



**HAL**  
open science

## Erratum: Self-induced dust traps: overcoming planet formation barriers

Jean-François Gonzalez, Guillaume Laibe, Sarah T. Maddison

► **To cite this version:**

Jean-François Gonzalez, Guillaume Laibe, Sarah T. Maddison. Erratum: Self-induced dust traps: overcoming planet formation barriers. *Monthly Notices of the Royal Astronomical Society*, 2017, 10.1093/mnras/stx2024 . hal-01579554

**HAL Id: hal-01579554**

**<https://hal.science/hal-01579554>**

Submitted on 31 Aug 2017

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Erratum: Self-induced dust traps: overcoming planet formation barriers

J.-F. Gonzalez,<sup>1</sup>★ G. Laibe,<sup>1,2</sup>† and S. T. Maddison,<sup>3</sup>

<sup>1</sup>Univ Lyon, Univ Lyon1, Ens de Lyon, CNRS, Centre de Recherche Astrophysique de Lyon UMR5574, F-69230, Saint-Genis-Laval, France

<sup>2</sup>School of Physics and Astronomy, University of Saint Andrews, North Haugh, St Andrews, Fife KY16 9SS, UK

<sup>3</sup>Centre for Astrophysics and Supercomputing, Swinburne University of Technology, PO Box 218, Hawthorn, VIC 3122, Australia

Accepted 2017 August 3. Received 2017 July 10; in original form 2017 July 10.

**Key words:** errata, addenda – hydrodynamics – methods: numerical – protoplanetary discs

After publication of the paper ‘Self-induced dust traps: overcoming planet formation barriers’ in MNRAS 467, 1984 (2017), we discovered an inconsequential error in Appendix C.

Steady-state expressions of the radial velocities for both the gas and dust phases of a dusty disc, taking into account the back-reaction of dust on gas, have been calculated by several authors, for different conditions (e.g. Nakagawa et al. 1986; Kretke et al. 2009; Dipierro & Laibe 2017; Kanagawa et al. 2017). They are usually written as functions of the Stokes number for the gas-dust mixture  $St'$  and the dust-to-gas ratio  $\epsilon = \rho_d/\rho_g$ . In equation (C1), we gave the steady-state expression of the radial velocity of the viscous gas phase of a dusty disc as a function of the more commonly used Stokes number defined for the dust only,  $St$ , related to  $St'$  by  $St' = St/(1 + \epsilon)$  (Price & Laibe 2015):

$$v_g = -f_{\text{drag}} \frac{1}{\Sigma_g \Omega} \frac{\partial}{\partial r} (c_s^2 \Sigma_g) + f_{\text{visc}} \frac{\partial}{\partial r} \left( \Sigma_g \nu r^3 \frac{\partial \Omega}{\partial r} \right), \quad (1)$$

$$\equiv v_{g,\text{drag}} + v_{g,\text{visc}},$$

where

$$f_{\text{drag}} = \frac{\epsilon}{(1 + \epsilon)^2 St^{-1} + St}. \quad (2)$$

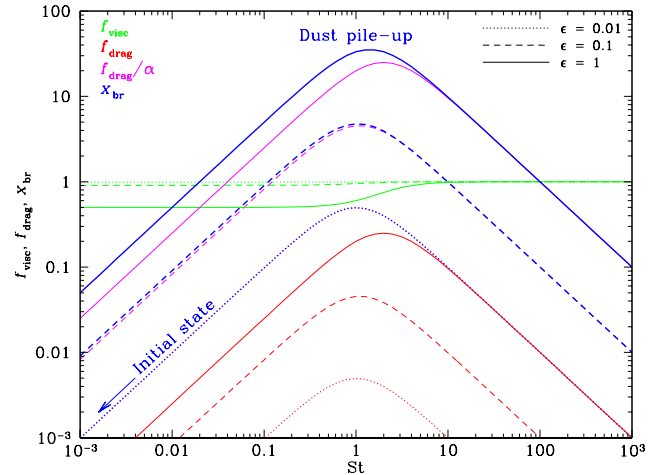
When replacing  $St'$  by its expression as a function of  $St$ , we mistakenly wrote that  $f_{\text{visc}} = 1$ . The correct expression is

$$f_{\text{visc}} = \frac{(1 + \epsilon) St^{-1} + St}{(1 + \epsilon)^2 St^{-1} + St}. \quad (3)$$

As a consequence, equation (C10) should now read

$$x_{\text{br}} \equiv \frac{|v_{g,\text{drag}}|}{|v_{g,\text{visc}}|} \approx \frac{1}{\alpha} \frac{f_{\text{drag}}}{f_{\text{visc}}}, \quad (4)$$

and Fig. C1 should be replaced with the current Fig. 1. It shows that both  $f_{\text{visc}}$  and  $x_{\text{br}}$  are little affected for small values of  $\epsilon$ . For  $\epsilon \sim 1$ , the effect of back-reaction on the gas phase is up to twice as large, strengthening the conclusions of the initial study.



**Figure 1.** Parameter  $x_{\text{br}}$ , quantifying the importance of back-reaction on the gas motion, as well as  $f_{\text{drag}}$  and  $f_{\text{visc}}$ , as a function of  $St$ , for  $\epsilon = 0.01, 0.1$  and  $1$ , and  $\alpha = 10^{-2}$ .

## REFERENCES

- Dipierro G., Laibe G., 2017, *MNRAS*, **469**, 1932  
 Kanagawa K. D., Ueda T., Muto T., Okuzumi S., 2017, *ApJ*, **844**, 142  
 Kretke K. A., Lin D. N. C., Garaud P., Turner N. J., 2009, *ApJ*, **690**, 407  
 Nakagawa Y., Sekiya M., Hayashi C., 1986, *Icarus*, **67**, 375  
 Price D. J., Laibe G., 2015, *MNRAS*, **451**, 813

This paper has been typeset from a T<sub>E</sub>X/L<sup>A</sup>T<sub>E</sub>X file prepared by the author.

★ E-mail: jean-francois.gonzalez@ens-lyon.fr

† E-mail: guillaume.laibe@ens-lyon.fr