Monthly Notices of the ROYAL ASTRONOMICAL SOCIETY
MNRAS **500,** 1125–1126 (2021) doi:10.1093/mnras/staa3413

# Erratum: Can magnetized turbulence set the mass scale of stars?

by Dávid Guszejnov [1]★ Michael Y. Grudić [2] Philip F. Hopkins [3] Stella S. R. Offner [1] and Claude-André Faucher-Giguère [2]

[1] *Department of Astronomy, University of Texas at Austin, TX 78712, USA*
[2] *CIERA and Department of Physics and Astronomy, Northwestern University, 2145 Sheridan Road, Evanston, IL 60208, USA*
[3] *TAPIR, Mailcode 350-17, California Institute of Technology, Pasadena, CA 91125, USA*

**Key words:** errata, addenda – MHD – turbulence – stars: formation – cosmology: theory.

The paper *Can magnetized turbulence set the mass scale of stars?* was published in MNRAS, 496, 5072–5088 (2020). In the original paper we found a large number of very low-mass sink particles (representing individual protostars) near the mass resolution limit (see fig. 10 of the original paper). After publication of the paper a detailed code review was carried out that found an uninitialized variable in the sink particle algorithm that could occasionally lead to erroneous behaviour. After re-running the simulation with the more thoroughly-developed sink particle methods used in Grudić et al. (2020) and Guszejnov et al. (2020), we found that this population of low-mass sink particles was drastically reduced (see Fig. 1), suggesting that a sub-population of these was unphysical in origin (strengthening our conclusions about the necessity of additional physics to prevent an overly top-heavy IMF).

Note that these low-mass objects represented a minor fraction of the total stellar mass. Since the main subject of our analysis was the mass-weighted median mass $M_{50}$, the main conclusions of the original paper are not strongly affected by this issue, as shown by Fig. 2. However we also conjectured that non-isothermal gas physics (e.g. the opacity limit for fragmentation) may be necessary to prevent an unphysically-large number of brown dwarfs from forming, as has been argued in many other works (Bate 2009; Offner et al. 2009; Lee & Hennebelle 2018; Colman & Teyssier 2019). Because a significant number of the brown dwarfs predicted by the simulation were unphysical in origin, the actual factor by which the brown dwarf population must be suppressed was overstated, and potentially our assessment of the importance of additional physics in turn.

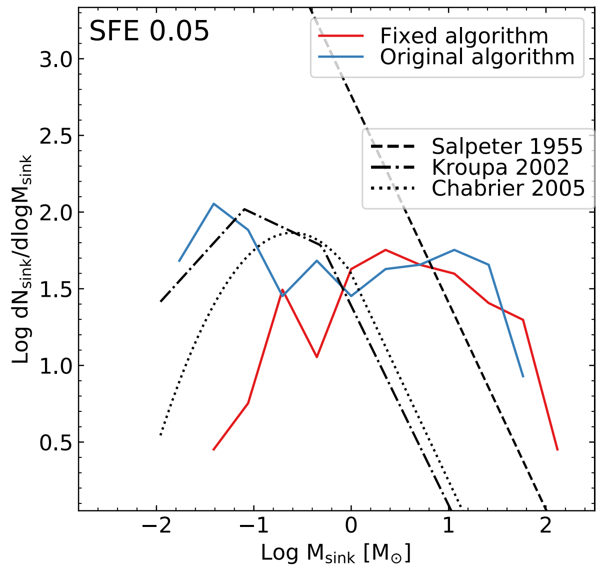


**Figure 1.** Distribution of sink particle masses measured in runs with both the original and the fixed algorithms for our **M2e4_R10** initial conditions at 5 per cent star formation efficiency (SFE = $\sum M_{\rm sink}/M_0$). We also show the Salpeter (1955), Kroupa (2002) and Chabrier (2005) fitting functions for the IMF. The peak at low masses with the original algorithm is clearly of numerical origin, however the high-mass ends in both cases are top-heavy compared to the observed one.

★ E-mail: guszejnov.david@gmail.com

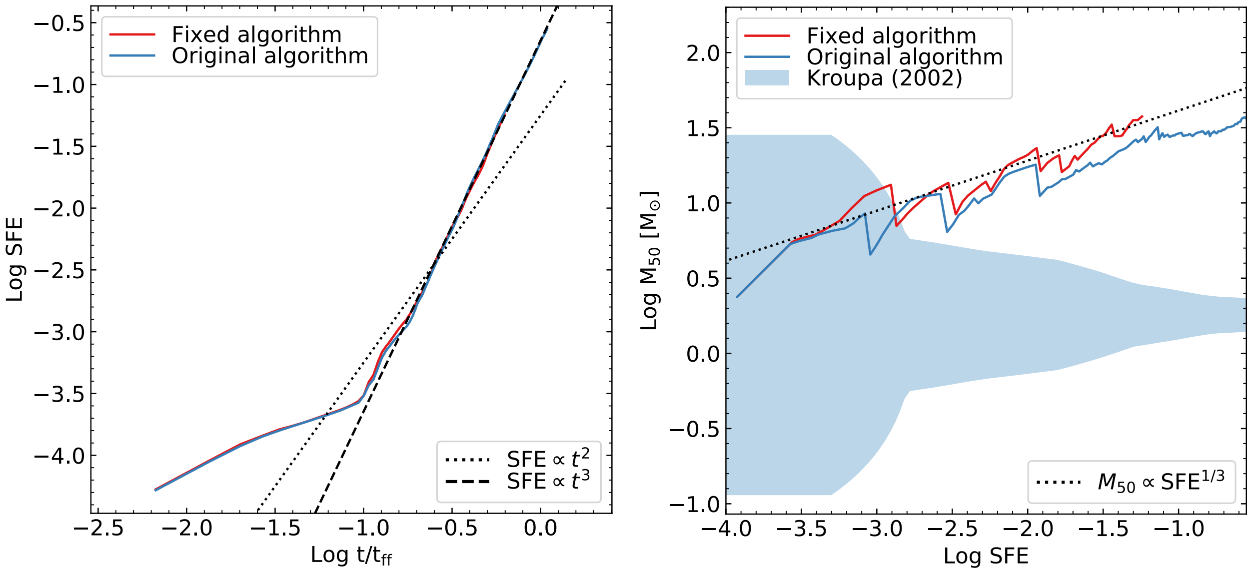


**Figure 2.** *Left*: Evolution of the star formation efficiency ($\mathrm{SFE}(t) = \sum M_{\mathrm{sink}}(t)/M_0$) as function of time with the original and the fixed version of the sink algorithm. Note that both versions of the code produce the same SFE$\propto t^3$ behaviour. *Right*: The evolution of the mass-weighted median ($M_{50}$, the mass scale above which half the total sink mass resides, right) sink mass as a function of star formation efficiency. We also show with a shaded region the 95 per cent confidence interval for these values if one sampled the Kroupa (2002) IMF at the current SFE value in the cloud. The behaviour with both the original and the fixed algorithms are essentially identical, leading to a top-heavy IMF.

## REFERENCES

Bate M. R., 2009, MNRAS, 392, 1363
Chabrier G., 2005, in Corbelli E., Palla F., Zinnecker H., eds, Astrophysics and Space Science Library, Vol. 327, The Initial Mass Function 50 Years Later, Springer, Dordrecht, p. 41
Colman T., Teyssier R., 2019, MNRAS, 492, 4727
Grudić M. Y., Guszejnov D., Hopkins P. F., Offner S. S. R., Faucher-Giguère C.-A., 2020, preprint (arXiv:2010.11254)
Guszejnov D., Grudić M. Y., Hopkins P. F., Offner S. S. R., Faucher-Giguère C.-A., 2020, preprint (arXiv:2010.11249)
Kroupa P., 2002, Science, 295, 82
Lee Y.-N., Hennebelle P., 2018, A&A, 611, A88
Offner S. S. R., Klein R. I., McKee C. F., Krumholz M. R., 2009, ApJ, 703, 131
Salpeter E. E., 1955, ApJ, 121, 161

This paper has been typeset from a TEX/LATEX file prepared by the author.