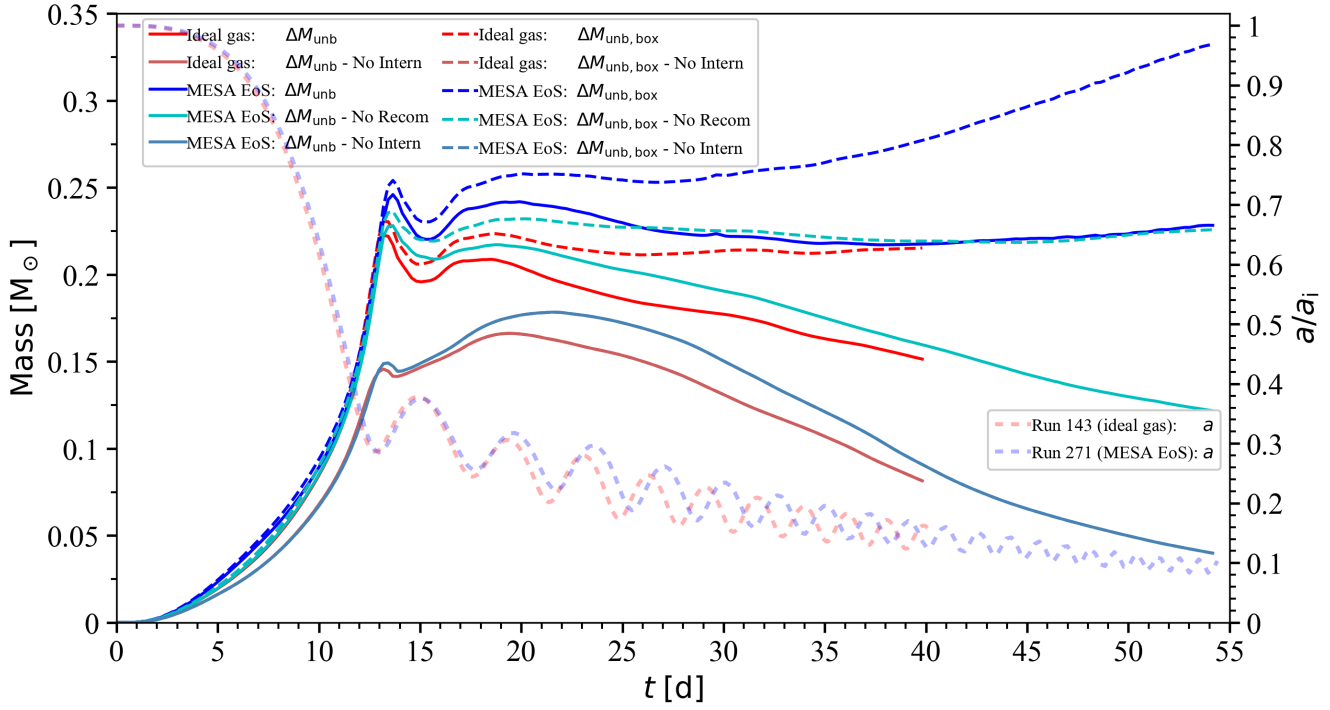

Figure 1. Standard definition of unbound mass used in Papers 1-5, but with thermal now replaced by internal=thermal+recombination.

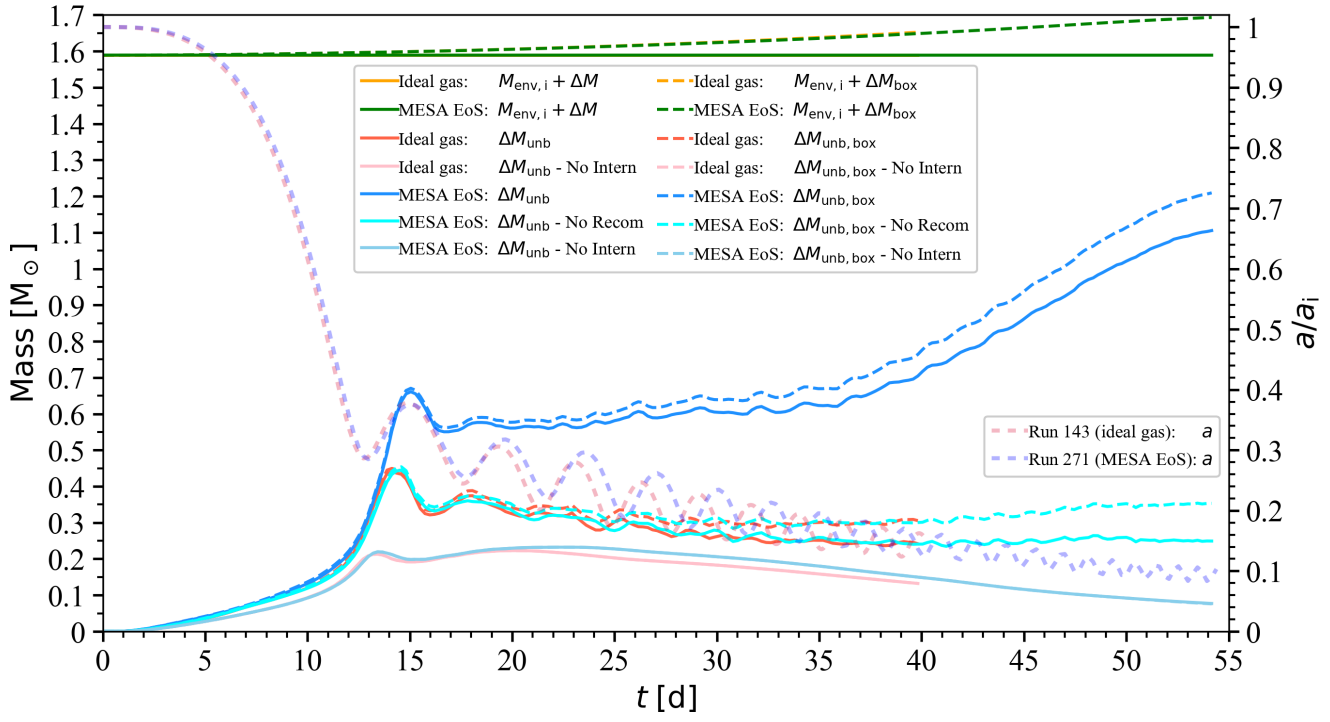

Figure 2. Unbound mass. Omitting factors of 2 on gas-particle PE terms used in Papers 1-5, for better comparison with literature.

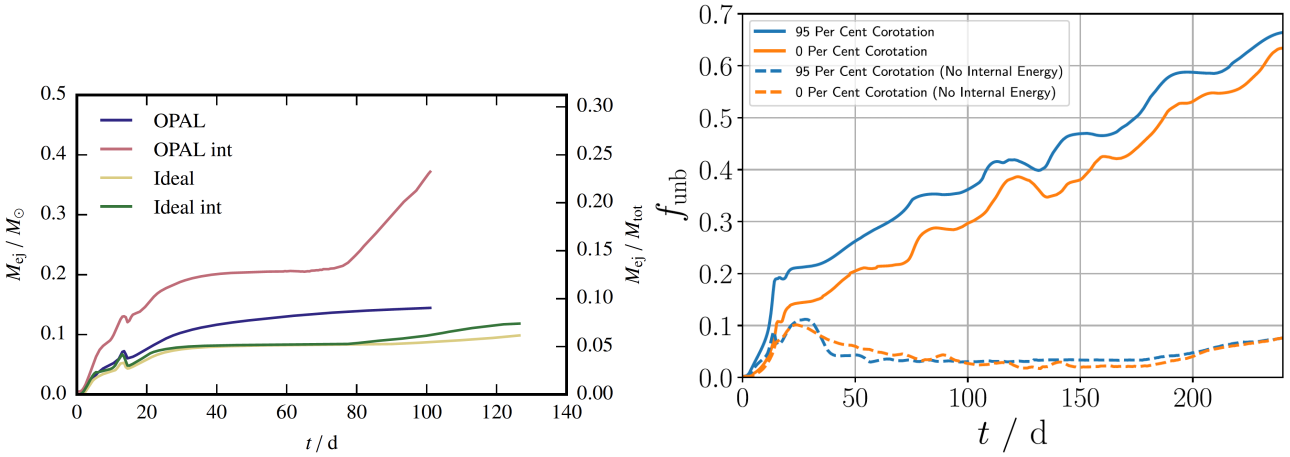

Figure 3. Left: Fig. 9.3 from Ohlmann's PhD Thesis (Ohlmann 2016). These authors use the energy density (presumably without our factors of 2 in the particle-gas PE terms). Right: Fig. 6 from Prust & Chang (2019). Our results should be compared with the orange curves since our giant is initialized without rotation. These authors use the bulk KE with respect to the CM of the bound matter.

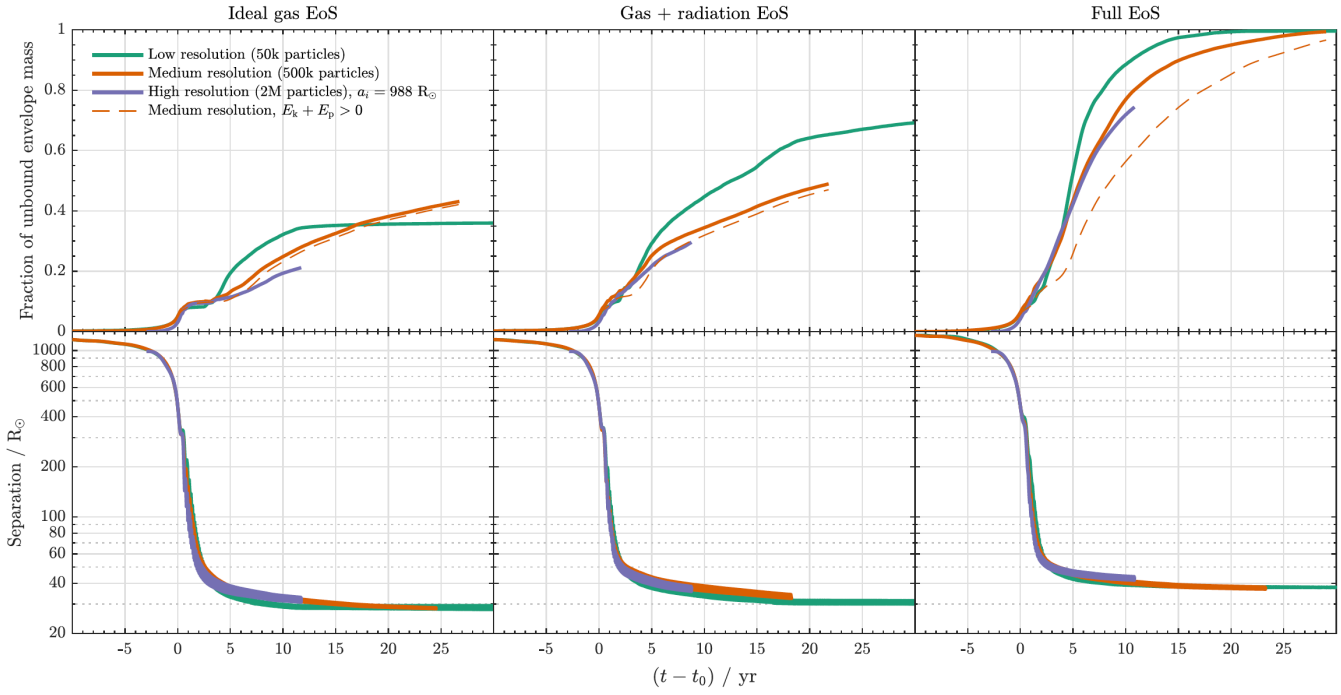

Figure 4. Fig. 3 from Lau et al. (2021). Thermal energy included in determining whether mass is unbound, but not recombination. Note that results are not converged with resolution.

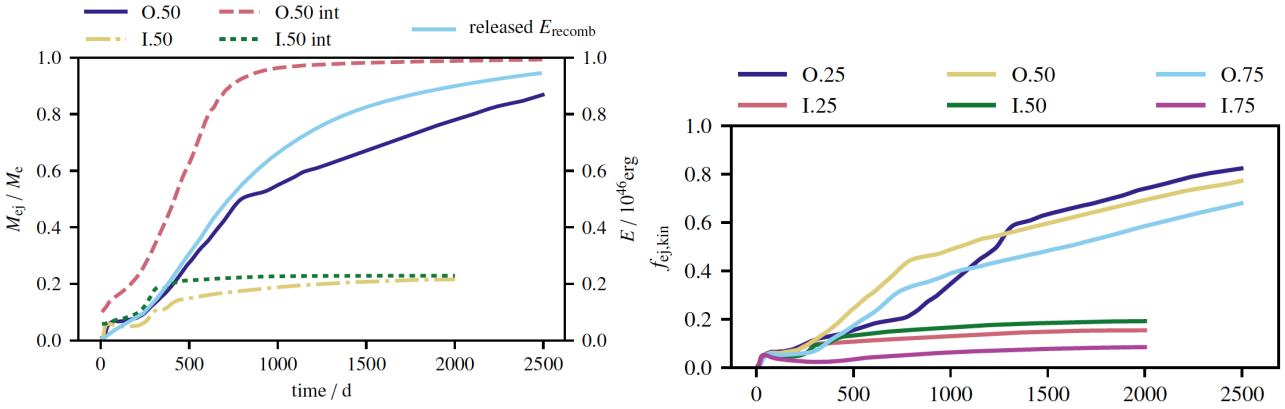

Figure 5. Left: Fig. 3 from Sand et al. (2020). Right: Fig. 9(top) from Sand et al. (2020). The unbound condition either includes internal energy (thermal+recombination) or does not.

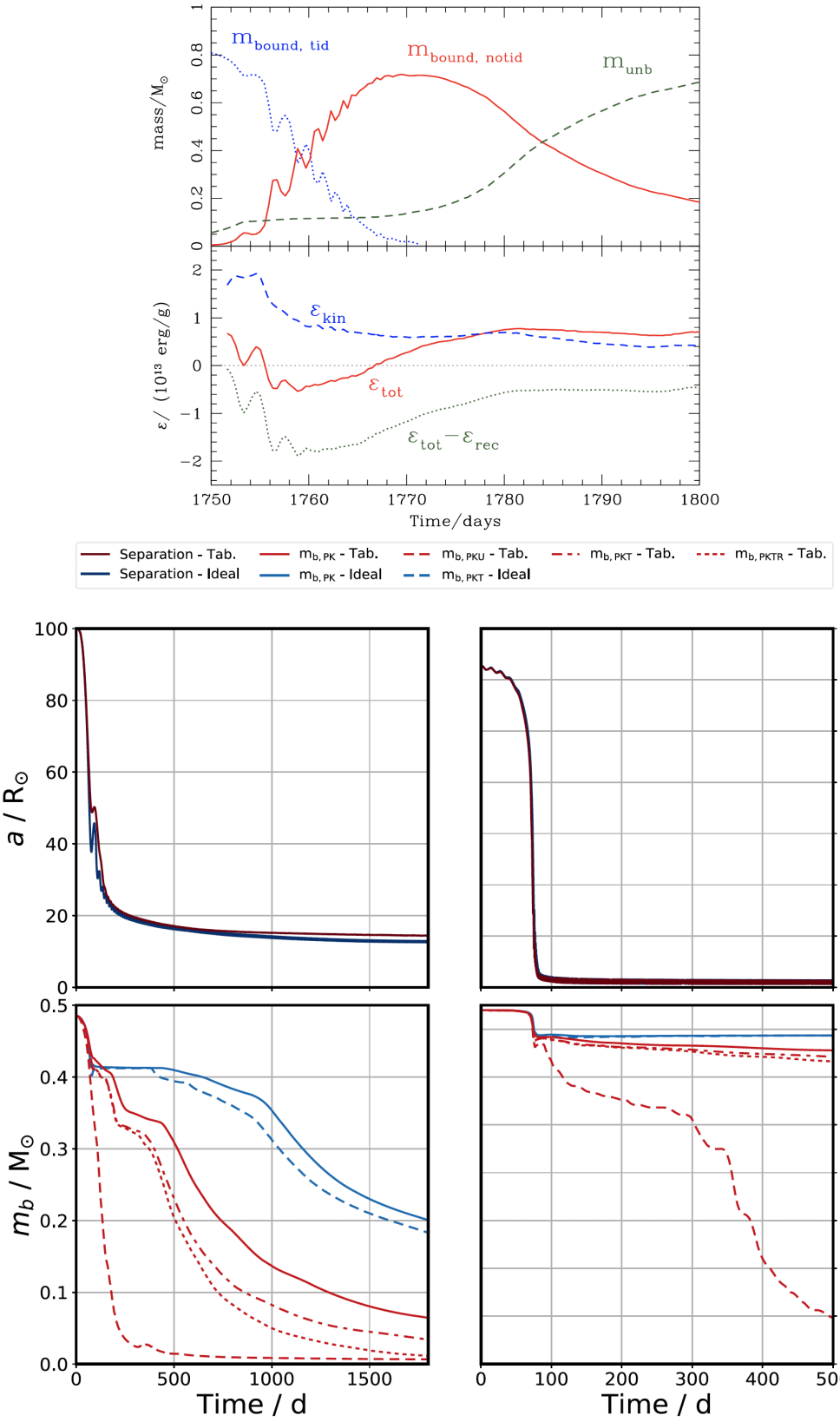

Figure 6. Left: Fig. 6 from Nandez & Ivanova (2016), where the definition of unbound is that total energy density (including thermal and recombination) is positive. Right: Fig. 2 from Reichardt et al. (2020).

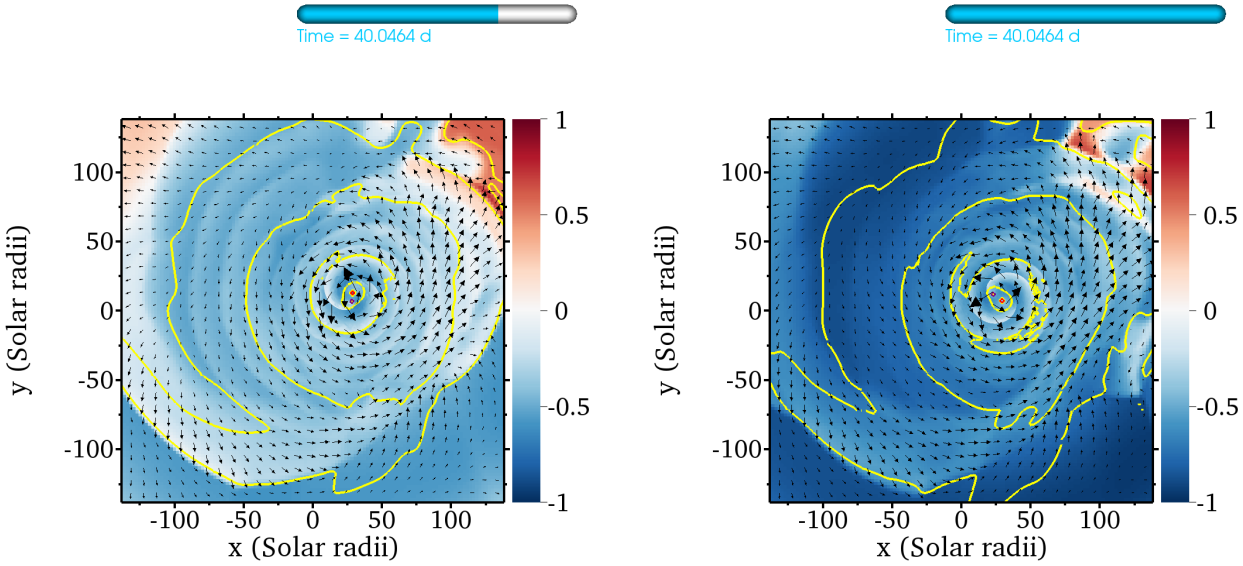

Figure 7. Standard definition of unbound mass used in Papers 1-5, but with thermal now replaced by internal=thermal+recombination. Slice through orbital plane, zoomed in to same view as in Paper 4. Left: Run271 (MESA EOS). Right: Run143 (ideal gas so no recombination energy).

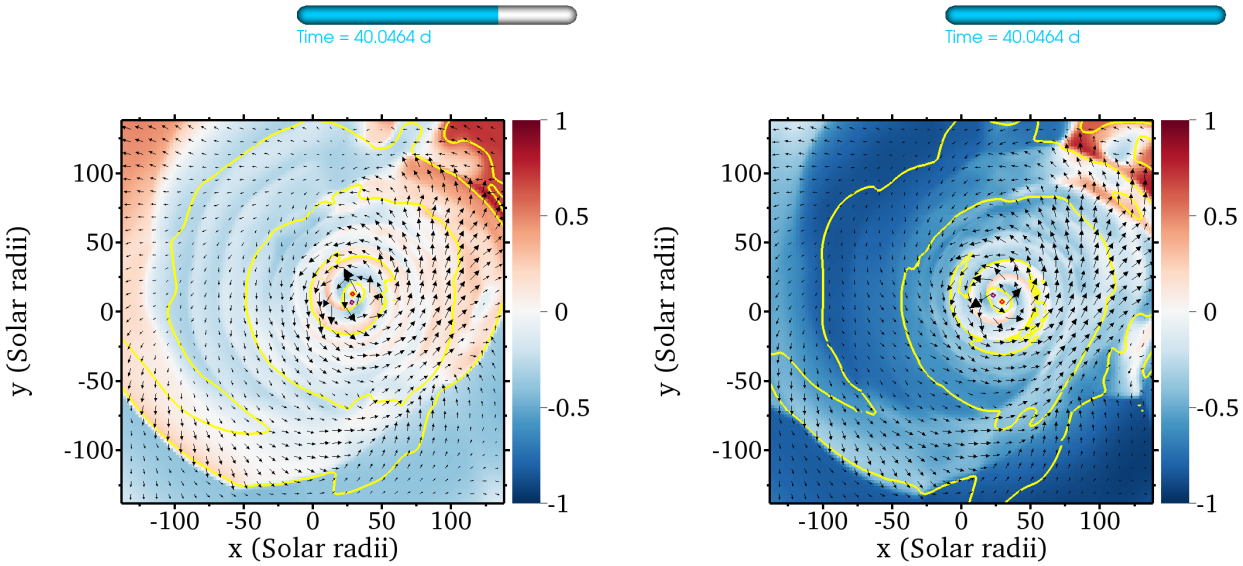

Figure 8. Definition of unbound mass with factors of 2 omitted from potential energy terms involving gas and particles, but with thermal now replaced by internal=thermal+recombination. Slice through orbital plane, zoomed in to same view as in Paper 4. Left: Run271 (MESA EOS). Right: Run143 (ideal gas so no recombination energy).

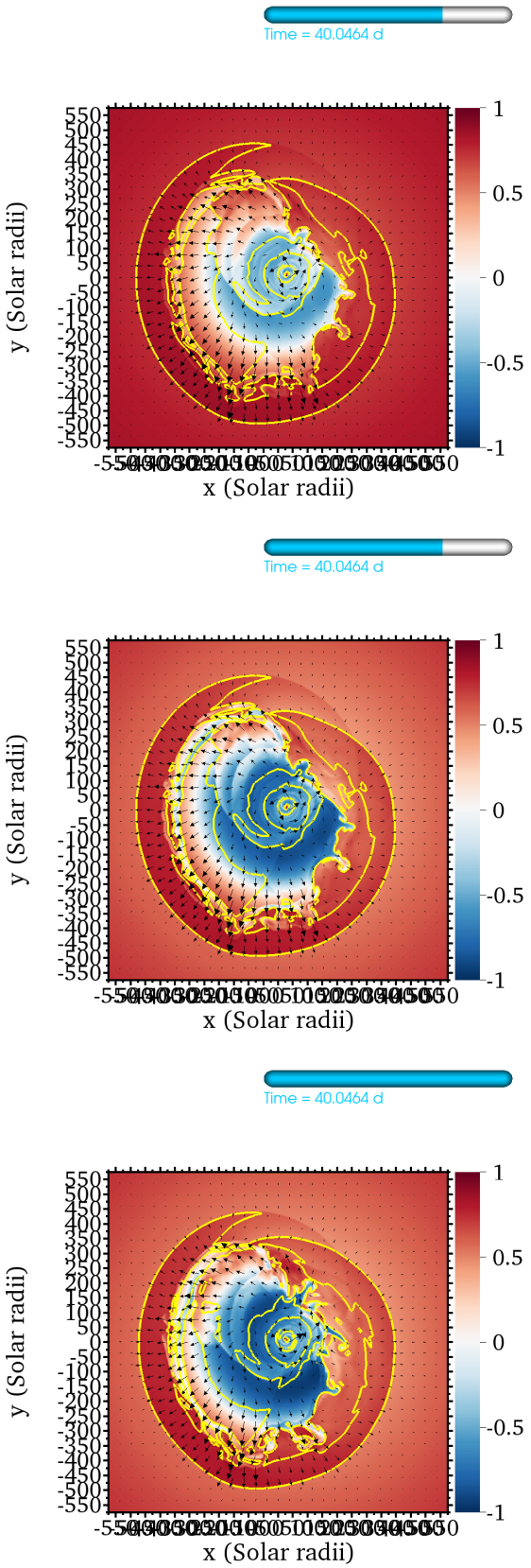

Figure 9. Standard definition of unbound mass used in Papers 1-5. Slice through orbital plane showing entire simulation domain. **Top:** Internal=thermal+recombination included in definition of unbound, Run271 (MESA EOS). **Middle:** Thermal, but not recombination, included in definition of unbound. Run271 (MESA EOS). **Bottom:** Ideal gas eos with $\gamma = 5/3$. Run143 (ideal gas so no recombination energy).

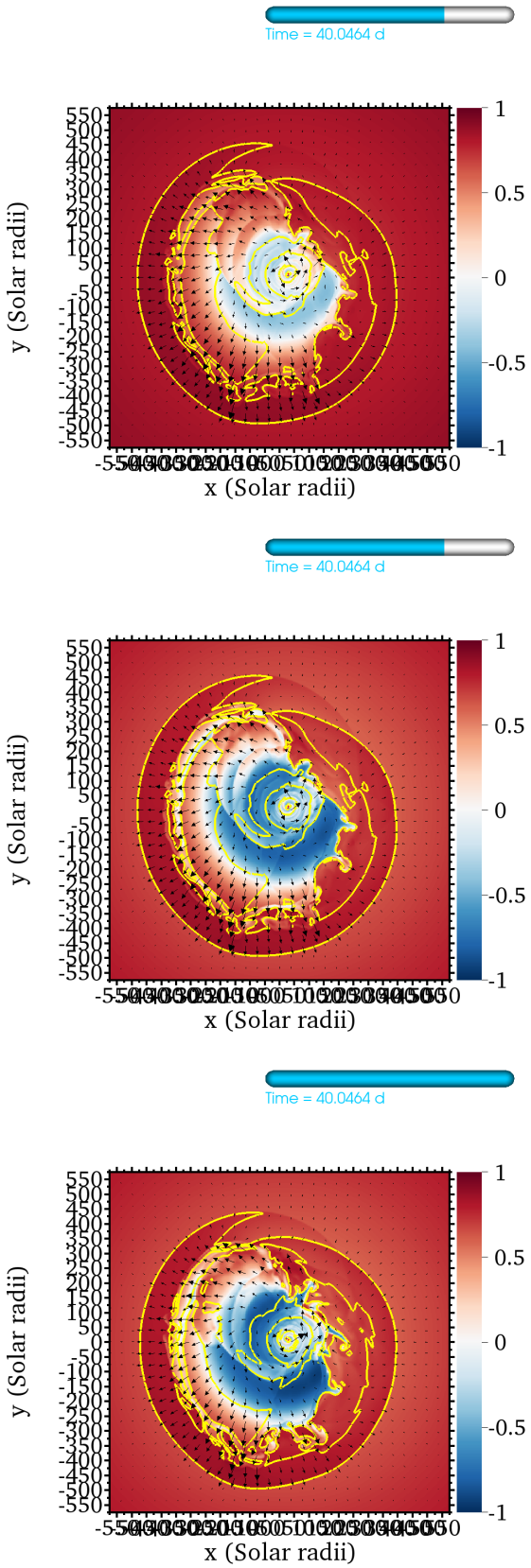

Figure 10. Definition of unbound mass with factors of 2 omitted from potential energy terms involving gas and particles. Slice through orbital plane showing entire simulation domain. **Top:** Internal=thermal+recombination included in definition of unbound, Run271 (MESA EOS). **Middle:** Thermal, but not recombination, included in definition of unbound. Run271 (MESA EOS). **Bottom:** Ideal gas eos with $\gamma = 5/3$. Run143 (ideal gas so no recombination energy).