



HAL
open science

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

Florent Rumiano, Victor Dufleit, Alexandre Caron, Eve Miguel, Pascal Degenne, Cédric Gaucherel, Hugo Valls-Fox, Michel de Garine-Wichatitsky, Annelise Tran

► To cite this version:

Florent Rumiano, Victor Dufleit, Alexandre Caron, Eve Miguel, Pascal Degenne, et al.. How to integrate satellite-derived indicators into models of animal mobility?. International Conference of Spatial Epidemiology, Geostatistics and GIS applied to animal health, public health and food safety (GeoVet 2023), Sep 2023, Silvi Marina, Italy. pp.38-39. <hal-05181413>

HAL Id: hal-05181413

<https://hal.science/hal-05181413v1>

Submitted on 23 Jul 2025

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.



Distributed under a Creative Commons CC BY 4.0 - Attribution - International License

GEO 2023 VET

September 19th - 21st 2023 Silvi Marina, Teramo, Italy

**Expanding boundaries:
Interdisciplinary geospatial research
for the One Health Era**

Abstract Book

Edited by

Annamaria Conte, Carla Ippoliti, Lara Savini

Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Teramo, Italy (IZS-Teramo)

R05.1 How to integrate satellite-derived indicators into models of animal mobility?

Florent Rumiano¹, Victor Dufleit², Alexandre Caron², Eve Miguel³, Pascal Degenne¹, Cédric Gaucherel⁴, Hugo Valls-Fox⁵, Michel de Garine-Wichatitsky², **Annelise Tran**⁶

1 - CIRAD, UMR TETIS, France

2 - CIRAD, UMR ASTRE, France

3 - IRD, UMR MIVEGEC, France

4 - INRAE, UMR AMAP, France

5 - CIRAD, SELMET unit, Montpellier, France

6 - CIRAD – Center for International Cooperation in Agricultural Research for Development, Montpellier, France

Keywords: remote sensing, spatial modelling, mechanistic model, animal movement, wildlife–livestock interface

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

Gregoire, G., Chate, H. & Yuhai, T. (2003). Moving and Staying Together without a Leader. *Physica D: Nonlinear Phenomena*, 181, pp. 157-70.

Rumiano, F., Gaucherel, C., Degenne, P., Miguel, E., Chamaille-Jammes, S., Valls, H., Cornélis, D., De Garine-Wichatitsky, M., Fritz, H., Caron, A. & Tran, A. (2021). Combined use of remote sensing and spatial modelling: When surface water impacts buffalo (*Syncerus caffer caffer*) movements in savanna environments. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, pp. 631-638.

Rumiano, F., Wielgus, E., Miguel, E., Chamaille-Jammes, S., Valls, H., Cornélis, D., De Garine-Wichatitsky, M., Fritz, H., Caron, A. & Tran A. (2020). Remote sensing of environmental drivers influencing the movement ecology of sympatric wild and domestic ungulates in semi-arid savannas, a review. *Remote Sensing*, pp.12-37