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Onset of collective movements: crucial moment that helps identifying the influential neighbours

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The capacity of animals to coordinate their motion in large groups and to respond to external and internal perturbation is puzzling. Many biologically inspired “theoretical” models have been proposed to explain how collective cohesion is achieved. The models infer few “simple” behavioural rules and local interactions at the individual level. Most of these models also deal with animals that are moving permanently where identifying the neighbours that influence what and when to do is very difficult to disentangle. Using experimental results, we assess the relevancy of two main proposal regarding interactions (metric and topological hypotheses). In the experiments we studied the dynamics of adhesion in grazing groups where one member moves away from the group under controlled condition. The sudden departure of one conspecifics is a critical moment for the social cohesion: the rest of the group members has to choose between staying motionless or abiding by the departed animals. We show than none of the two current hypotheses accounts for our results. We propose a model that best fits our data and explore what would occur in new conditions.