

(PAsture-Ruminant Interaction Simulator)

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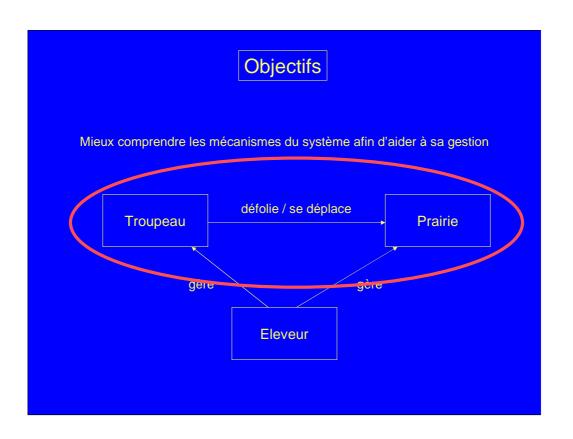
Contexte

Elevage d'herbivores / Prairie

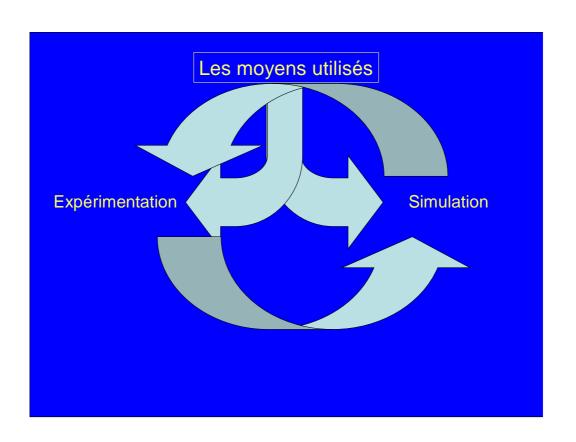
Pâturage extensif = faible chargement

Les enjeux

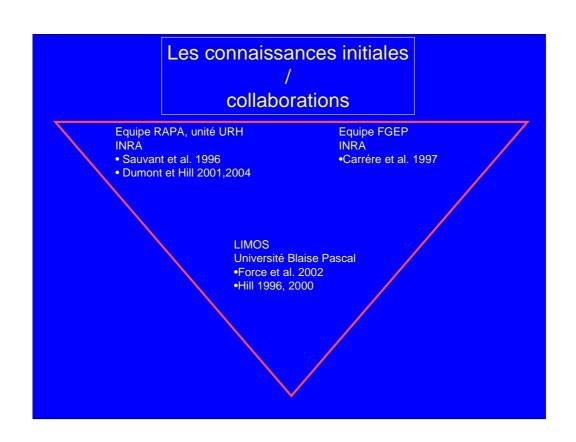
Nourrir les animaux et gérer l'écosystème prairial par le pâturage et la récolte de fourrages

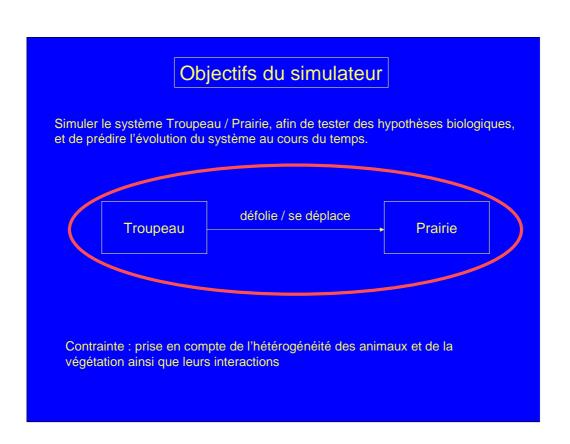


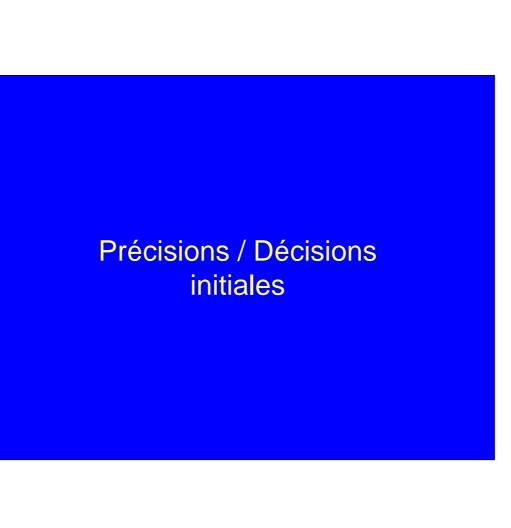


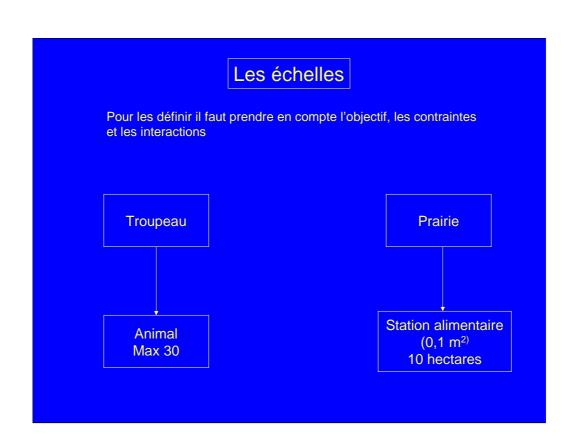


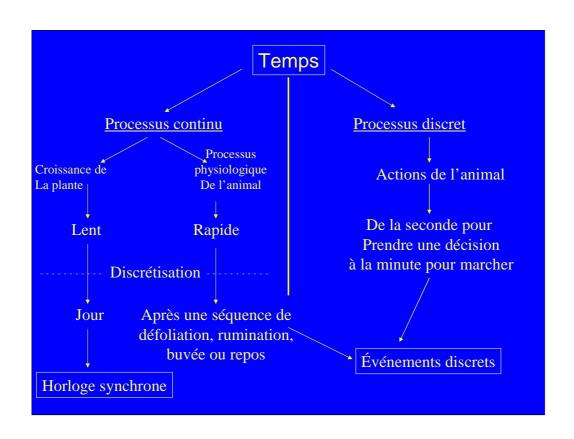
Les connaissances initiales / collaborations Equipe RAPA, unité URH INRA • Expérimentation Animaux / Parcelles • 1 modèle à compartiments 2 simulateurs multi-agents LIMOS Université Blaise Pascal • Simulateurs multi-agents • Travaux mathématiques • Modélisation UML









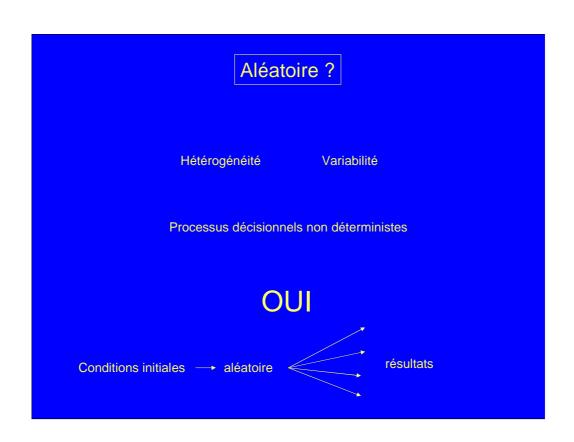


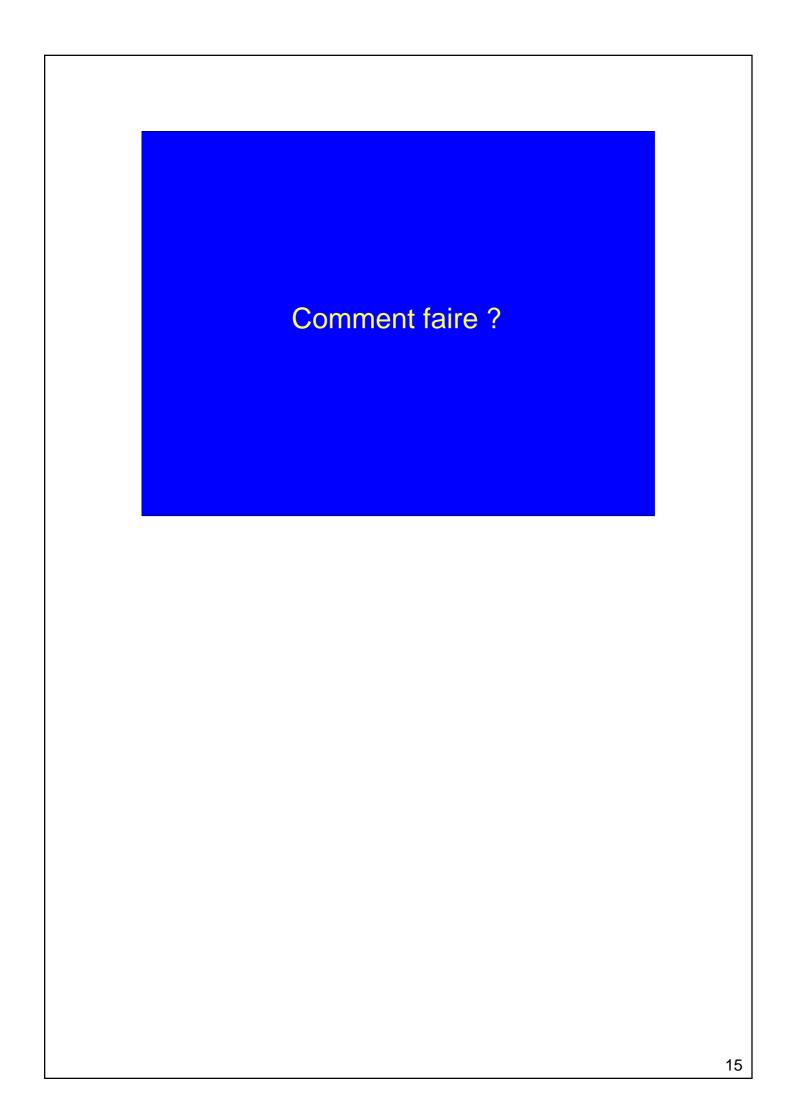
Spatial ou non?

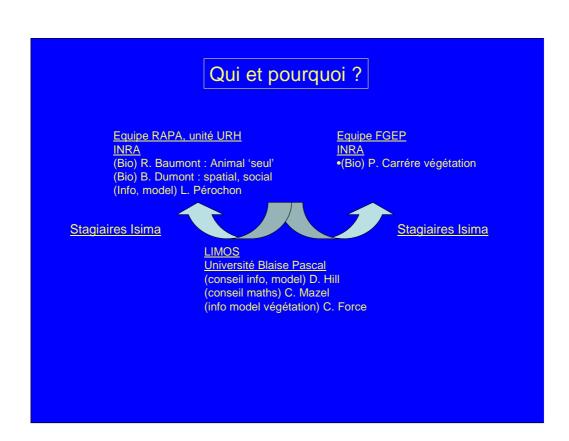
Prise en compte de l'hétérogénéité de la végétation, et des emplacements remarquables : point d'eau, aire de repos

Compétition entre individus et interaction spatiales des individus

OUI







Approches utilisées pour l'analyse

Multi-agents (Ferber 2000, Janssen 2002) : animal

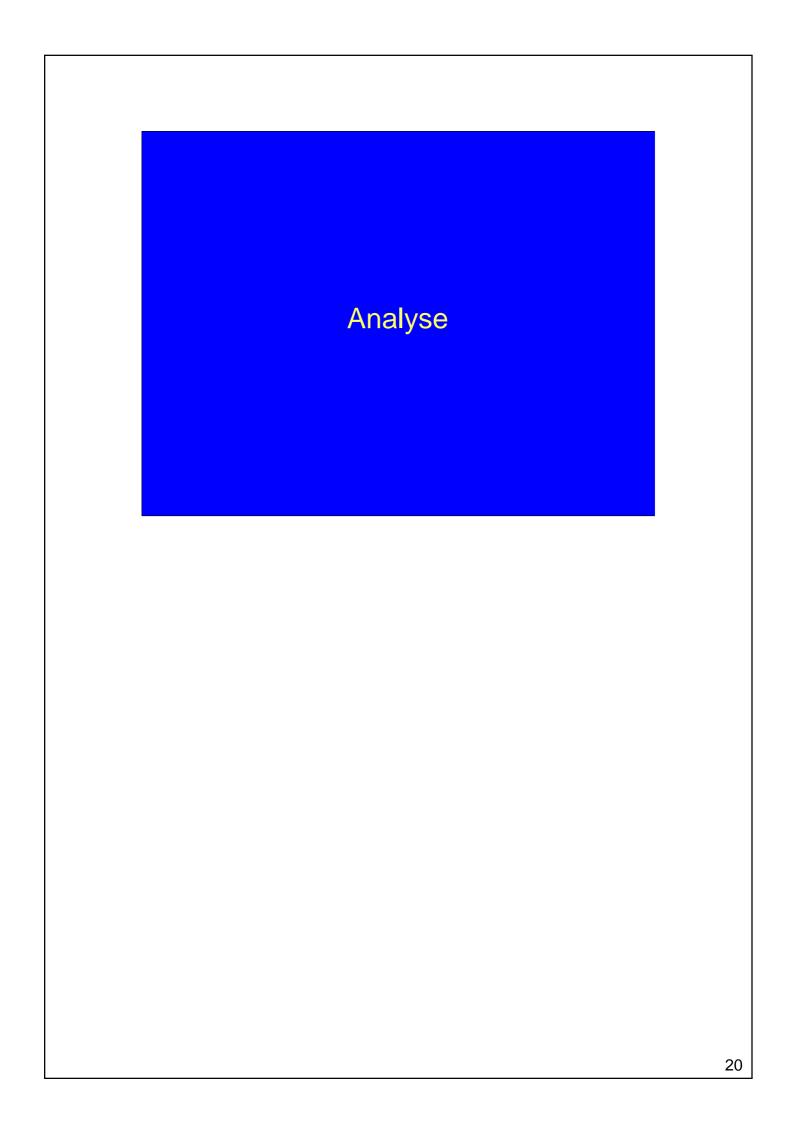
Modèles à compartiments : Physiologie animal Station alimentaire

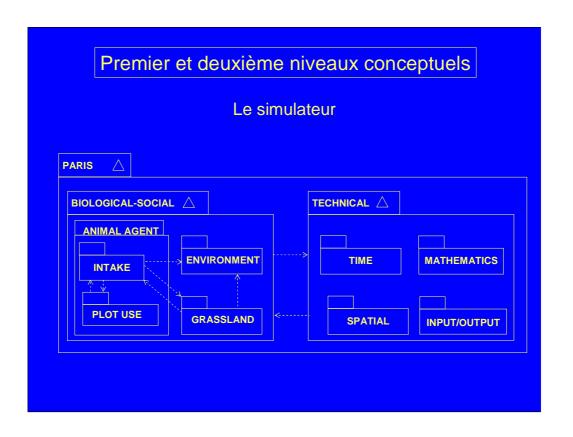
Multi-modèles (Fishwick, 1995) #niveaux d'abstractions #modèles en interactions

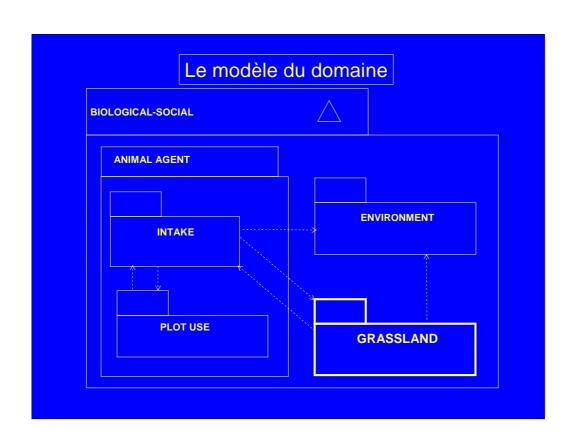


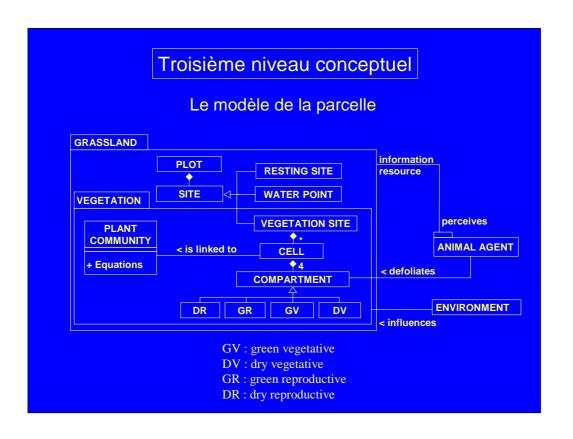
Programmation

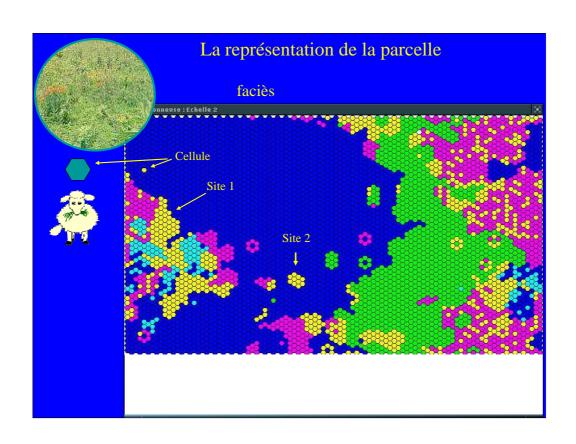
Le simulateur : C++ (gcc) Interface homme-machine : Java (sun) Système d'exploitation Linux (Mandrake)

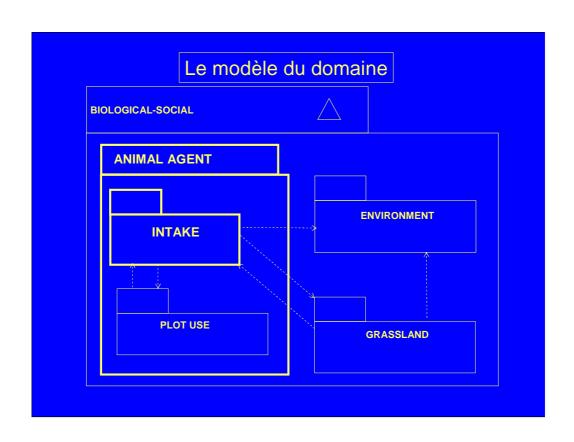


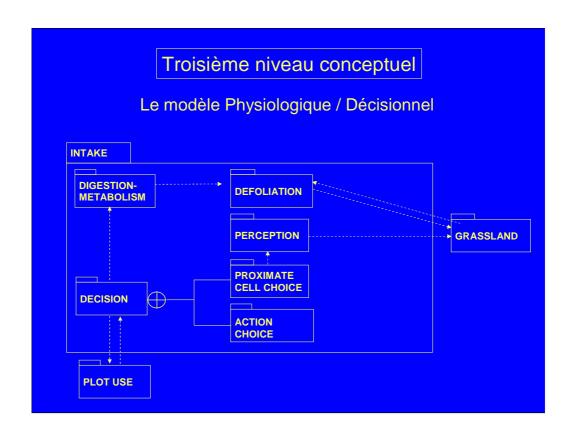


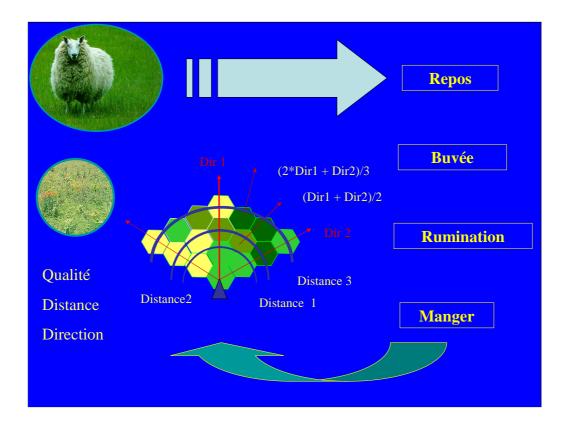












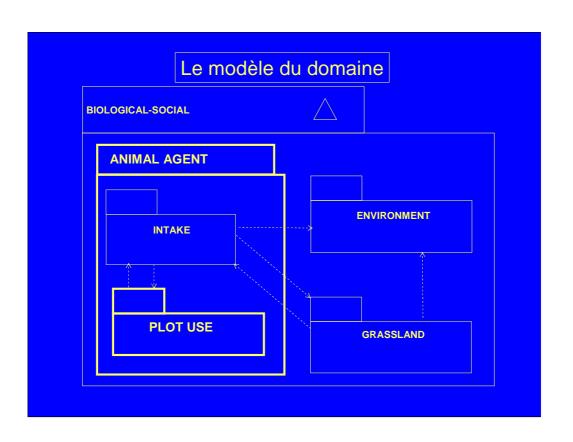
First the animal makes a choice between to graze, to drink, to ruminate or to rest.

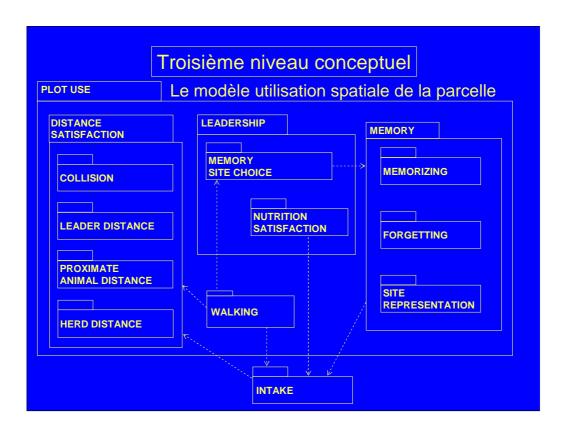
Second, when the animal eats, the sub-model simulates **proximate** choices between vegetation cells.

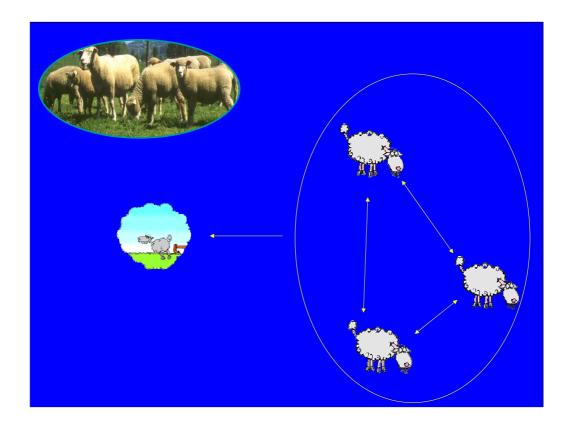
Modelling the role of **vegetation quality** on proximate choices is based on **vegetation characteristics** or on **potential intake rate**.

Each cell will be characterized by an "interest" index integrating distance, direction and quality.

The model will allow testing different choice behaviours from matching behaviour (the probability to choose a cell equals to its relative interest index) to optimal choices (always the best cell is chosen).







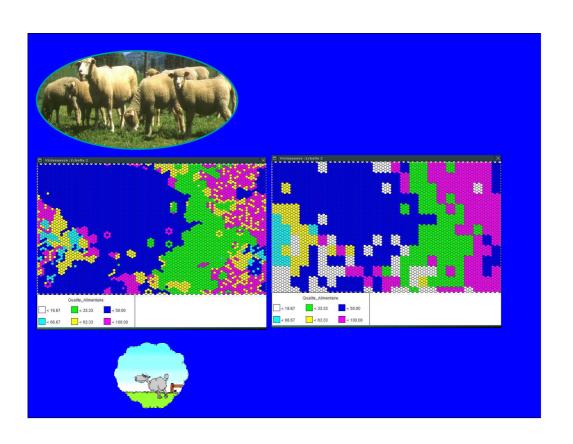
This sub-model simulates social interactions between animals in the herd,

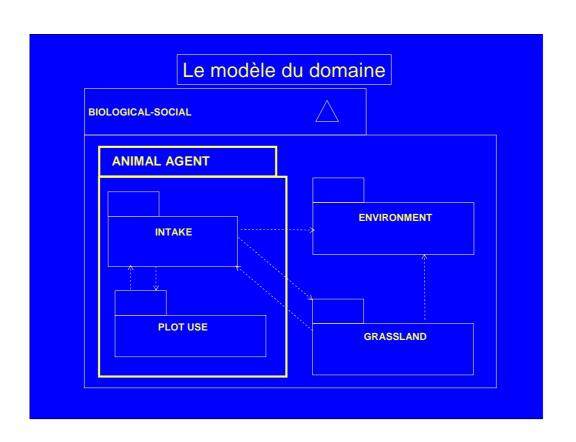
Animals want to be at the same time **not to be too far away from others, and not to close too**.

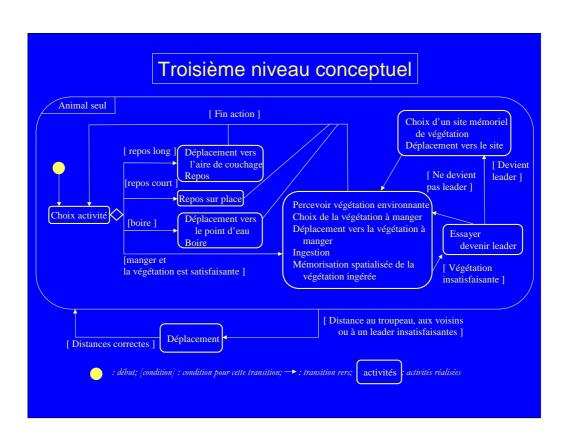
when its intake rate of digestible matter on that site falls below a given threshold an animal can move to a new location.

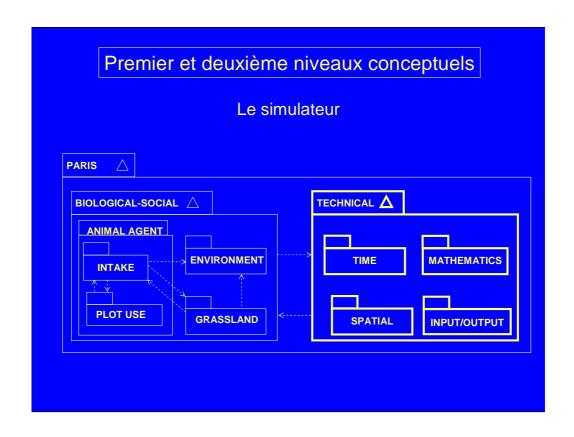
It's what we call a **leader**. Each animal can become at any time a leader, but some will **use this possibility more often** than others will. the whole herd will follow it.

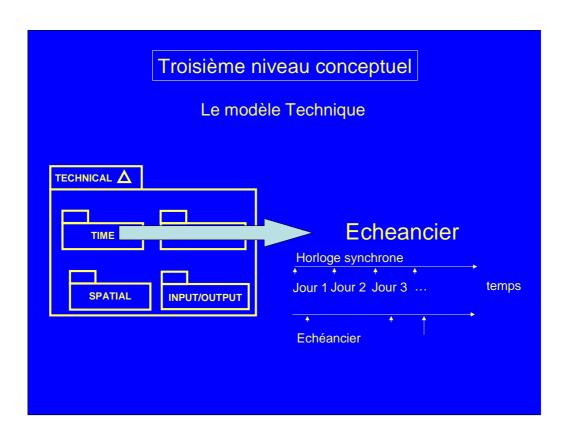
Amongst the animals, only a leader can take the whole group to a new grazing location,). Now, an animal not satisfied by the quality of the surrounding cells, can decided to move on another area of the plot. An area it think it have better cells. When a leader move on another area,





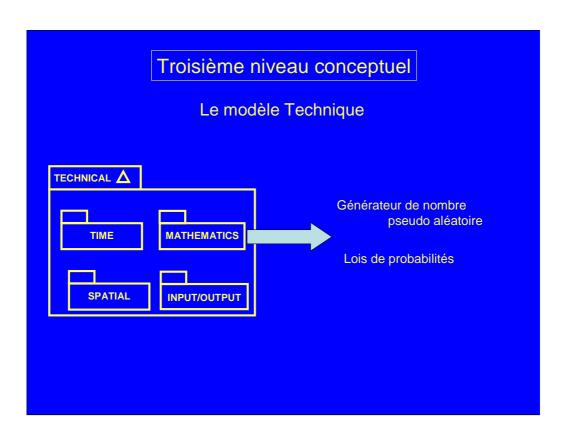


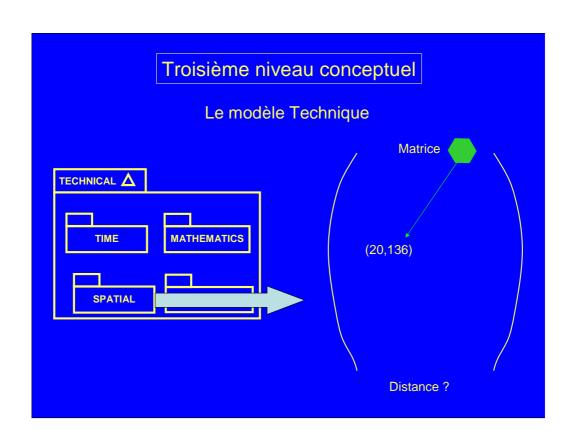


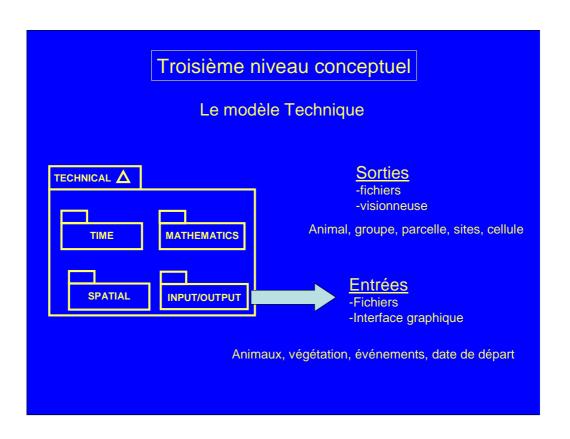


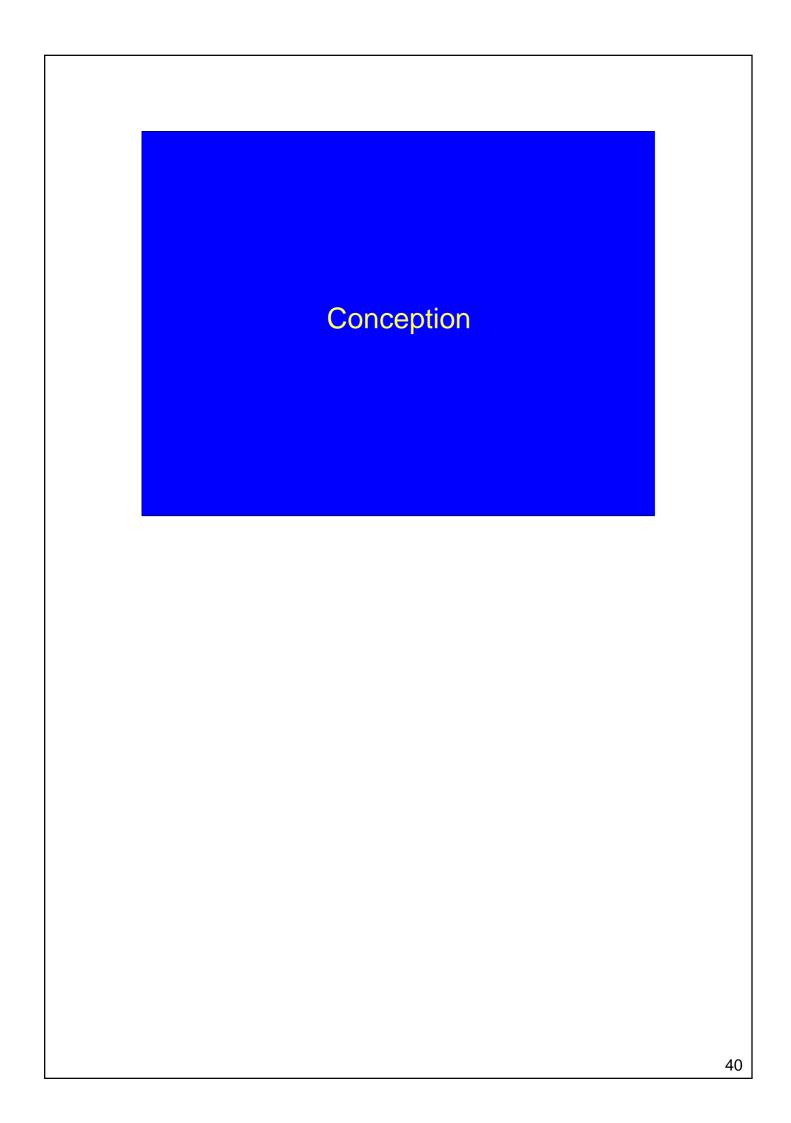
Choisir les événements

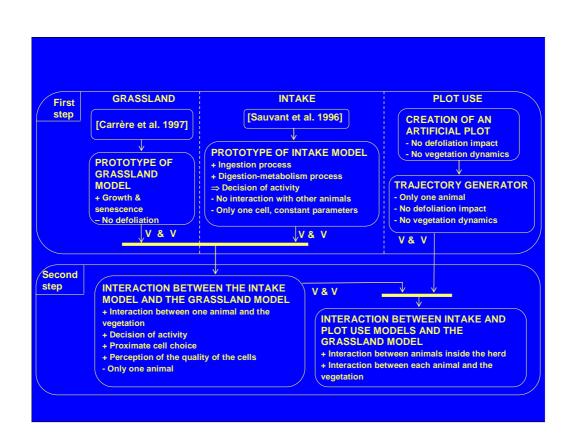
- Pour chaque instant important -> un événement
 - Changement d'activité
 - Choix d'une cellule
 - Rumination
 - Lien social, leadership et isolement
 - Suivre un leader
 - Se rapprocher du troupeau
 - Arriver à une destination

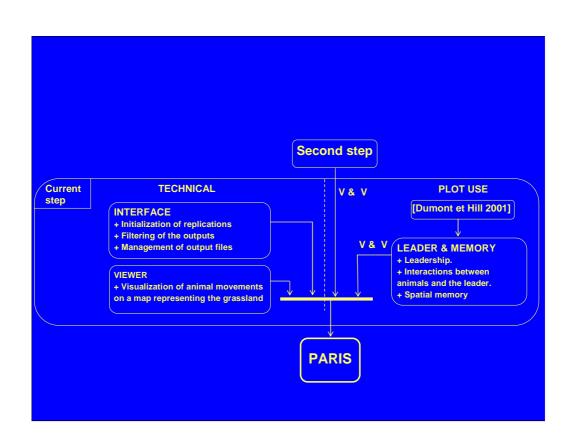


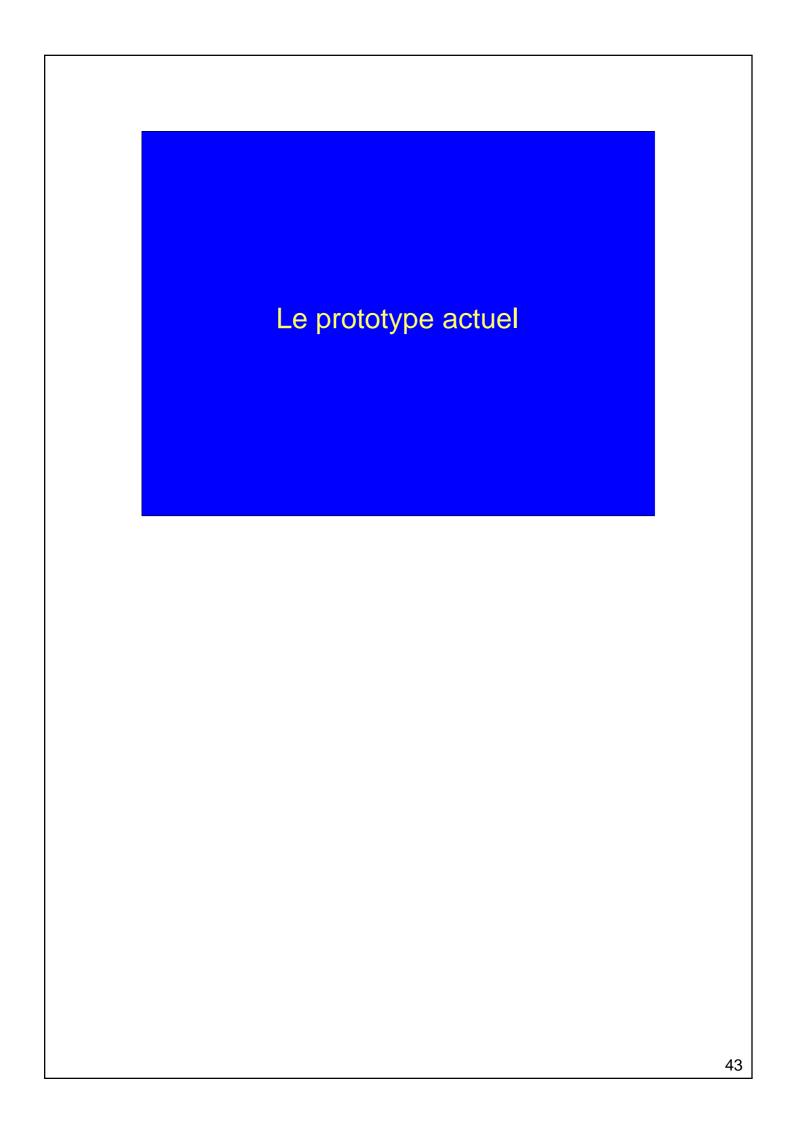


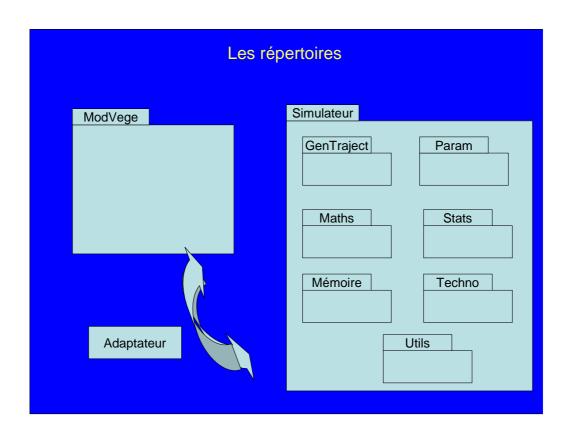


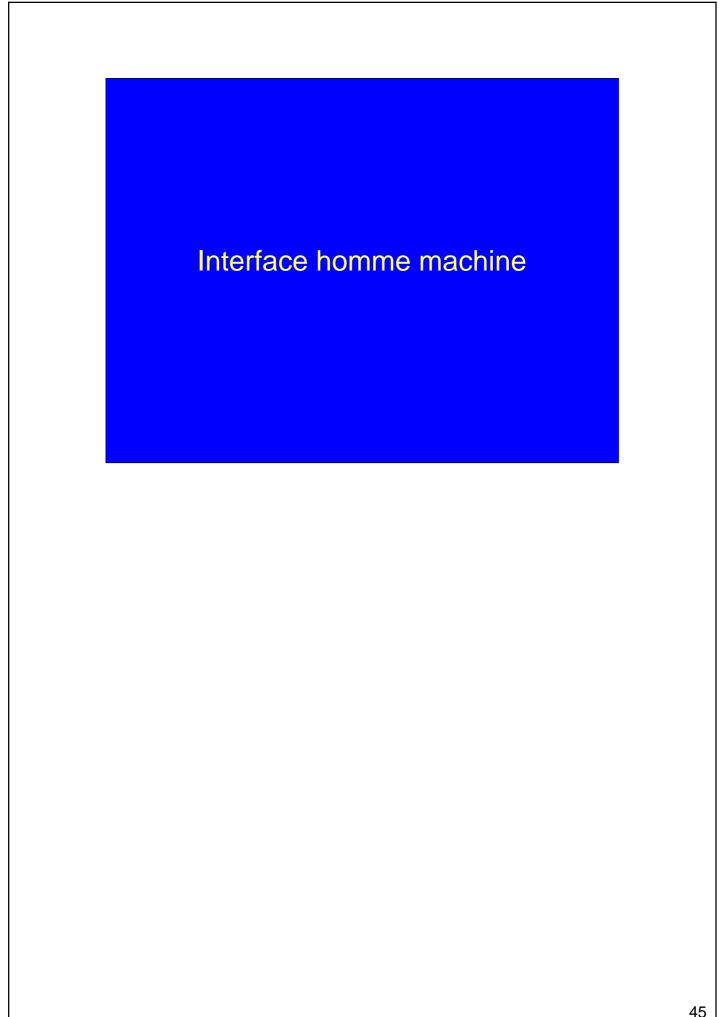


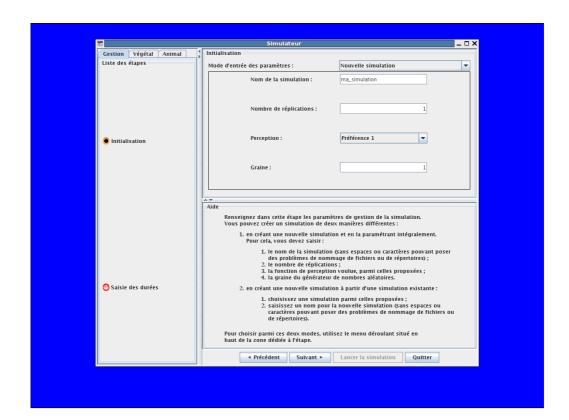


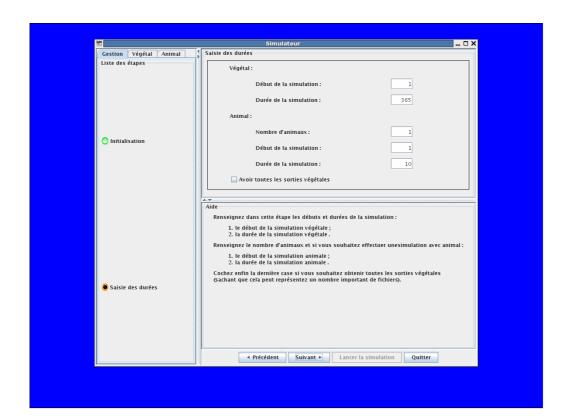


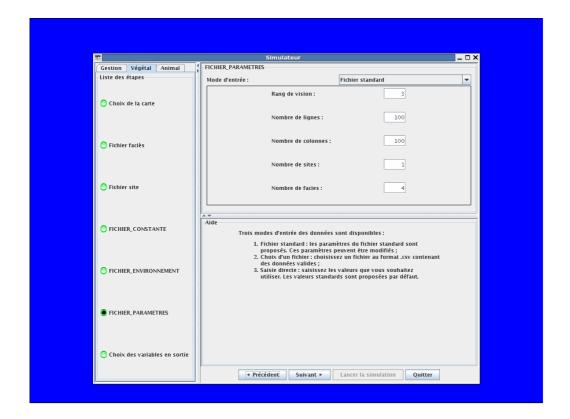


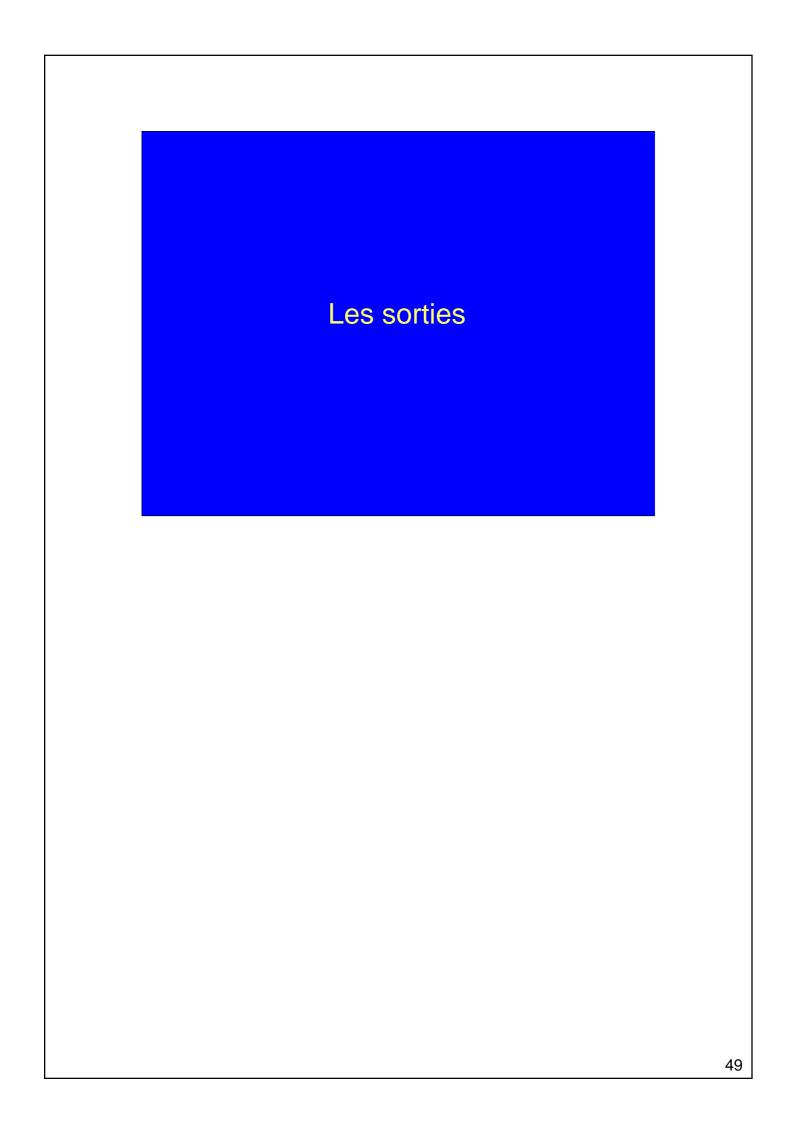


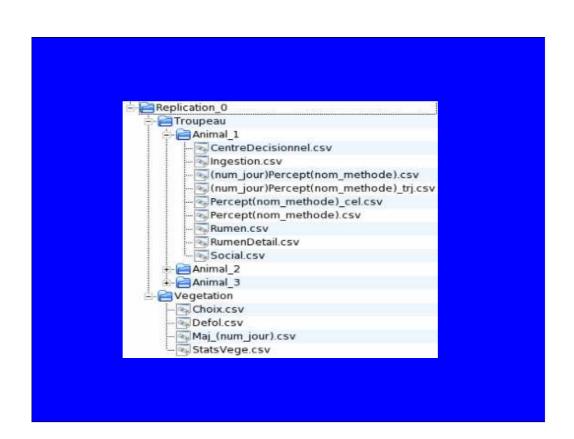


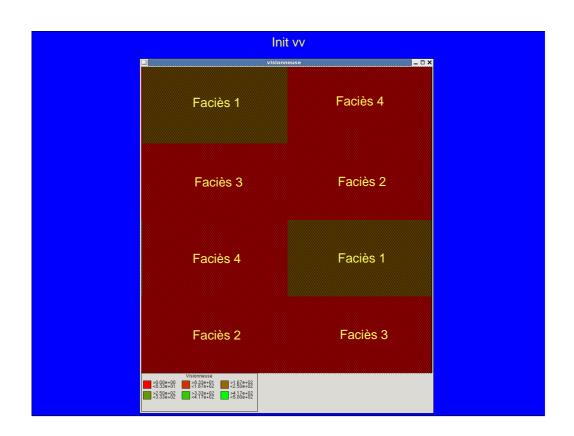


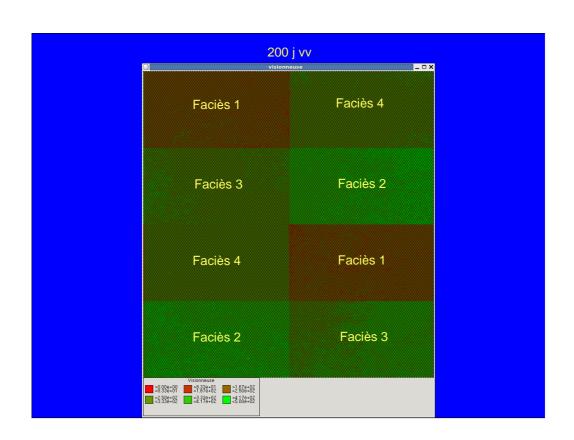


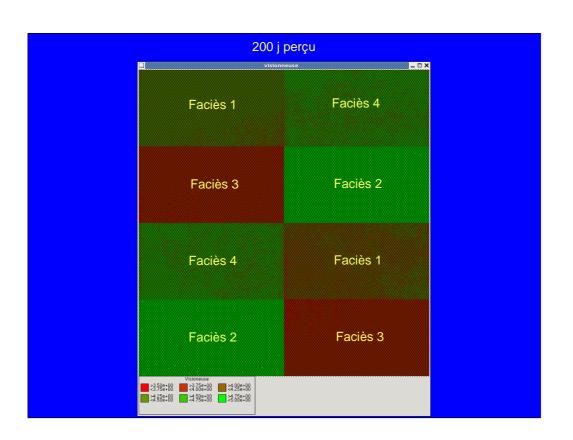


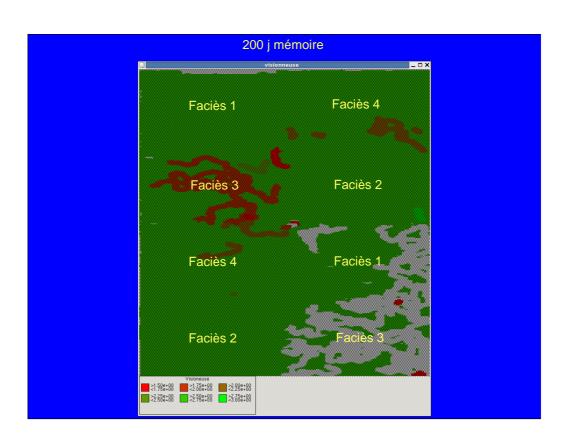


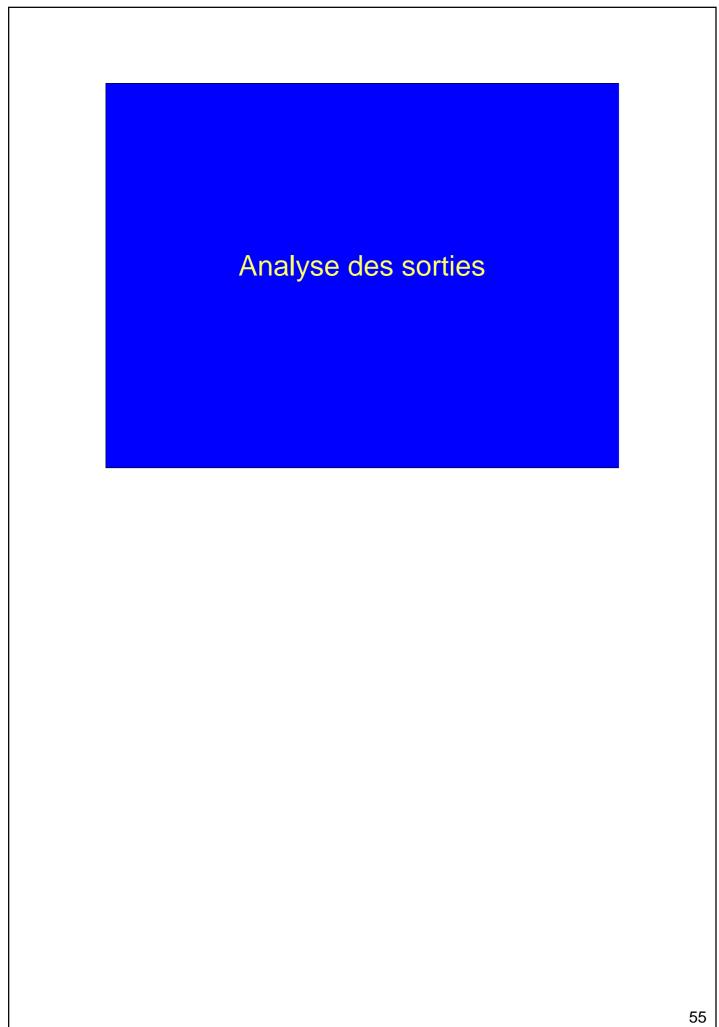




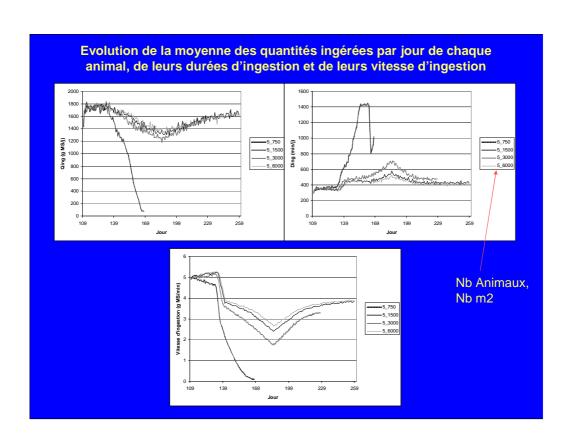








Visuelle / statistique Troupeau / animal / Leader Parcelle / Faciès / site (végétation et mémoire)



Le simulateur en bref

2000-2005

20.000 lignes de codes et de commentaires

Temps de simulation : 2h30 pour 10 animaux sur 1 hectare pendant un an

(1Go amd 3200+)

Fichiers en sorties : 9 Go pour la végétation, pour un animal sur 100 jour 180 Mo

3 équipes en collaboration

Interactions informaticiens / biologistes

Multi agents; multi modèles

Références

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