Sebastian Weitz
Richard Fournier
Stéphane Blanco
Laboratoire Plasma et Conversion d'Energie, UMR-CNRS 5213, Université Paul Sabatier, Bât 3R1, 118 Route de Narbonne, F-31062 Toulouse cedex 9, France
e-mail: weitz@laplace.univ-tlse.fr
Jacques Gautrais
Christian Jost
Guy Theraulaz
Centre de Recherches sur la Cognition Animale, UMR-CNRS 5169, Université Paul Sabatier, Bât 4R3, 118 Route de Narbonne, F-31062 Toulouse cedex 9, France

A model of self-induced thigmotactism in ants

Ants display thigmotactic behaviour which is a tendency to align with a border and move along it for some time. In many cases, ants' activity results in the formation of environmental heterogeneities that in turn modify the motion of ants and trigger a thigmotactic behaviour as they reach a critical size. We have analyzed this phenomenon during object clustering experiments in the ant *Messor Sanctus*. The experimental investigation of the motion of ants in presence of objects (Casellas et al. [1] and subsequent experimental work) leads to a new thigmotactic random walk model, in which ants tend to walk around the emerging piles rather than crossing them. In this contribution we analyze the properties of this model and show that its predictions are in quantitive agreement with the experimental observations. We then show the essential role played by the coupling between the clustering dynamics and the motion of the ants in the object clustering experiments. We finally discuss the implications of the model for the study of the nest building process in ants, and for understanding the shape transition in the clustered items observed when ants are facing low-speed air currents.

References

[1] E. Casellas, J. Gautrais, R. Fournier, S. Blanco, M. Combe, V. Fourcassié, G. Theraulaz, and C. Jost, *From individual to collective displacements in heterogeneous environments* Journal of Theoretical Biology **250** 424–434.