Objective Climate Forecasts for Agriculture and Food Security Sector in Eastern and Southern Africa

Co-design and delivering of climate information at S2S time scale

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Laboratory for Environmental Modelling and Atmospheric Physics (LEMAP)

Climate information and services

Information useful for users *(agriculture, disater risk management, water …*

Climate information and services

CR4D initiative

CR4D's overriding mission is to create an enabling environment for effective decision maker-scientist collaborations to

- **co-explore**
- **co-design**
- **co-produce**
- **co-communicate**

climate information and services.

Climate information and services

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we know why : user relevant, sectors specific, drive the development

Climate information and services

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but how?

Climate information and services

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Methodology?

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Methodology?

Tools?

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Tools?

Methodology? Approach?

Climate information and services

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but how?

questionnaires

user feedback on existing products

Initiative on S2S prediction Over Central Africa

- **Pilot project** on S2S prediction
- **Aim**: assess the skill of available S2S predictions to capture seasonal characteristic useful for agriculture over Central Africa *(e.g. onset of growing season, occurrence of dry spells during the growing season)*
- **Period**: 2016-2017
- Within the framework of **CR4D**
- **Two Countries** :Cameroon and Dem. Rep. of Congo (DRC)

Projet activities

Define meaningful climate index related to information need by farmers

Event/shock identified by farmers	Climate information related to event/shock	Climate information needed by farmers
prolonged episode of drought during the rainy season	Length of dry spells during the rainy season	• onset of growing season • dry spells distribution during the growing season • dry spells duration

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- **co-communicate**

Weakness

- **no involvement of farmers**
- **products not build on farmer activities**
- **Missing of details**

Assessing user needs

questionnaires

Appendix A Interview questions

General questions for all interviewees:

1. In which country (and city) are you located?
2. What type of organisation do you work at?
3. Is the provision of climate services the main focus?
4. How many staff are devoted to climate services?
5. What job profiles usually use climate information at your organisation? (the risk department, R&I
6. When compared to the other issues your organisation is facing, where do climate challenges lie?
7. How have the industry's views towards climate issues changed over the years?

Further questions for users of climate services:

8. What types of climate services or information do you use, and for what purposes? (ex: decadal information for insurance purposes)

For each example given as a response to Q8, ask the following set of questions:

9. What are the benefits of using climate information for this purpose?
10. How often do you refer to the climate information for this reason?
11. What made you decide to start using climate information for these matters?
12. What are the main constraints/barriers you face in applying climate information? Are there any shortcomings of the data? (data quality not good enough, lack of support from the information provider, information is not tailored to your needs, etc.)

Further qu

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(Tart et al. 2020)

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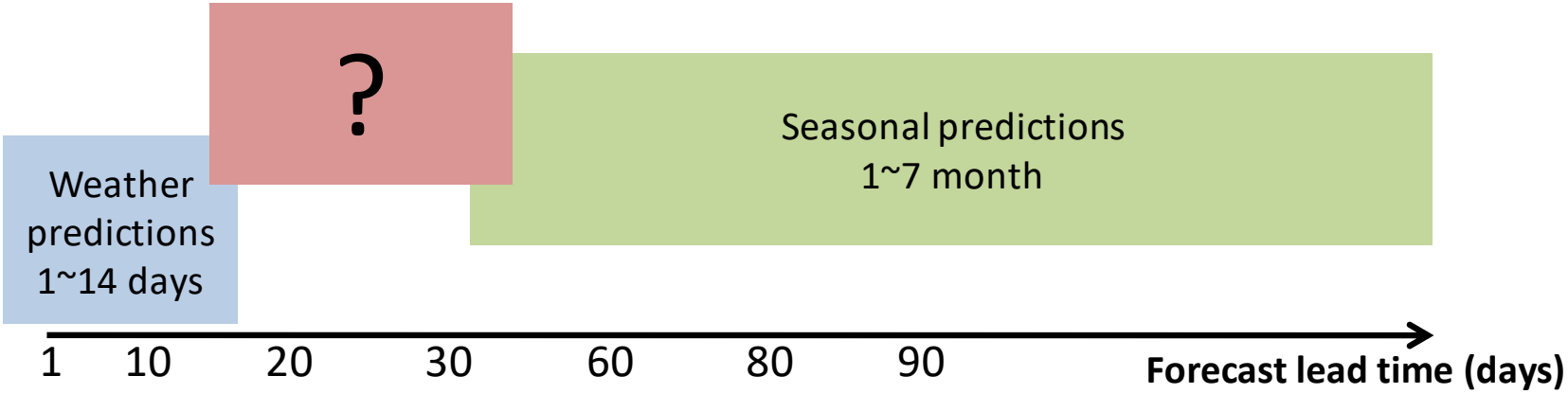
- **Based on existing products**

(Tart et al. 2020)

Initiative on S2S prediction Over Central Africa

- **Pilot project** on S2S prediction
- **Aim**: assess the skill of available S2S predictions to capture seasonal characteristic useful for agriculture over Central Africa *(e.g. onset of growing season, occurrence of dry spells during the growing season)*
- **4 months**: 2016-2017
- Within the framework of **CR4D**
- **Two Countries** :Cameroon and Dem. Rep. of Congo (DRC)

Available climate information



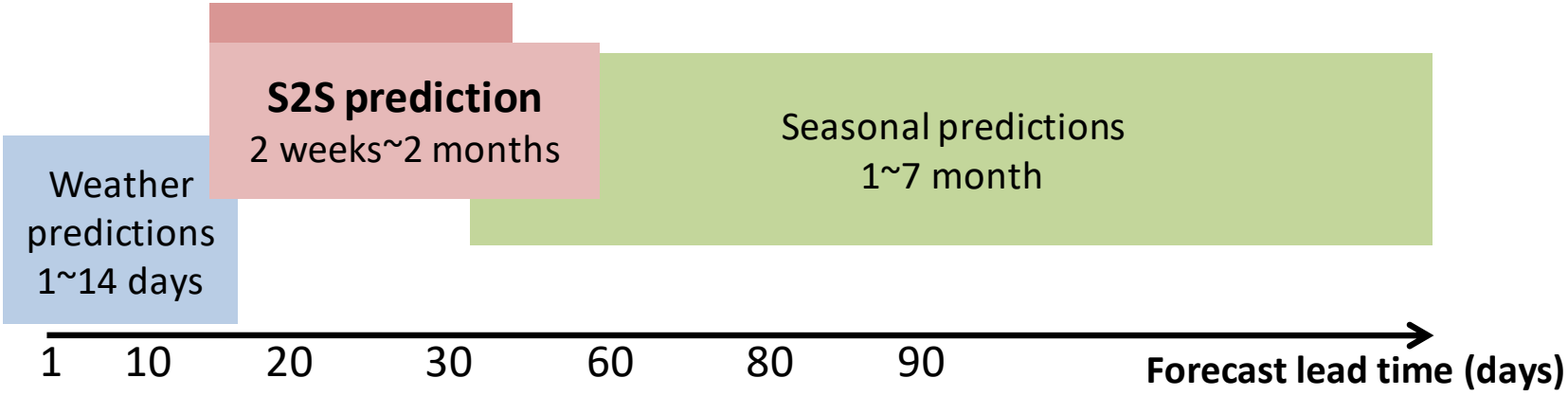
Weather predictions: provide **details** weather information, but **time** scale **too short** for agricultural **planning**

Seasonal predictions: indication of seasonal average conditions of weather parameters (normal, wet,dry)

Good time scale, but **information not detailed enough** for local agriculture Planning *(e.g. onset of growing season, dry episodes)*

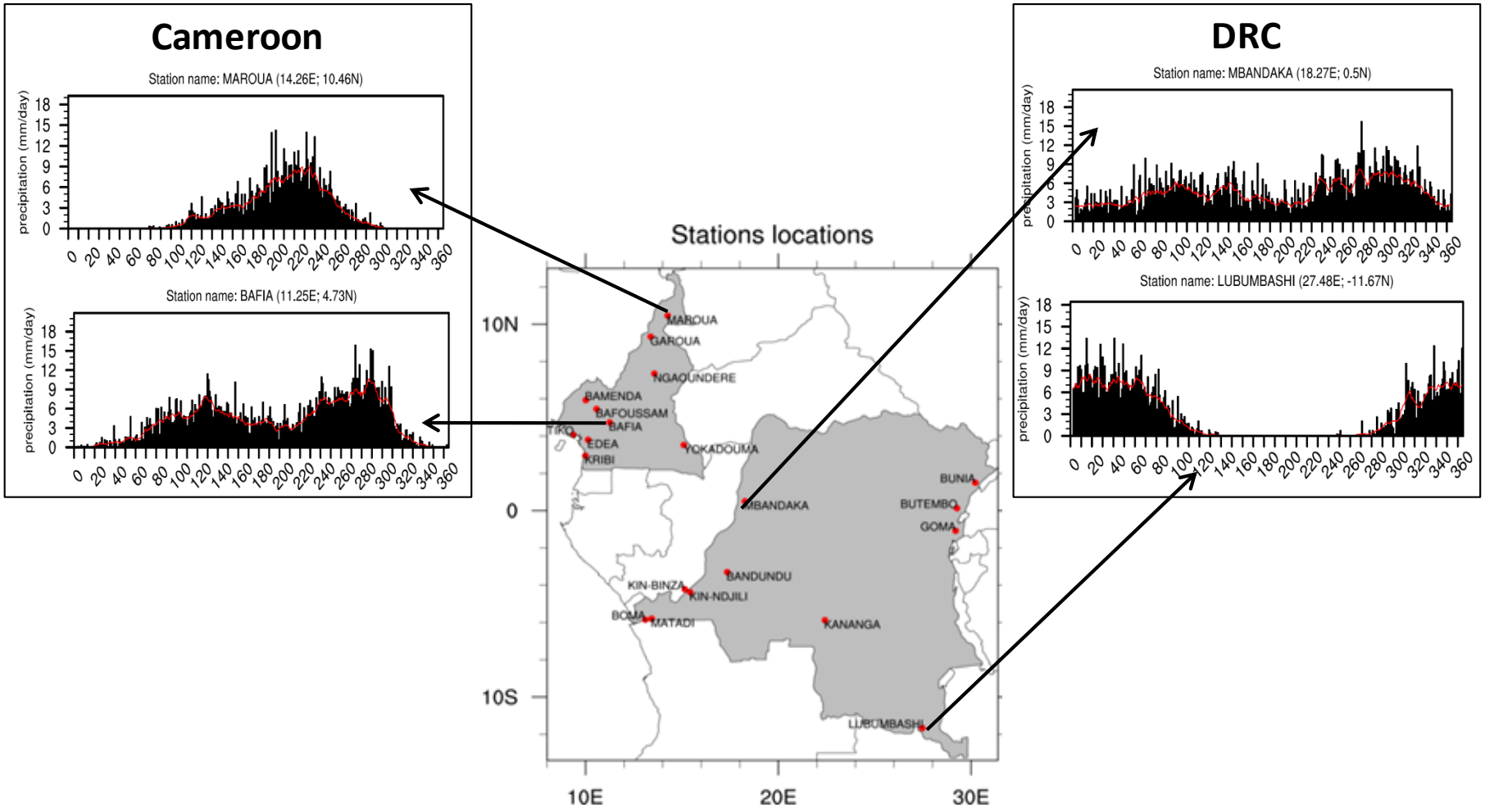
Need to address **both time scale** and **detailed** information

Available climate information



S2S predictions contribute to fill the gap between weather and seasonal time scales

Annual cycle of rainfall



Strong spatial variability of rainfall regime leads to different criterias for agro-meteorological metrics

Agro-ecological metrics

Observations

Onset date of growing season

- **Cameroon**

- 20 mm of precipitation is recorded
- no more than 5 consecutive dry days within the next 30 days.

- **DRC**

- 20 mm of precipitation is recorded followed by
- an accumulation of at least 10 mm the next 20 days

Maximum dry spell length (both countries)

- Maximum consecutive days with rain amount less than **0.1 mm**, from the 25th to 90th day after the start of the growing season

Models

2-, 3- and 4-weeks lead times before

- onset date
- first day of the observed dry spell period

GCM forecasts

S2S database archives include near real-time ensemble forecasts and hindcast (reforecasts) up to 60 days from 11 centers (Vitart et al., 2016).

Model	Timerange (days)	Hindcast (Reforecast)	Forecast
		Period	***Start date***
BoM	0-62	1981-2013 (**1981-2000**)	January 2015
CMA	0-60	1994-2014 (**1994-2000**)	January 2015
ECCC	0-32	1995-2012	January 2016
ECMWF	0-46	past 20years (**1995-2000**)	January 2015
HMCR	0-61	1985-2010 (**1985-2000**)	January 2015
ISAC-CNR	0-31	1981-2010	November 2015
JMA	0-33	1981-2010	January 2015
KMA	0-60	1996-2009	Not available
Météo-France	0-61	1993-2014	May 2015
NCEP	0-44	1999-2010 (**1999-2000**)	January 2015
UKMO	0-60	1996-2009	December 2015

In **bold** : models used in the study

Two type of analysis

Hindcast

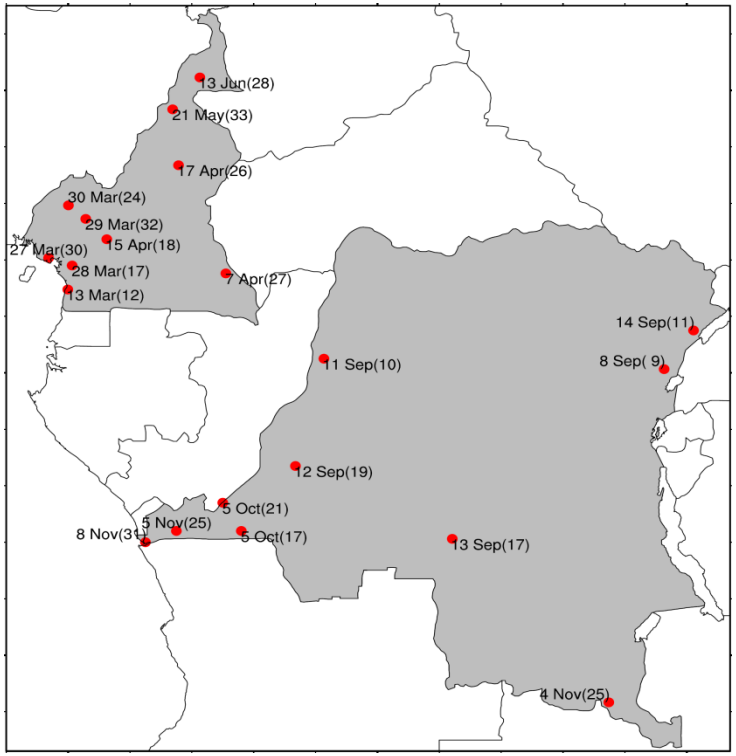
Period varies with model (bold in table)

Forecast

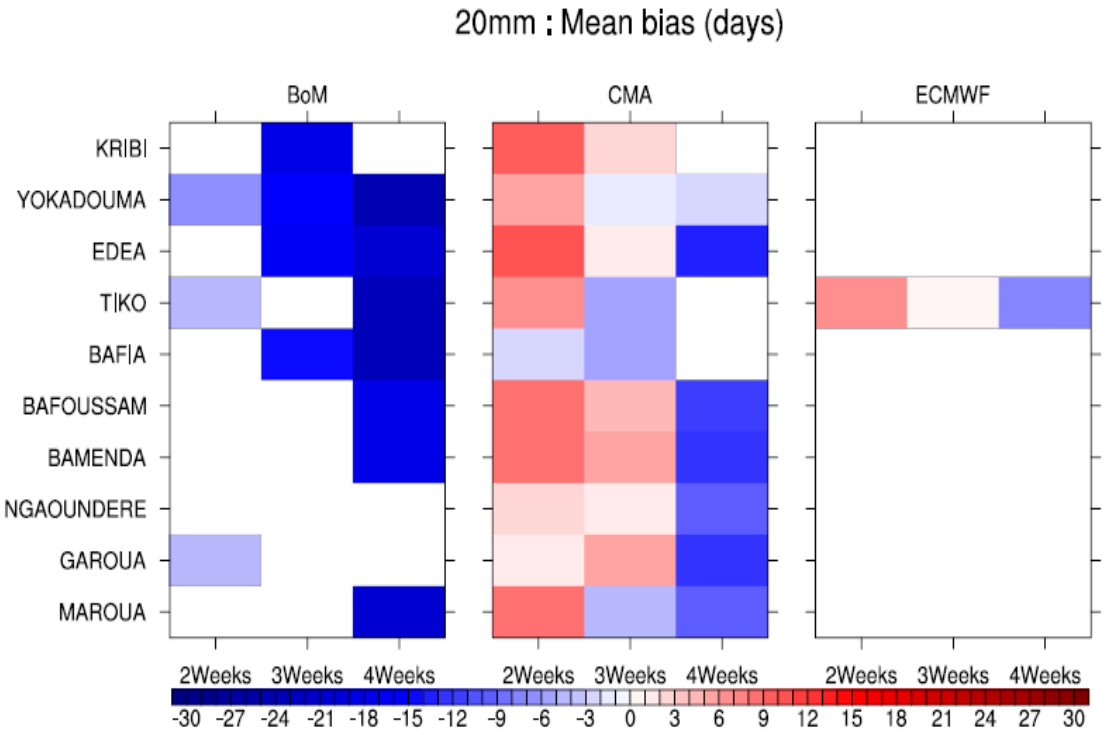
Jan – Dec 2015

GCM forecasts evaluation
Onset dates

Observed mean onset dates (standard deviation)



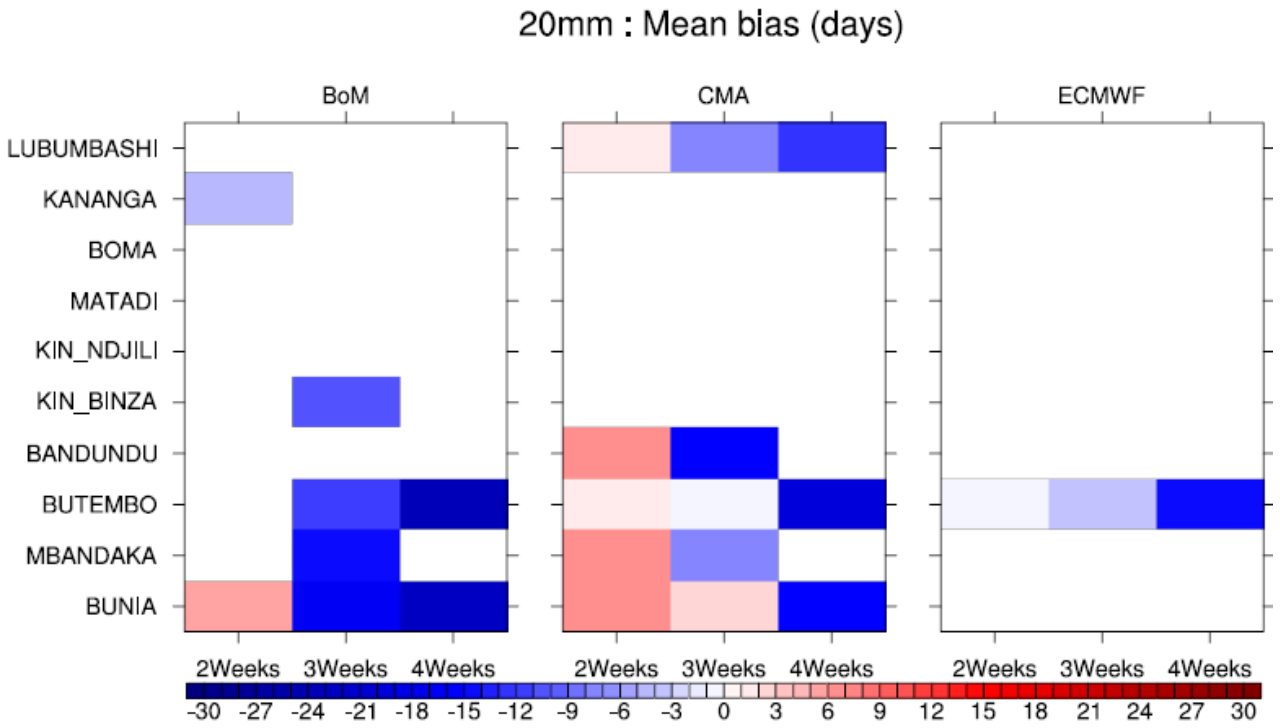
Cameroon



- BoM : earlier onset going from moderate to too early onset dates as the lead time increases
- CMA : bias values range from later to early as lead time increases
- ECMWF clearly shows bad skill

GCM forecasts evaluation
Onset dates

DRC



Blank areas : no skill

- BoM : onset dates with approximately one week in advance DRC except for Bunia
- CMA : bias values range from later to early as lead time increases
- ECMWF clearly shows bad skill

GCM forecasts evaluation

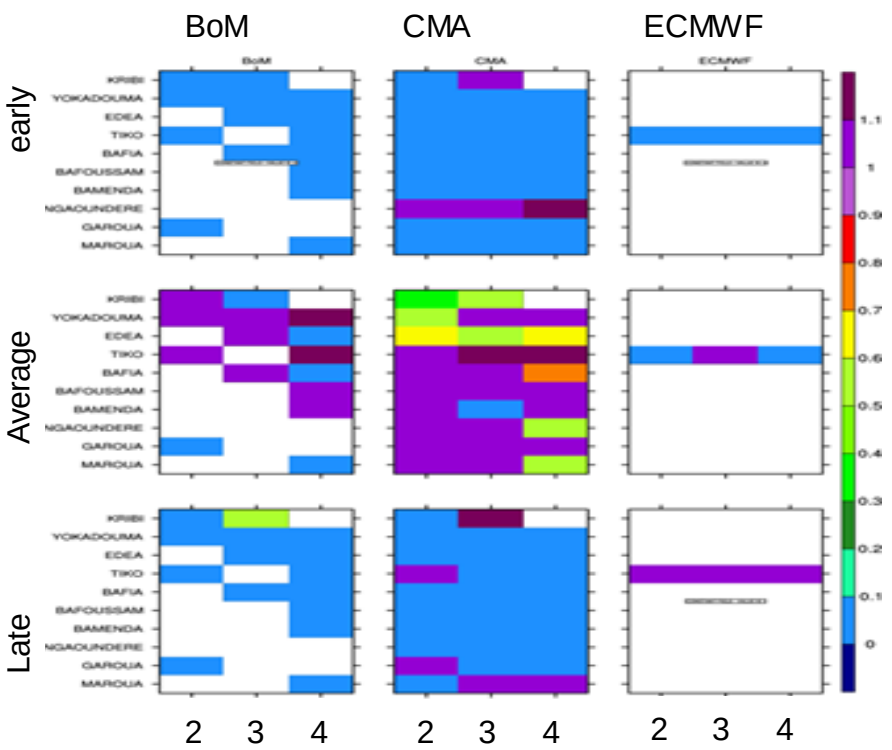
Onset dates : Frequency bias

observed onset dates distribution suggests 3 categories of onset date

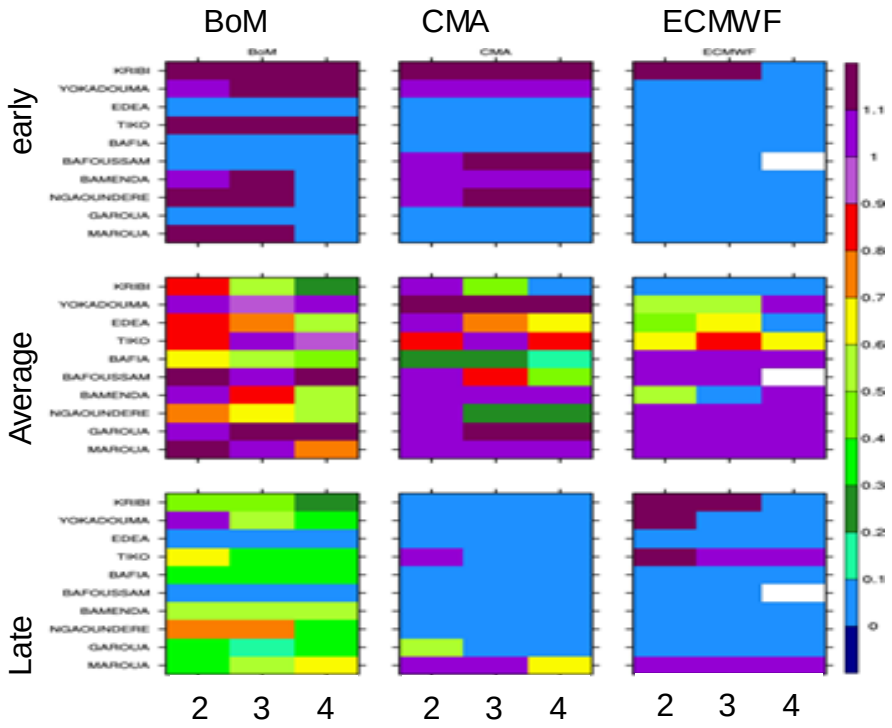
- Early - normal -late

Cameroon

20 mm



5 mm



-consitency between thresholds

-Main deficiency of models for early and late cathegories

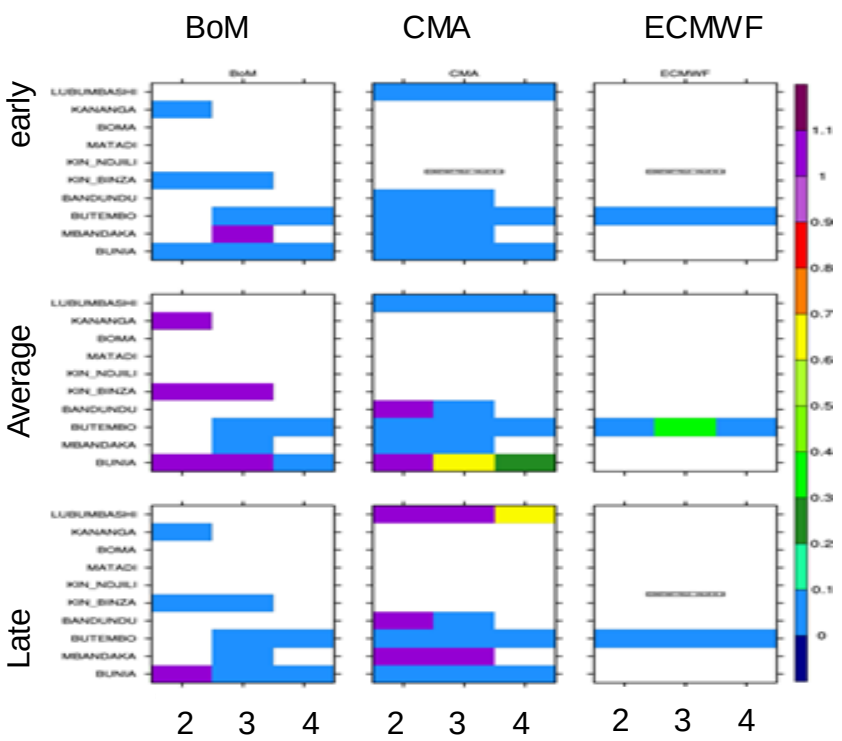
-BoM perform better

GCM forecasts evaluation

Onset dates : Frequency bias

DRC

20 mm



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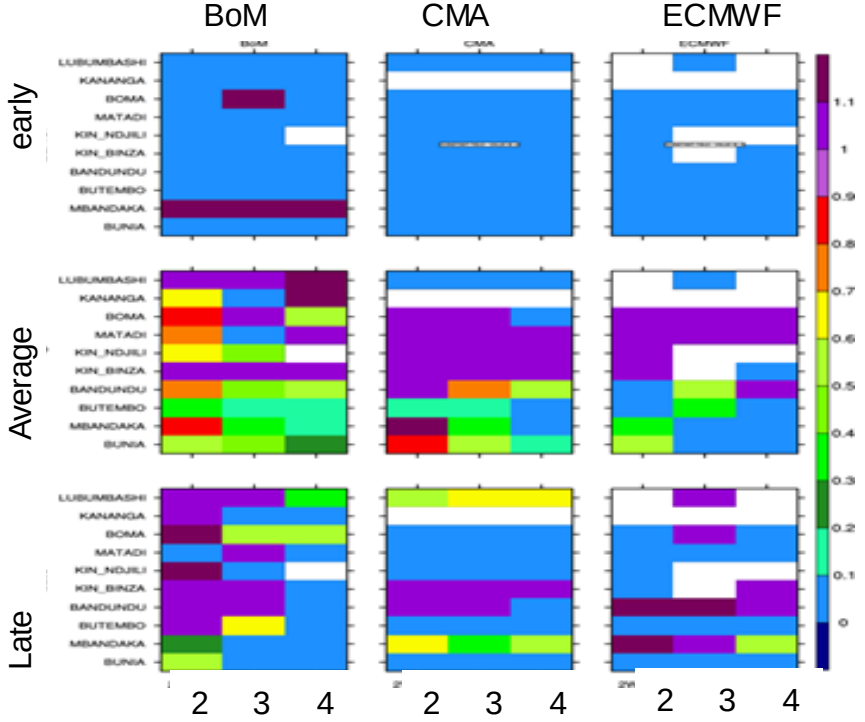

-consistency between thresholds

-Main deficiency of models for early and late categories

-BoM perform better

Other output : Capacity building

Workshop on Sub-seasonal to Seasonal Prediction - Central Africa

CIFOR-Central Africa, Yaounde, Cameroon, July 25-29, 2016

Objective : strengthen links between climate science research and climate information needs in support development planning in Africa

Partner : Andrew Robertson,
- head of Climate Group at the IRI, Columbia University, USA
- Co-chair of the steering group of S2S prediction project .

http://wiki.iri.columbia.edu/index.php?n=Climate.S2S-CentralAfrica

GCM forecasts

NEW S2S initiative

Subseasonal EXperiment (SubX)

http://cola.gmu.edu/subx/index.html

experimental forecasts for **weeks 1-4** available to both the operational and research communities

This project was :

- multidisciplinary (team: climate and agricultural scientists, forecasters)
- designed to target CR4D priorities

Project activities	Target CR4D priority (actors)
Present the current state of climate service for agriculture over CA	
Highlight climate information needed by farmers	**Co-design** (climate and agricultural scientists)
Define meaningful climate index related to information need by farmers	**Co-design** , **co-production** (climate scientists and forecasters)
Assess the skill of GCM predictions at S2S timescales over Central Africa	**Co-production** (climate scientists and forecasters)
Workshop on S2S prediction	• Capacity building (project team) • Partnership (IRI, Columbia university,USA)

Models assessed : **Five** GCMs forecasts from S2S database archives (Vitart et al., 2016), **BoM**, **NCEP**, **ECMWF**, **HMCR** and **CMA**

Targeted metrics :

- onset date of growing season
- maximum dry spell duration during the rainy season

Thank you


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