

ORCHIDEE Modelling

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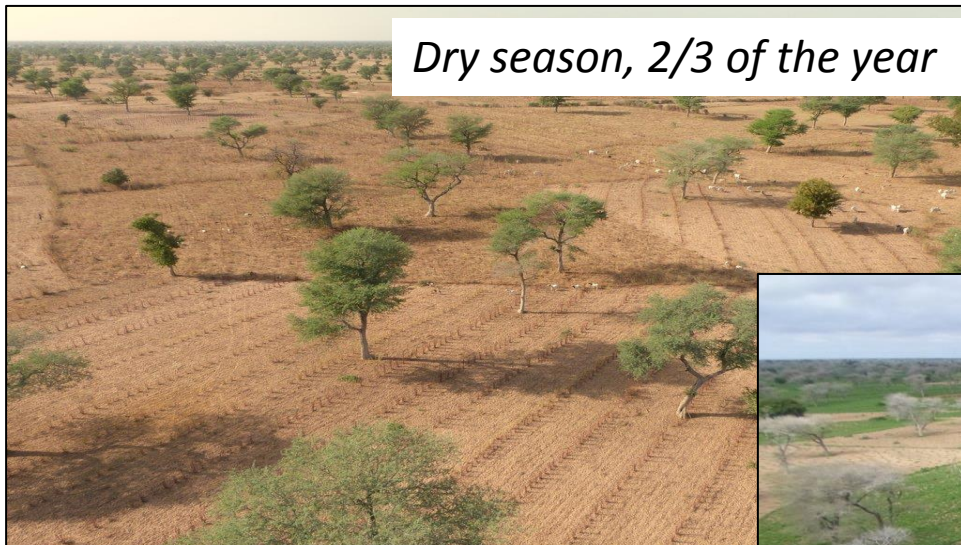
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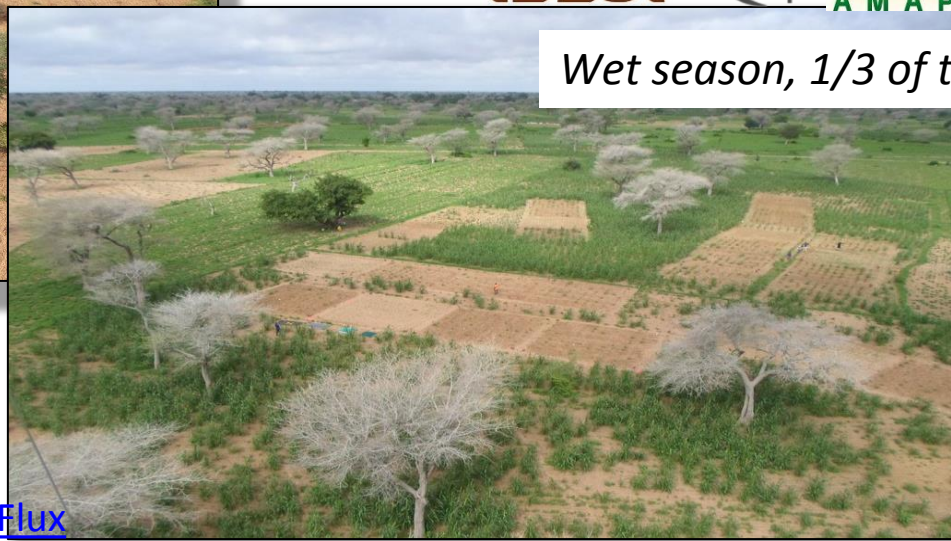
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“*Faidherbia-Flux*”: A long-term Collaborative Observatory on food security, GHG fluxes, ecosystem services, mitigation and adaptation in a semi-arid agro-silvo-pastoral ecosystem (groundnut basin in Niakhar/Sob, Senegal)

Dry season, 2/3 of the year



Wet season, 1/3 of the year



“*Faidherbia-Flux*” Web site :
<https://lped.info/wikiObsSN/?Faidherbia-Flux>

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Vegetation-climate interactions and ecosystem services in the Sahel: a modeling approach

ORCHIDEE Land Surface Model

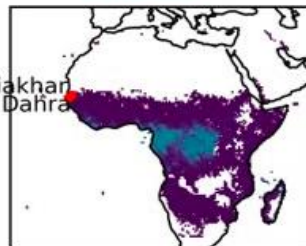
- simulate water, carbon and energy fluxes

Application in

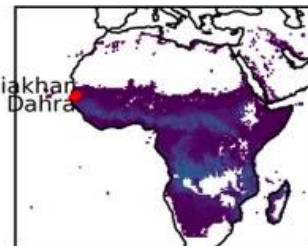
- Ecosystem resilience
- Management practices
- Climate feedback

4 plant functional types to describe African ecosystems from

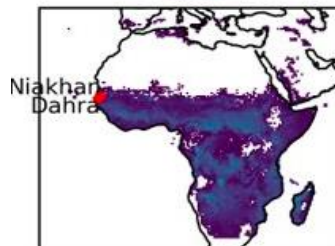
Tropical broad-leaved evergreen



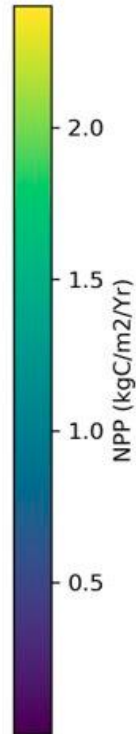
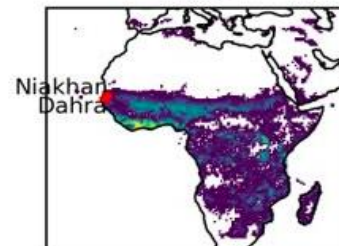
Tropical broad-leaved raingreen



C4 grass



C4 crop



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NPP simulated by ORCHIDEE for the African ecosystems in 2018

Faidherbia albida agroforestry ecosystem in a global Land Surface Model

Espoir Gaglo, Aude Valade, Olivier Rouspard, Guerric Le Maire, Sebastiaan Iuyssaert



ORCHIDEE
LAND SURFACE MODEL

Understand and predict the land-atmosphere interactions of a complex agro-ecosystem under climate change

Scenarios

- Climate
- Management
- Land cover

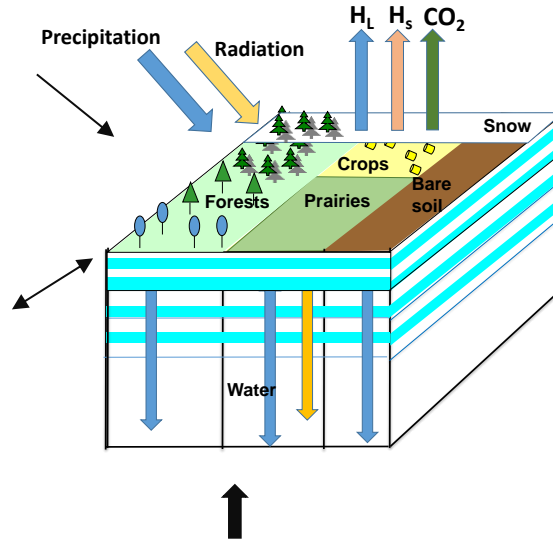
Faidherbia-flux

- Vegetation map
- Weather forcing
- Soil

Parameters

- Soil depth
- Free drainage
- Discretization
- Water table

-  Inputs
-  Output Variables
-  Deliverables



Output

- Soil moisture
- Leaf area index
- Heat fluxes
- C fluxes
- Water fluxes



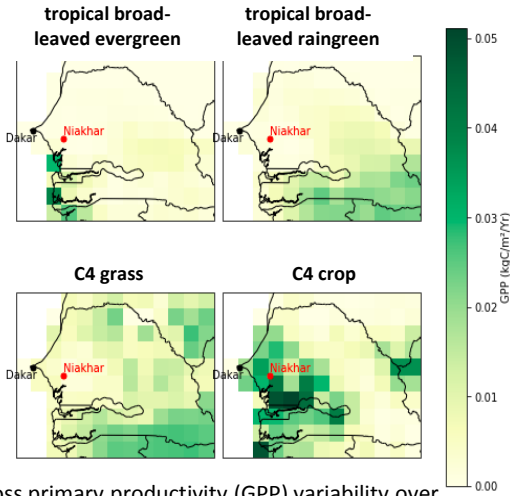
- Effect of climate on *F. albida* ecosystem
- Effect of management practices on C & water fluxes

Towards a new Plant Functional Type “phreatophyte ecosystem” for *Faidherbia*

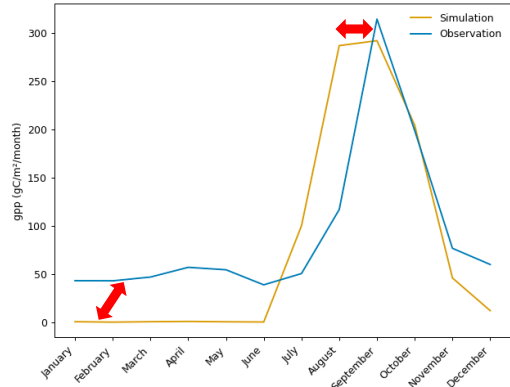
- Root growth
- Groundwater dynamics
- Phenology

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ESA High Resolution Land Cover Simulation:
ORCHIDEE 2.2, Global scale, resolution 0,5° with land use change



Gross primary productivity (GPP) variability over Senegal in 2018



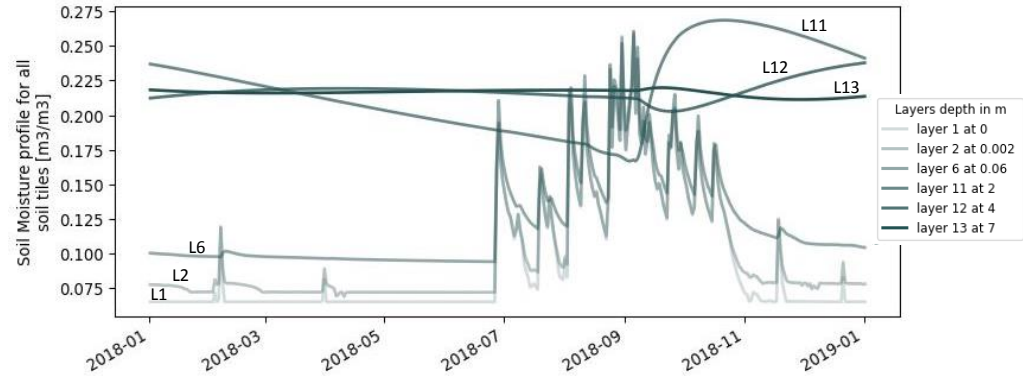
Comparison of simulated GPP and observed GPP at Faidherbia-flux in 2018

Gap (January – June) and delay (mid-July – September) between GPP simulated and observed

Towards a new Plant Functional Type “phreatophyte ecosystem” for Faidherbia

- Root growth
- Groundwater dynamics
- Phenology

On-site Simulation:
ORCHIDEE trunk 4, Soil depth 7m



Dynamics of soil moisture simulated for 6 layers

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Articles

Communications

- Gaglo KE, Tall L, Badiane Ndour Y, Roupsard O, Mbengue M, Ciss Ndiaga P, Clermont-Dauphin C, Cournac L, Ngom D. 2019. Les associations de culture mil et niébé dans le bassin arachidier: une voie d'intensification agroécologique. Conférence Intensification Durable (CID) 2019: Leviers d'intensification pour une transition agroécologique des systèmes de production en Afrique Subsaharienne. 08-09 Octobre 2019. Hotel Ngor Diarama, Dakar, Sénégal. Oral Presentation. <https://sites.google.com/site/cidintensificationdurable/home/cid-2019: Senegal>.

Shared databases

[Faidherbia-Flux Collaboratif Database](https://baobab.sedoo.fr/)

<https://baobab.sedoo.fr/>