Dynamics, variability and bioclimatic effects of low clouds in Western Central Africa

ANR–PRCI 2020-2022 (580k€)

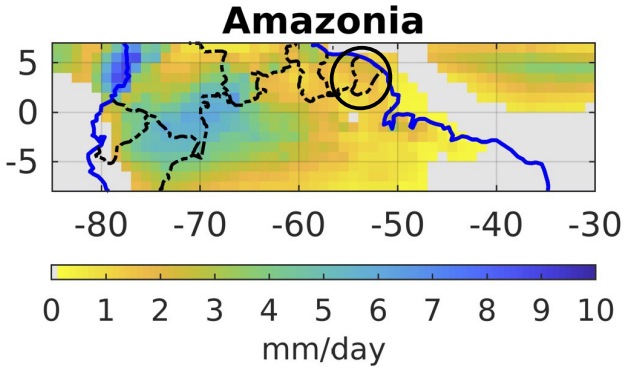
Nathalie PHILIPPON – CR CNRS – IGE Grenoble

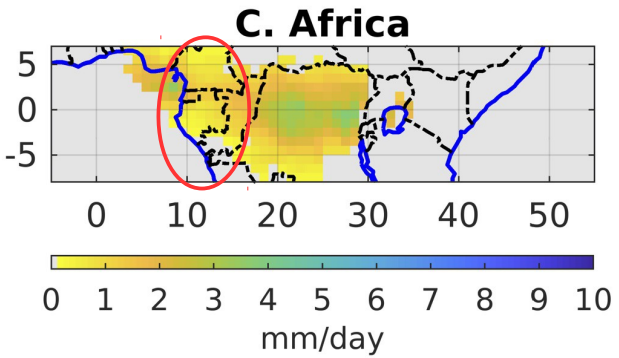
Andreas FINK – PR KIT – IMK Karlsruhe

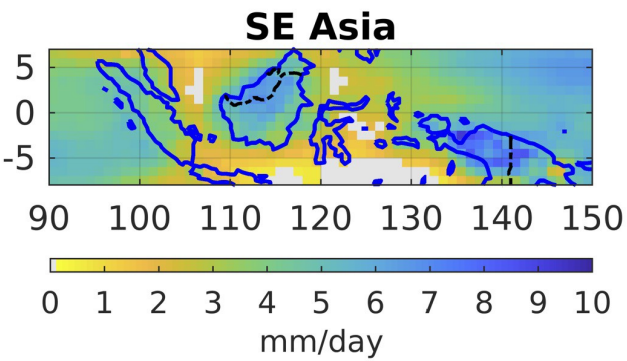
PROJET FINANCÉ PAR L'ANR - PROJECT FUNDED BY THE ANR

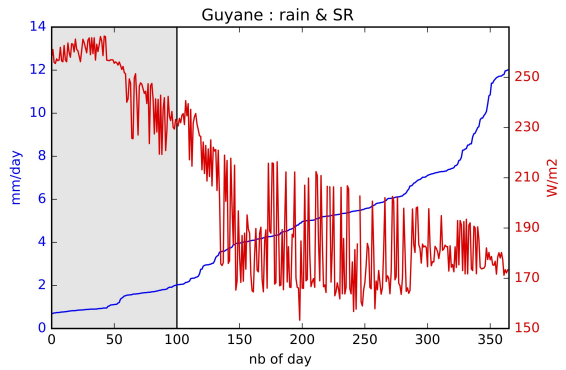
Dynamics, variability and bioclimatic effects of low clouds in Western Central Africa

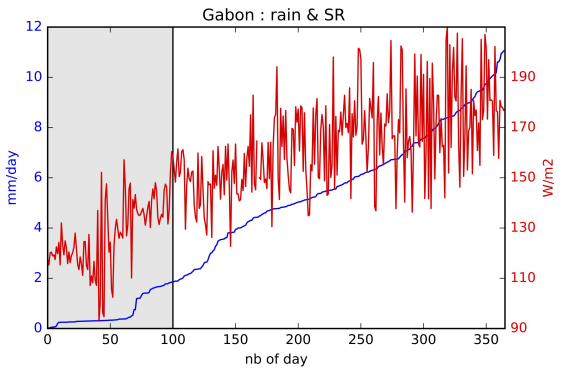
Western Central Africa
→ hosts most of the dense evergreen forests of Central Africa
→ has the longest (4 months) and driest (<1mm/j) main dry season which is also strongly light-deficient

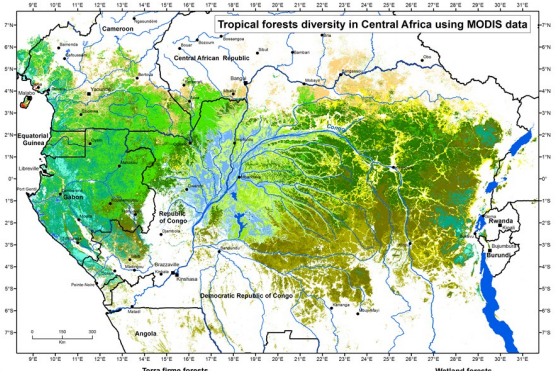








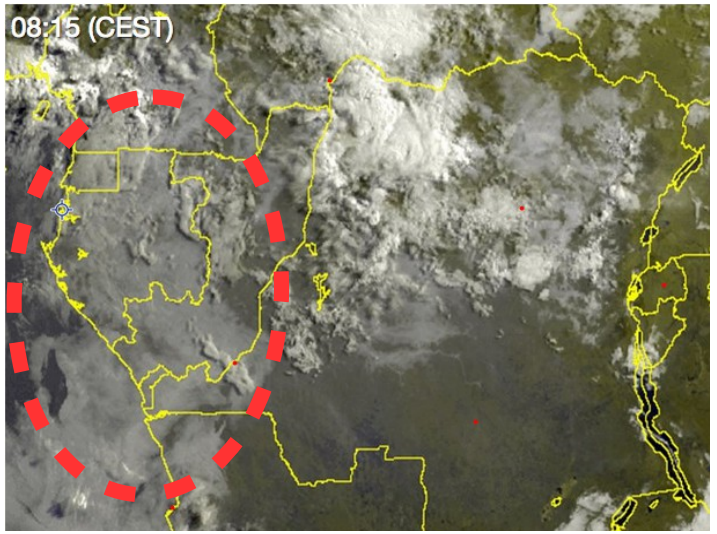




Dynamics, variability and bioclimatic effects of low clouds in Western Central Africa

→ uniqueness of the main dry season with a persistent low cloud cover which keeps conditions cool, humid and light-deficient

canal Visible MSG



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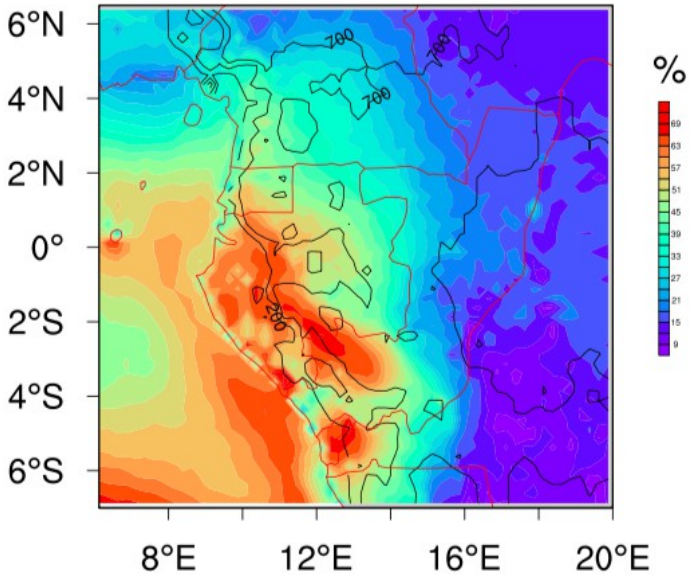


Dommo et al (2018)

Objectives

IDENTIFY ATMOSPHERIC PROCESSES AT DIURNAL SCALE THAT CONTROL THE DEVELOPMENT AND PERSISTENCE OF LOW CLOUDS DURING THE DRY SEASON

CHARACTERISE THEIR INTRA-SEASONAL AND INTERANNUAL VARIABILITY AND THE OCEANIC-ATMOSPHERIC FORCINGS AT PLAY

EVALUATE THEIR EFFECTS ON WATER AND LIGHT AVAILABILITY FOR FORESTS

Partnership

IMK – KIT Germany

Tropical Meteorologists

IGE – CNRS France

Tropical Climatologists

CRC – UB France

Climate modellers & Bioclimatologists

UOB — *Climate funct.*

ASECNA

Met. Office

Historical data climate. funct.

ANPN

CENAREST

Historical data forests funct.

Precious Wood

Field activities

LMI DYCOFAC

LABORATOIRE MIXTE INTERNATIONAL
Dynamique des écosystèmes continentaux d'Afrique centrale

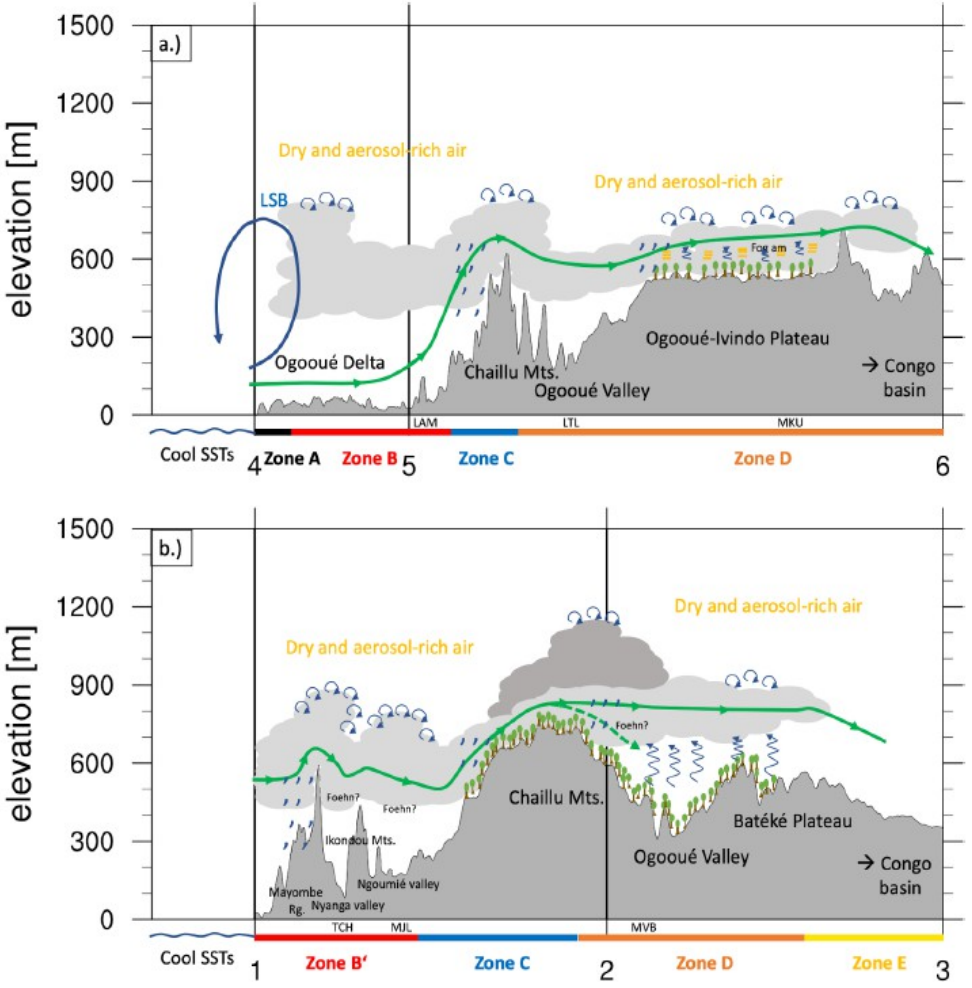
+ external experts on remote sensing of clouds, solar radiation measurement and estimation, and tropical forests functionning

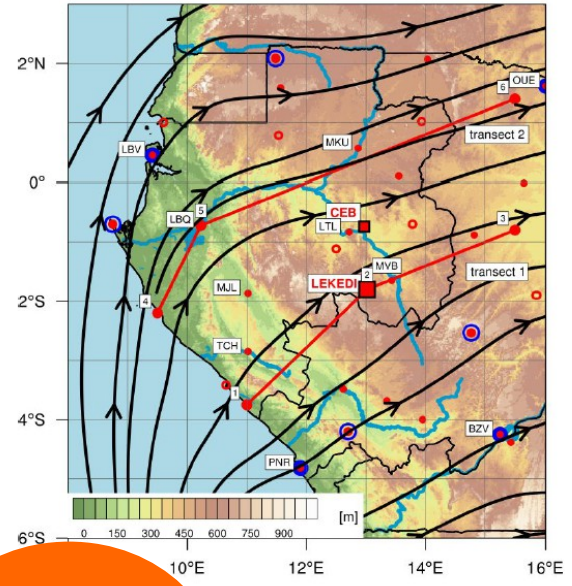
Identify atmospheric processes at play

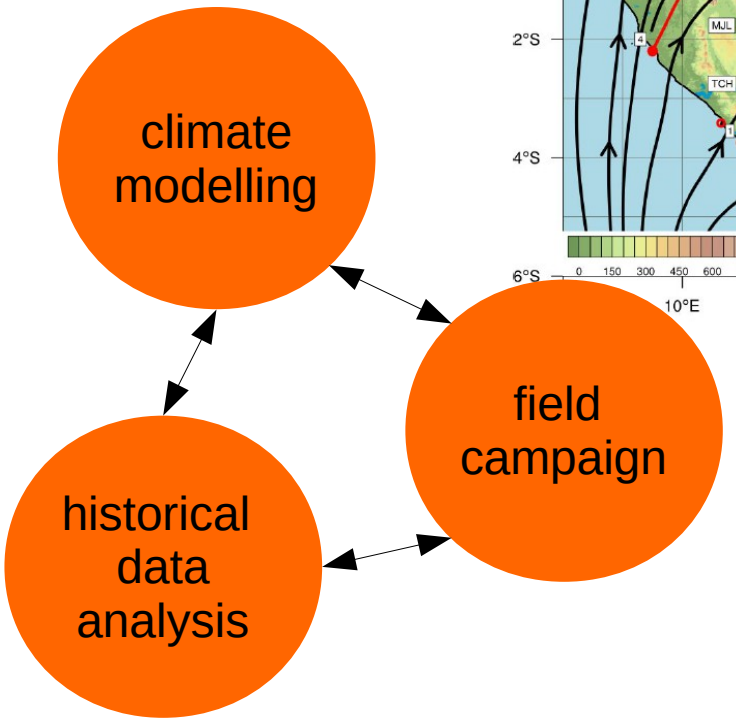
IMK – KIT Germany | **CRC – UB France**

H1 : processes at play are different from coast to inland

H2 : processes are different from Southern West Africa







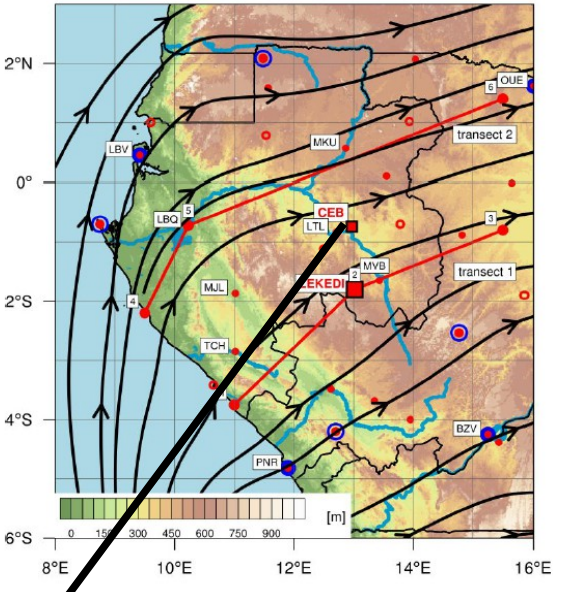
Identify atmospheric processes at play

IMK – KIT Germany | **CRC – UB France**

climate modelling

→ ICON and Meso-NH 2km simulations for July-August

→ ICON sensitivity experiments to warmer SSTs in the equatorial Atlantic



PRECIOUS WOODS

field campaign

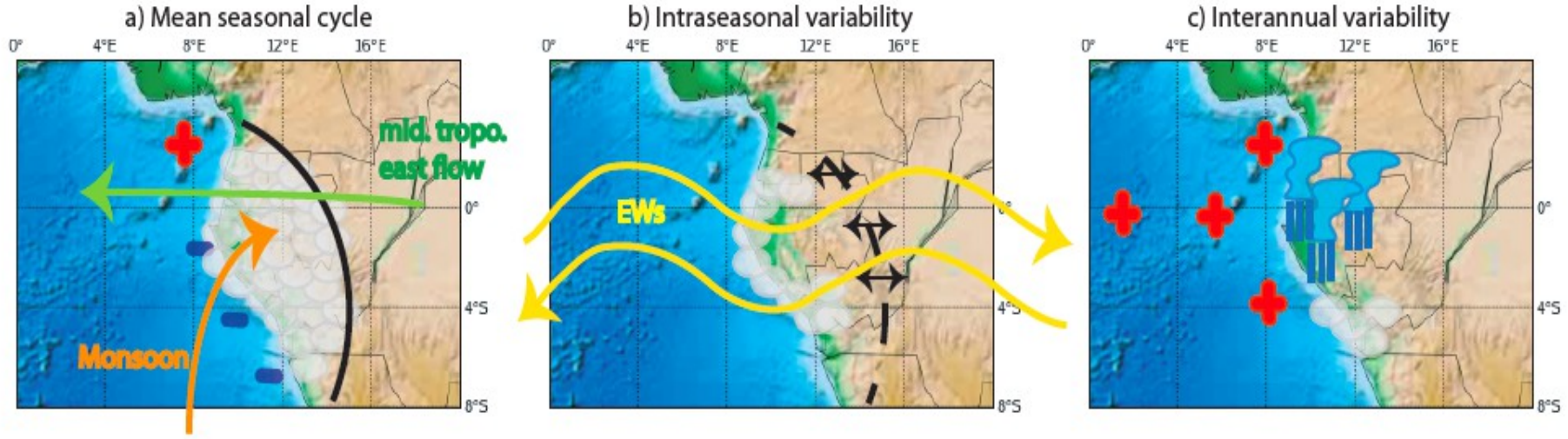
July-August 2021

Characterize their intra-seasonal and interannual variability

IMK – KIT Germany | **IGE – CNRS France** | **CRC – UB France**

H1 : SSTs at the coast (equator) play on the LCC seasonality (interan. variability)

H2 : low clouds are not properly simulated in CMIP6



historical data analysis

→ time-scale of variability, role of synoptic-scale changes in atmospheric dynamics

climate modelling

→ Meso-NH sensitivity experiments to warmer SSTs at the coast and in the equatorial Atlantic

→ CMIP6 historical simulations

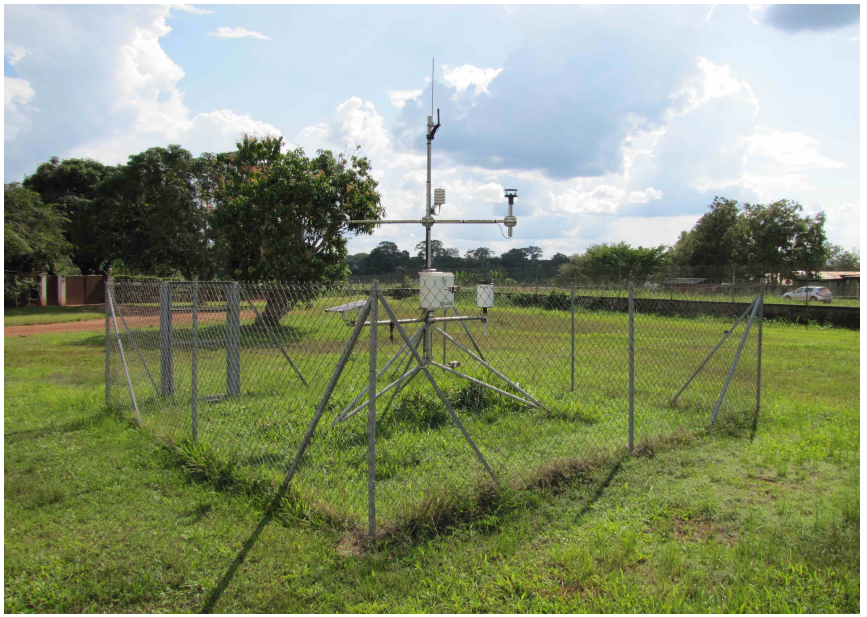
Evaluate the low clouds cover bioclimatic effects

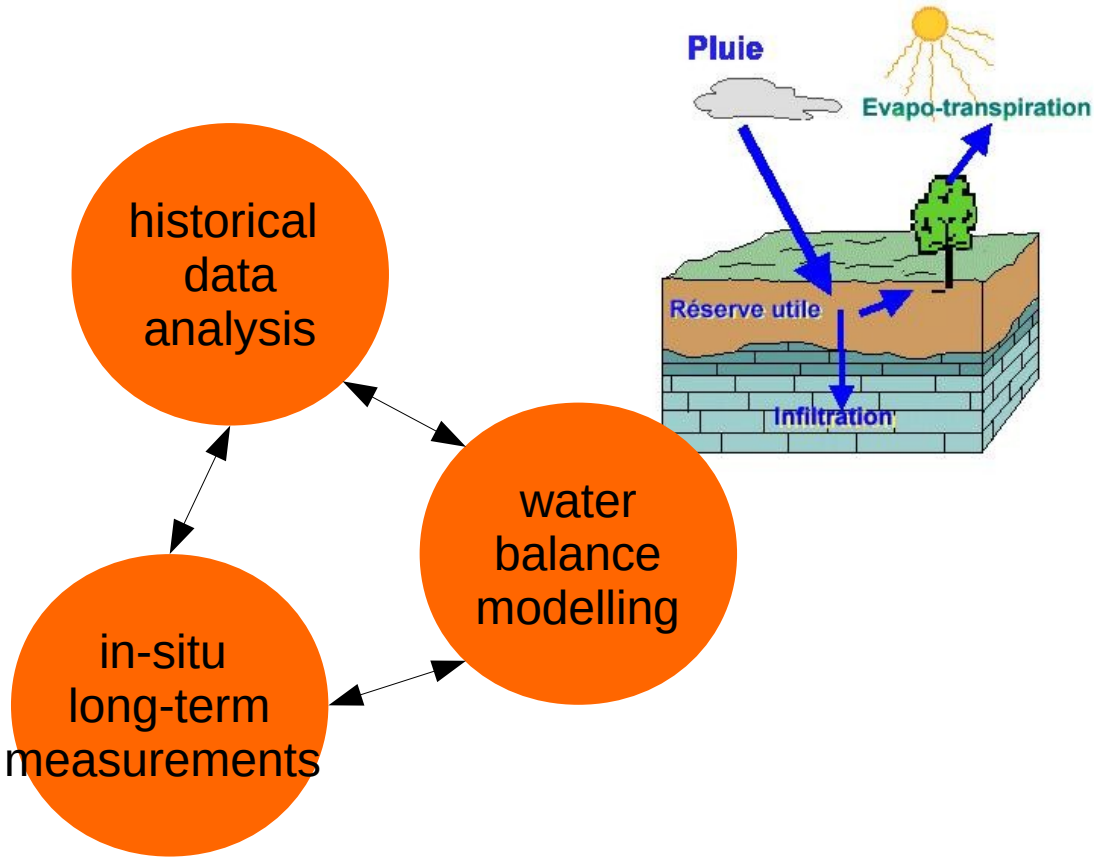
dyvalocca

IGE – CNRS France | CRC – UB France

H : high light quality for photosynthesis

H : low PET under low clouds cover compensates for the marked seasonal dryness





March 2020 - onwards

Expected results and impacts

How specific are processes triggering LCC formation and dissipation in WCA ?
→ *Development of a conceptual model*

How good are estimates of LCC and solar radiation for Gabon in JJAS ?
How good are climate models at simulating the LCC ?

How variable and predictable is the LCC ?

How specific are light and water constraints during the dry cloudy season and how are they modulated when low clouds dissapear ?

→ Finally do we anticipate a major threat for evergreen forests for the next decades in Western Central Africa due to CC ?

Valorisation

WP1, 2 & 6

Papers and conferences
→ final synthetic paper for BAMS
Open-access data at the end of the project

Website with results, news, videos on in-situ measurements and field campaign

Popularizing science
documentary, school intervention

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DYVALOCCA

Dynamics, Variability and Bioclimatic Effects of Low Clouds in Western Central Africa

https://dyvalocca.osug.fr

THE PROJECT | ACTIVITIES | RESSOURCES | NEWS

RATIONALE

Low-level clouds are key components in many regions but are usually not well represented in weather and climate models. Recently it has been shown that **an extensive low-level cloud cover develops during the June-September main dry season in western Central Africa** (Dommo et al 2018), from the coastal plains of Gabon and Congo-Brazzaville to the inland plateaus downstream of the Chaillu mountains. **Such a cloudy main dry season** – which is the longest (4 months) and driest (<1mm/day) in Central Africa – **is unique in the moist tropics and likely explains the presence of the densest evergreen forests in this region.**

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NEWS

Presentation of DYVALOCCA at ANR2020 Laureates' Day

The first official presentation of DYVALOCCA will held at Paris Wednesday the 6th of February (...)

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PUBLICATIONS

PEOPLE

FIELD ACTIVITIES


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Karlsruhe Institute of Technology
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