# How to integrate satellite-derived indicators into models of animal mobility?

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## Abstract

In a context of increasing anthropization at the interface between protected areas and rural communal areas in southern Africa, the multiplication of interactions between wildlife and livestock may generate conflicts such as competition for natural resources, predation, crop destruction by wildlife, or the risk of pathogen transmission. To better understand these potential contacts, we have developed a method combining remote sensing and spatial modelling to simulate the movements of domestic ruminants (cattle) and wild animals (buffaloes).

Water surfaces and vegetation, identified as the main drivers of movement for these ungulate species (Rumiano et al., 2020), were derived from a series of Sentinel-2 satellite images. The resulting maps were then integrated into a mechanistic model of collective movement of interacting individuals (Gregoire et al., 2003), applied to buffaloes (Rumiano et al., 2021) and cattle. The model, tested at three study sites in Zimbabwe, simulates herd movements, the location of contact zones and their seasonal dynamics.

Model results were compared with GPS collar location data from 34 individuals (16 buffalo and 18 cattle). The results show a high degree of spatial and seasonal variability in buffalo-cattle contacts in the three study areas, and a correspondence at landscape scale between the spatial extensions of modeled and observed contact zones. These results illustrate the potential of spatial modelling combined with remote sensing to simulate animal movements on a landscape scale, while offering possibilities for managing these interfaces through, for example, a coupling with epidemiological modelling, or the testing of different scenarios of changes (e.g., practices, environment, climate).

## References

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# Keywords

remote sensing; spatial modelling; mechanistic model; animal movement; wildlife-livestock interface