

Quantifying Weather and Climate Impacts on Health in Developing Countries (QWeCI)

Science Talk

**The Malaria Early Warning System
developed under QWeCI: achievements
and perspectives**

**QWeCI is funded by the
European Commission's
Seventh Framework
Research Programme under
the grant agreement 243964**

13 partners from 9 countries

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Francesca Di-Giuseppe
Anne Jones Adrian M Tompkins
ECMWF. UniLiverpool, ICTP
F.DiGiuseppe@ecmwf.int



This talk

**Meteorological inputs (from ecmwf) for malaria modelling
Introduction to the malaria early warning system**

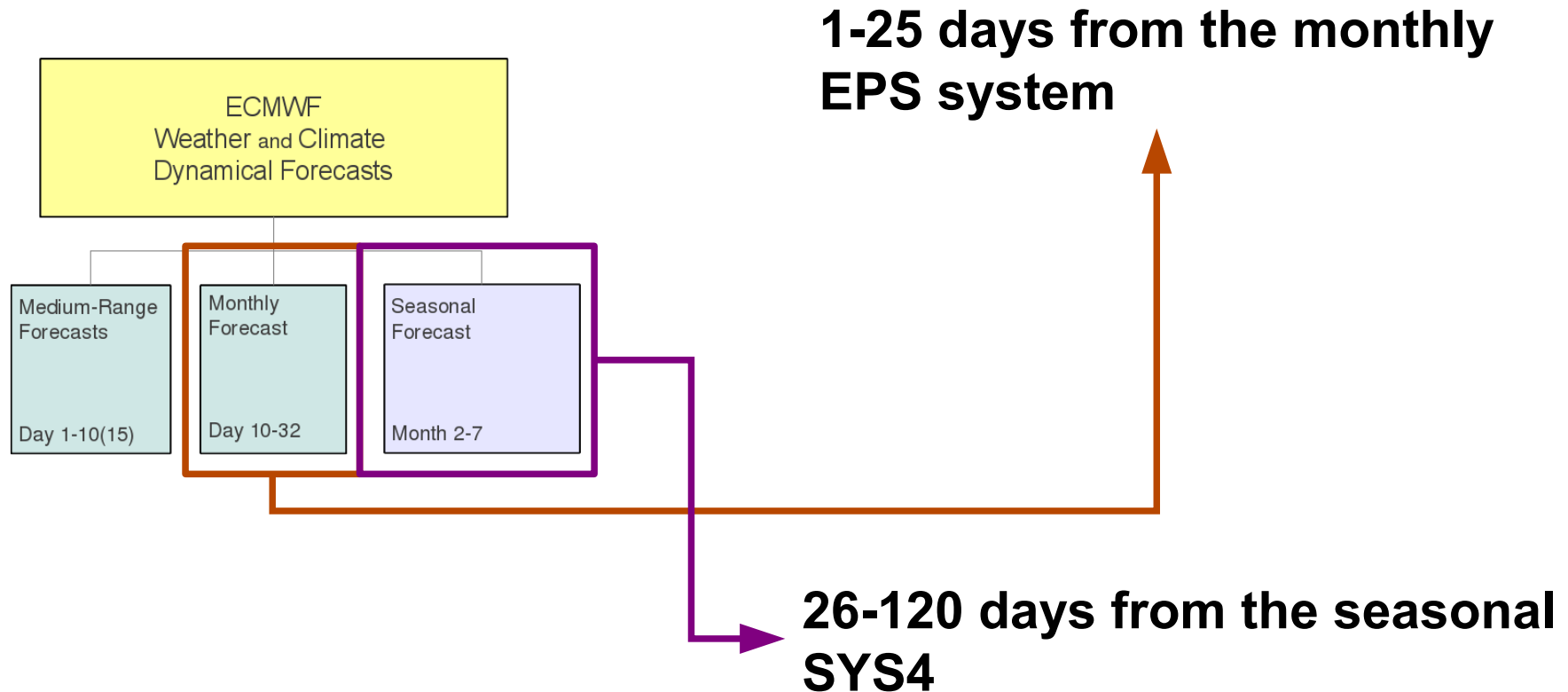
Anne's talk

**Comparison between calibrated and uncalibrated
meteorological inputs**

Adrian's talks:

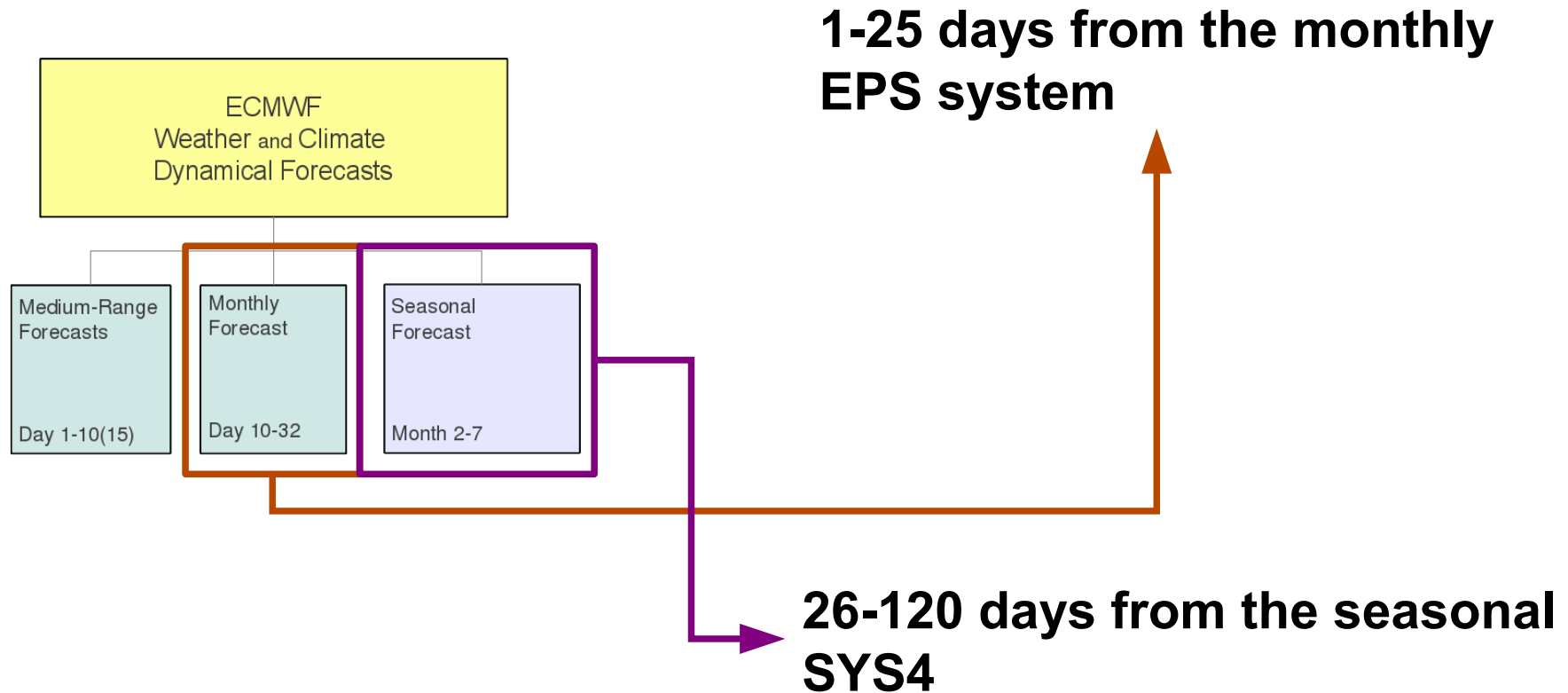
Insight on some products which will be made available.

Input fields for the malaria prediction system



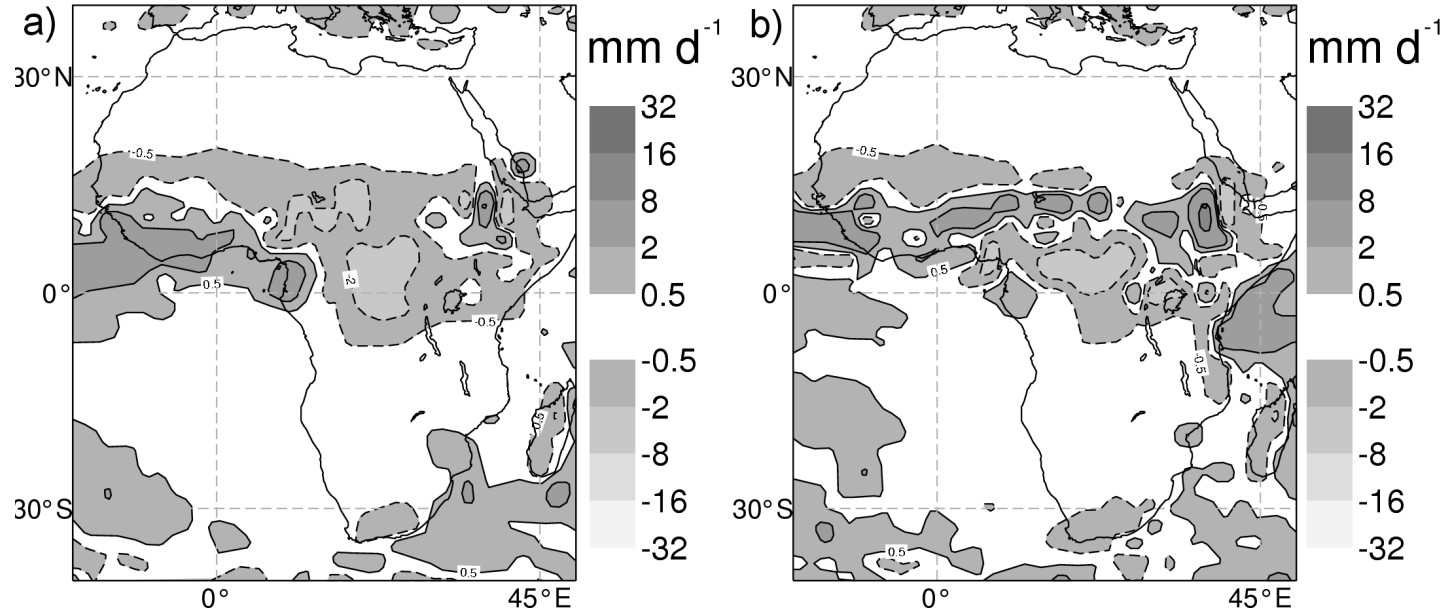
Fields are bias corrected using their own hindcast against the same set of observation to guarantee seamlessly

Input fields for the malaria prediction system



Fields are bias corrected using their own hindcast against the same set of observation to guarantee seamlessly

Model biases are different across systems



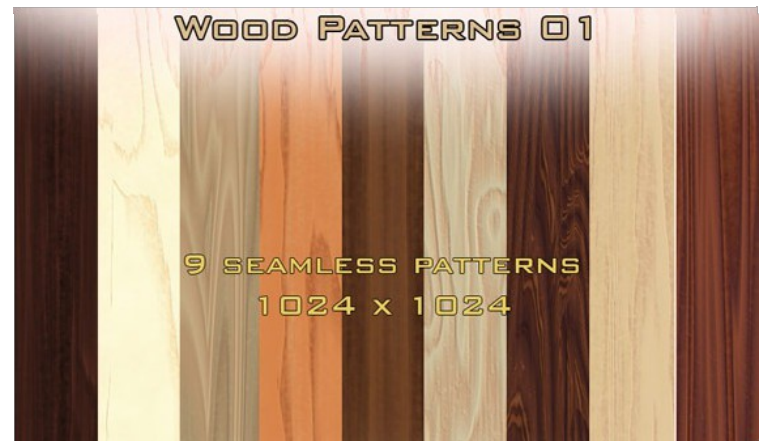
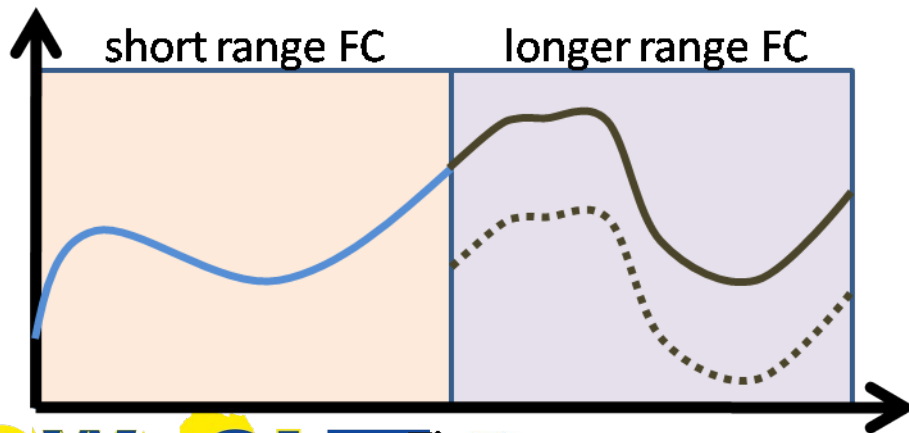
Africa precipitation bias across different model cycles in the ECMWF forecasting system. Panel (a) shows the mean JJA bias for the period 1993–2010 from system-4 hindcast at lead time 1 month. Panel (b) shows the same period mean but from the hindcast of the EPS monthly forecast with initial dates in JJA 2011. The two systems adopt different model cycles; model cycle 37R2 for the EPS monthly and model cycle 36R3 for System-4. Both models are compared to GPCPv2.1 dataset, units are in mm per day.

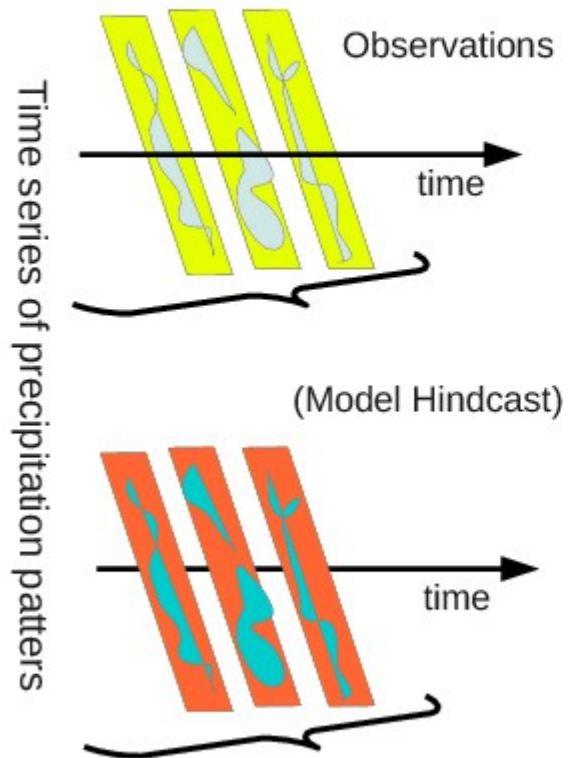
Di Giuseppe F, Molteni F, Tompkins AM. 2012. A rainfall calibration methodology for impact modelling based on spatial mapping. Q. J. R. Meteorol. Soc. DOI:10.1002/qj.2019

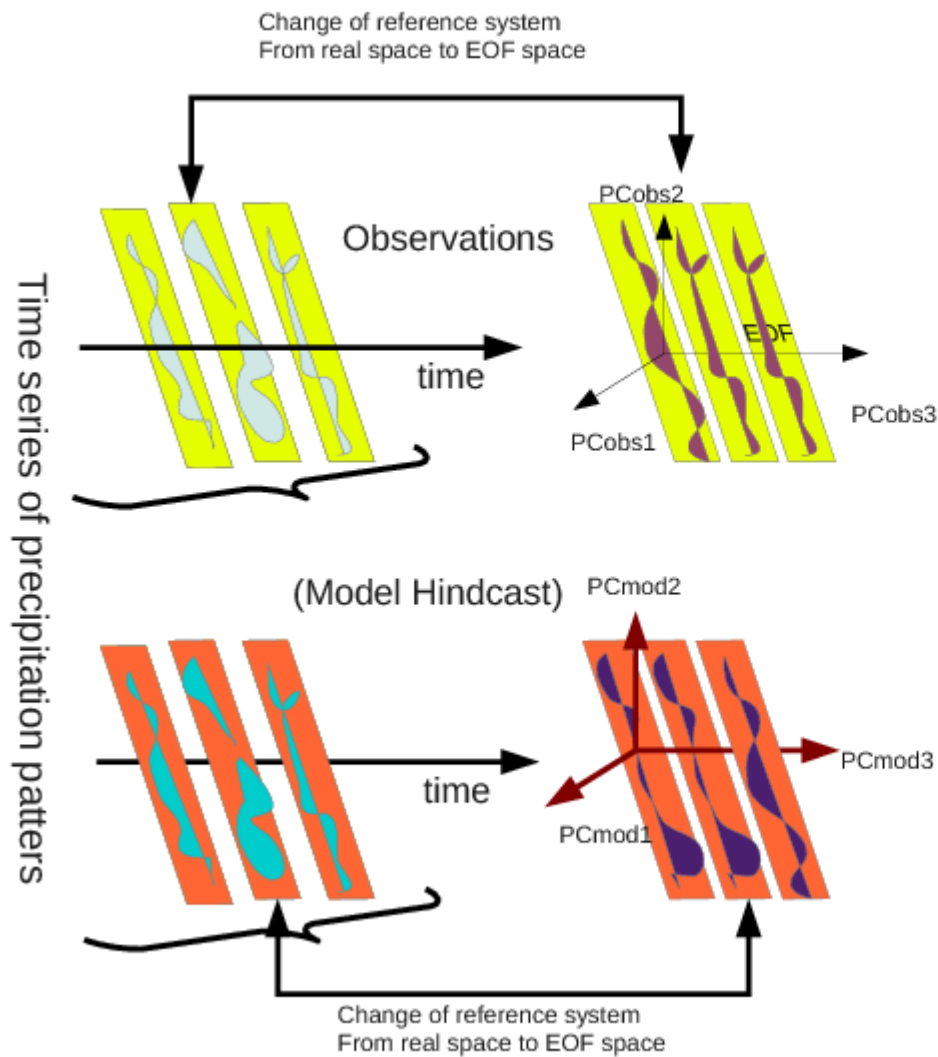
This is what is called **seamless forecasting**

For many practical applications this would be an advantage ... but a correction in time and space is required to concatenate different systems in a way transparent to the final user

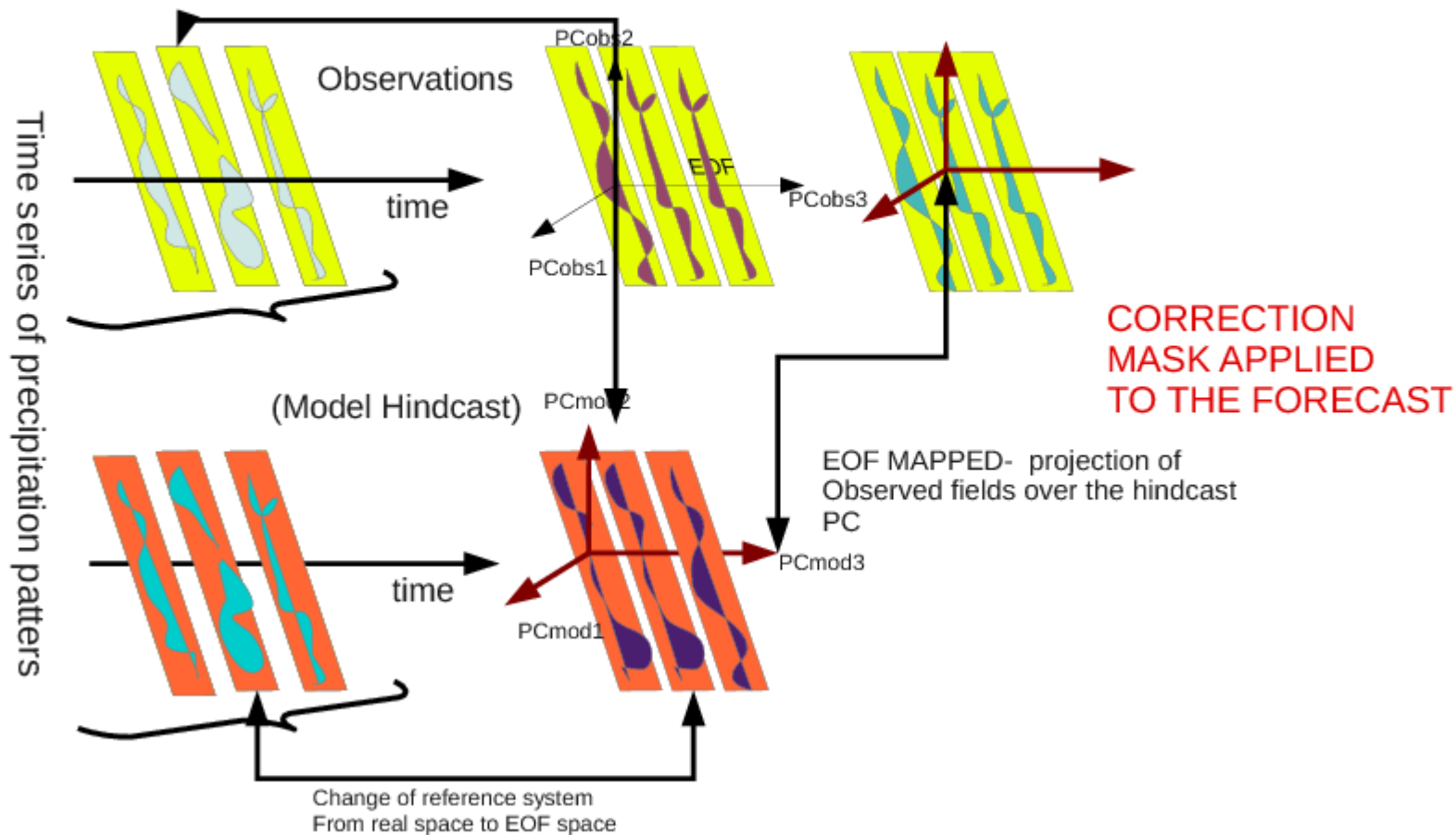
Temperature



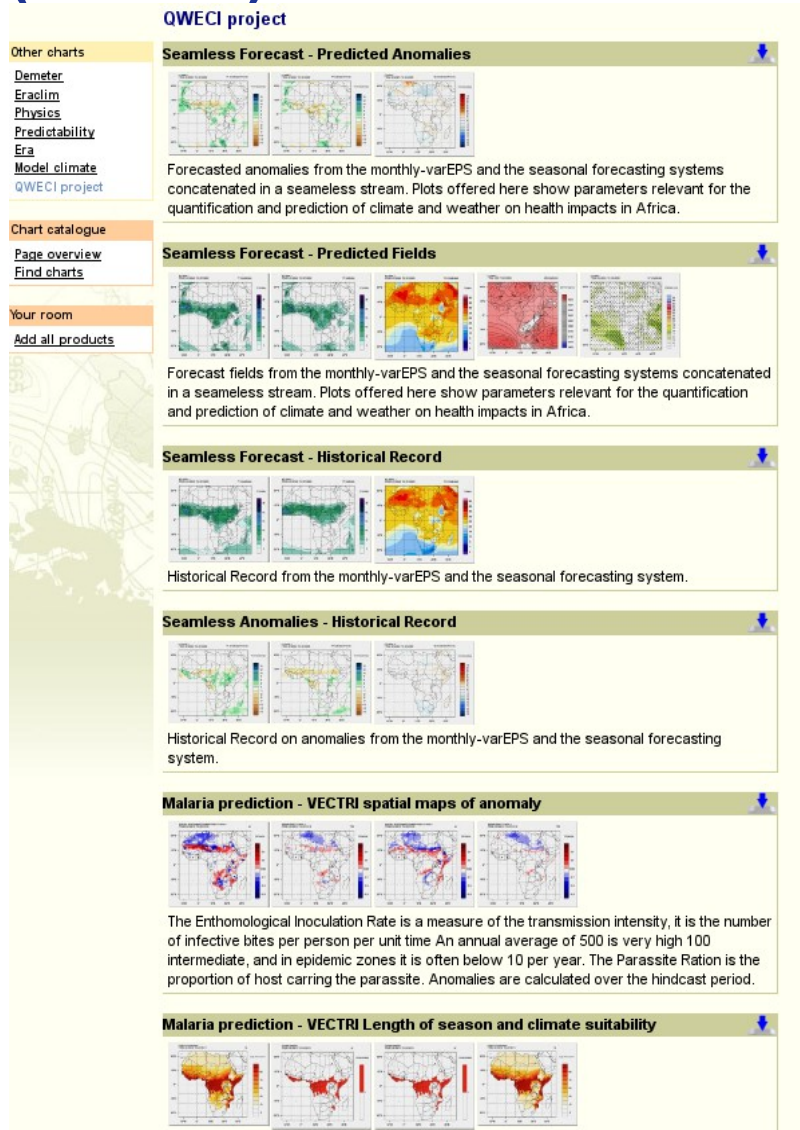




Change of reference system
From real space to EOF space



Schematic of the malaria Early warning system (MEWS)



Long range forecast of precipitation and temperature are taken from:

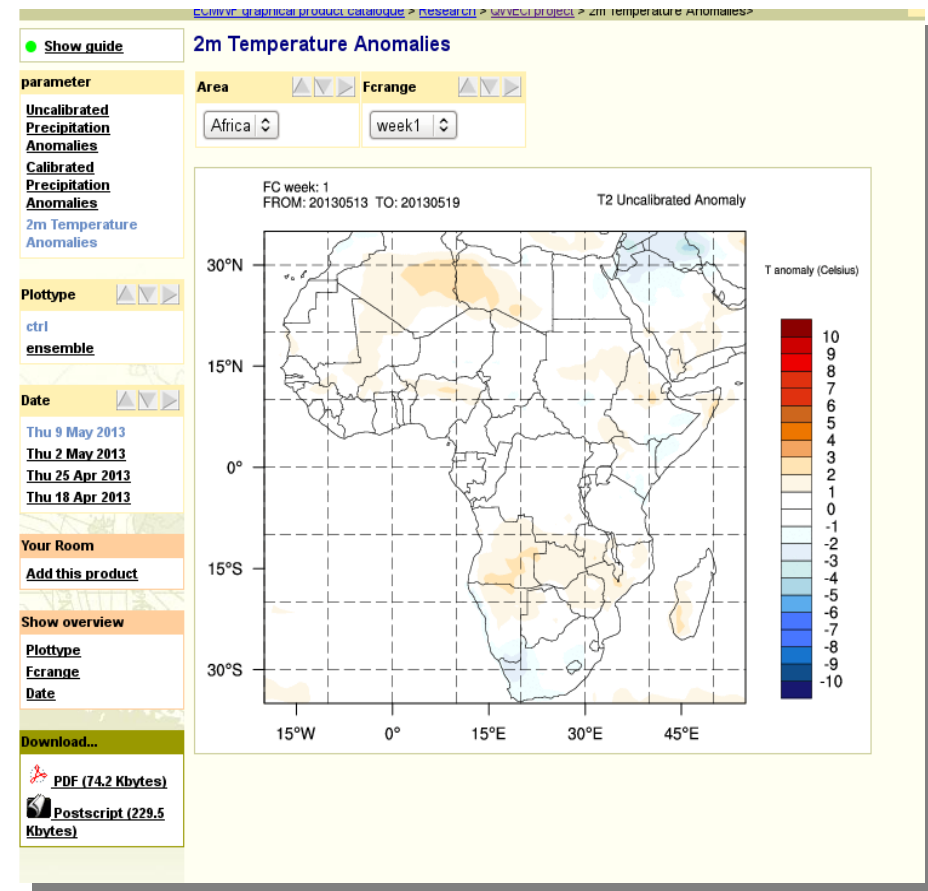
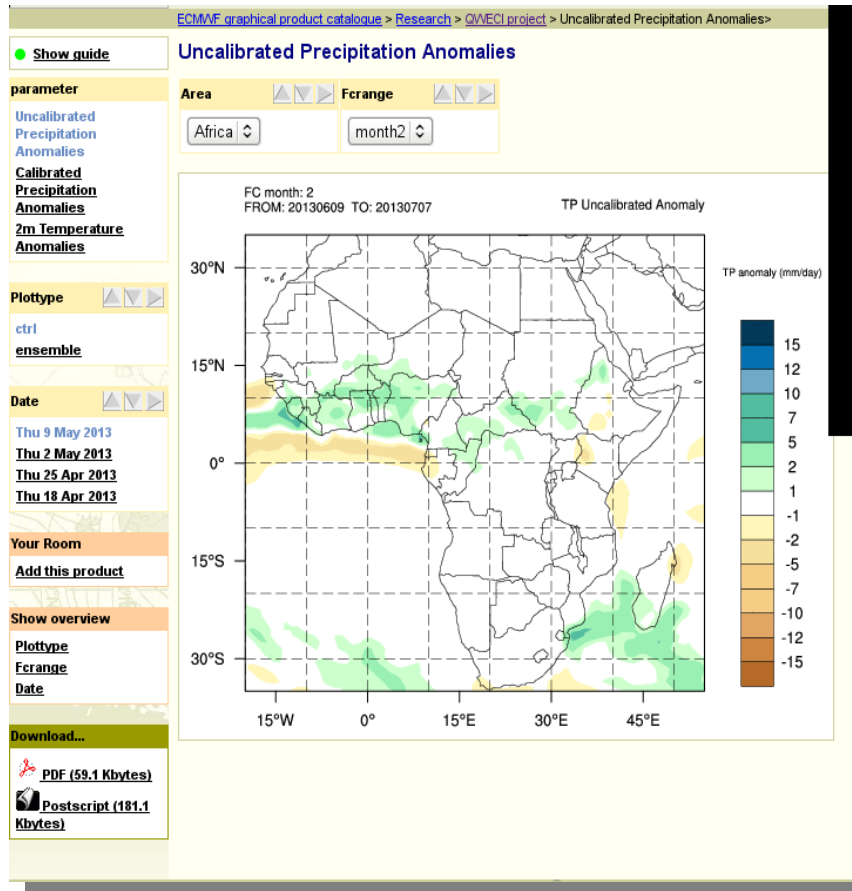
1- 25 days var-EPS monthly

26-129 days System-4

Data are bias corrected to make them “seamless” then used to drive two malaria models **VECTRI** and **LMM**.

Malaria Transmission outputs are transformed in “hazard” maps looking at the probability to exceed climatic values for the season

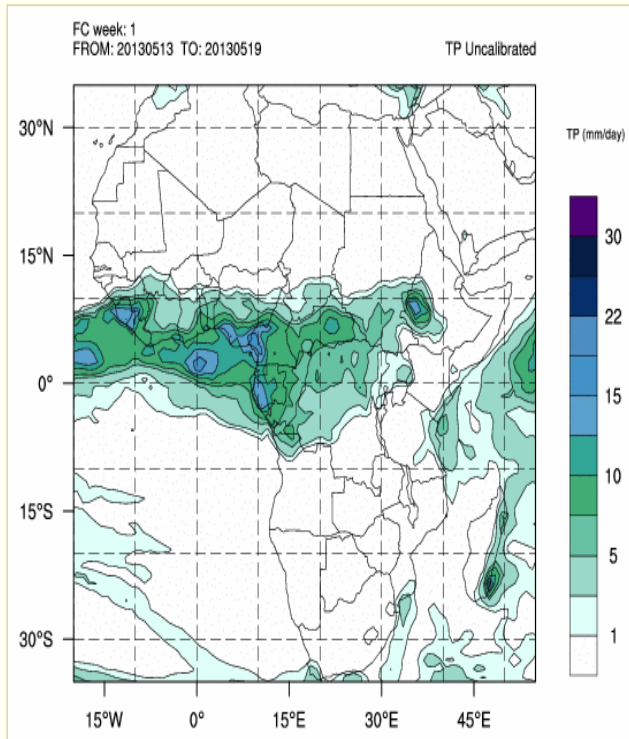
Climate product 1 – Predicted anomaly fields (precipitation and temperature)



(precipitation and temperature)

Uncalibrated Precipitation

parameter
Area Fcrange



Plottype
ensemble

Date

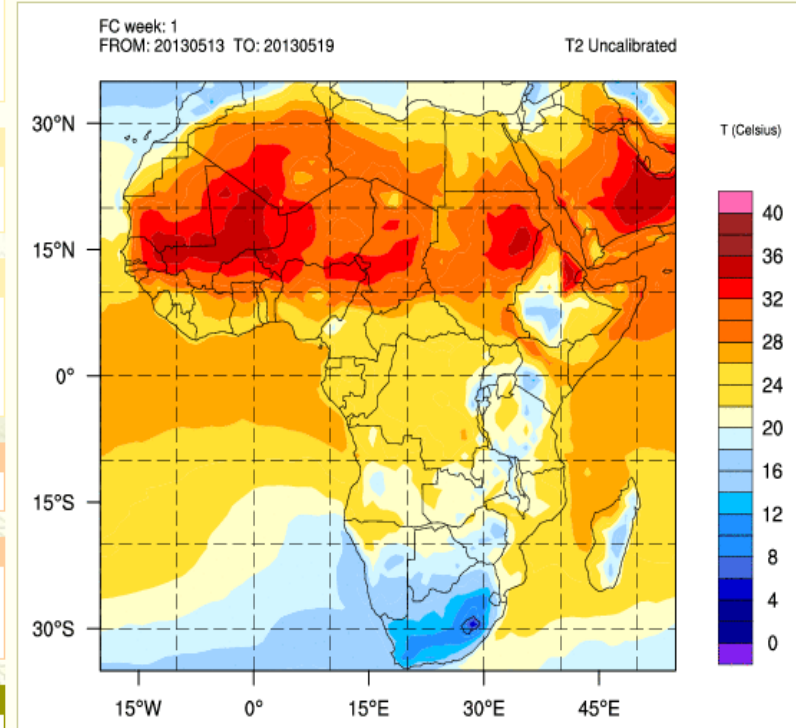
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Show overview
Plottype
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2m Temperature

parameter
Area Fcrange



parameter
Uncalibrated Precipitation
Calibrated Precipitation
2m Temperature
Geopotential 850hPa
Surface winds (10 m)

Plottype
ensemble

Date

Your Room
[Add this product](#)

Show overview
Plottype
Fcrange
Date

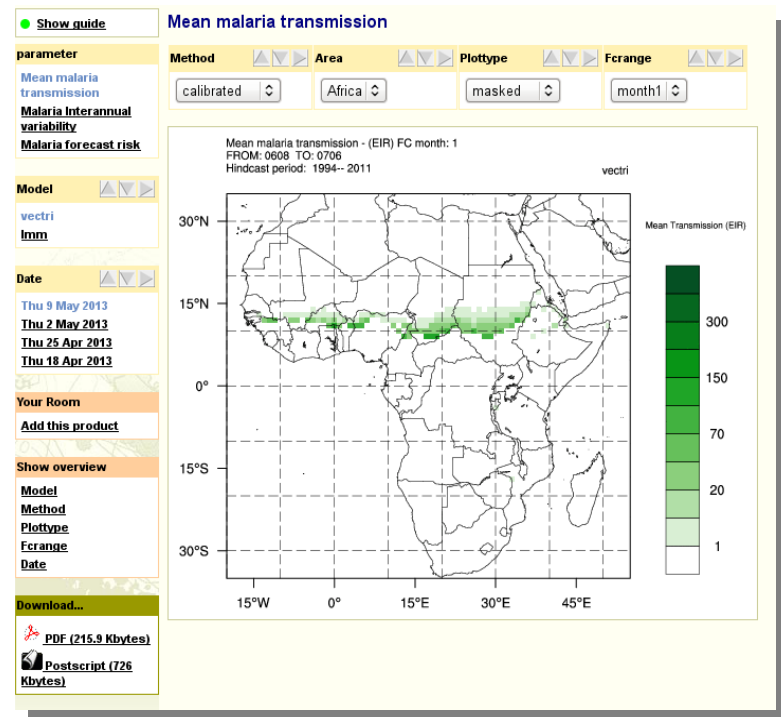
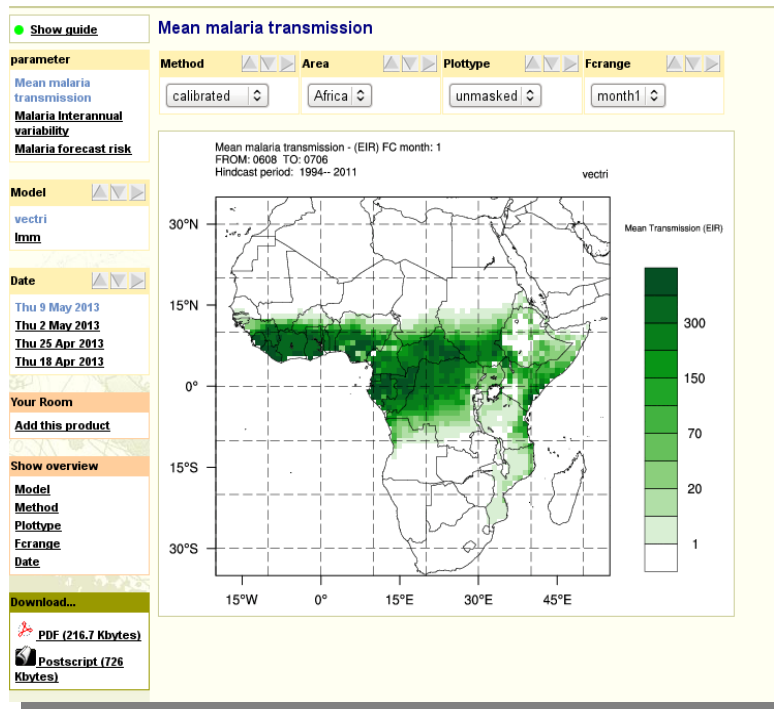
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Malaria Product 1: Mean transmission

EIR is a measure of the transmission intensity, it is the number of infective bites per person per unit time

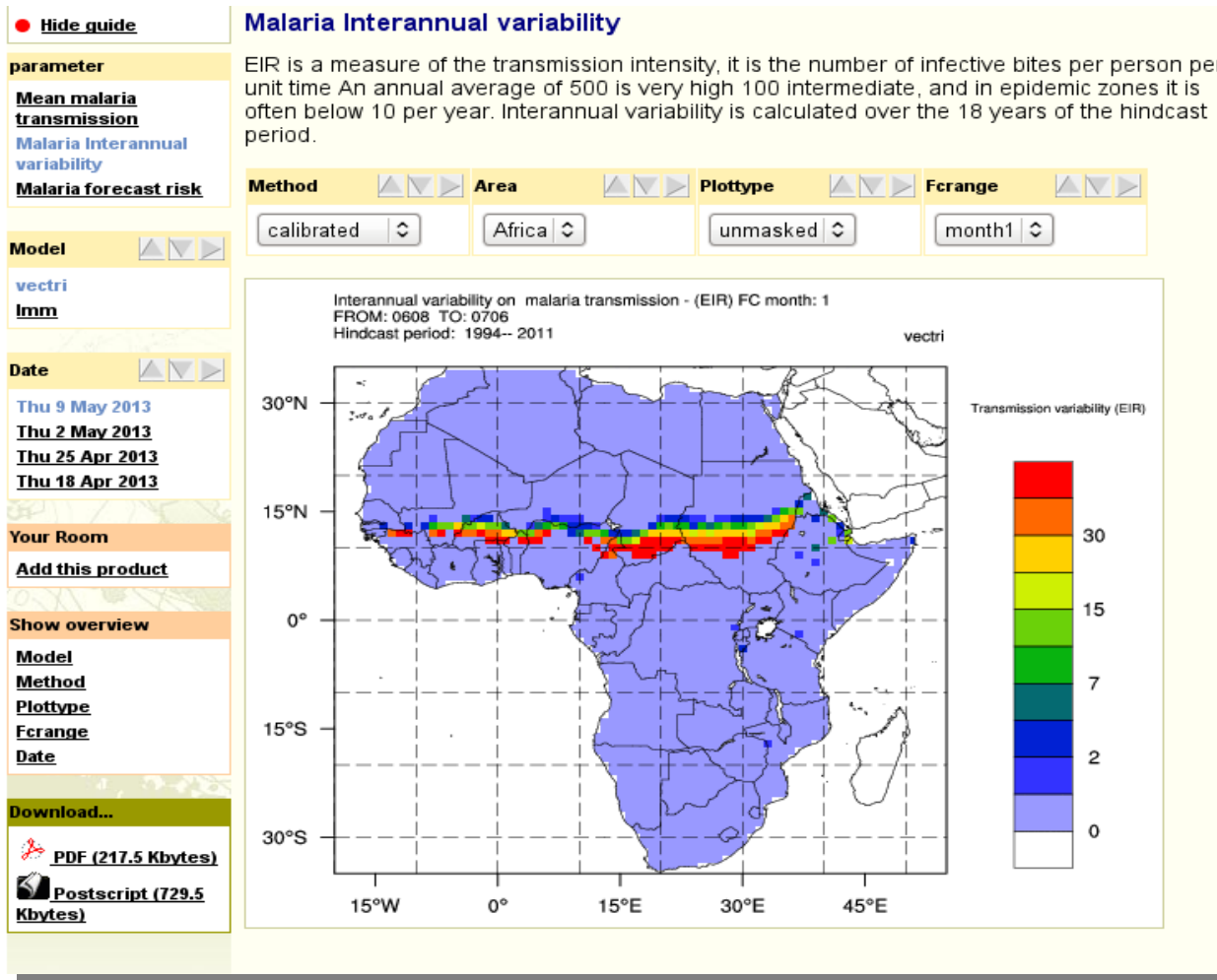
An annual average of 500 is very high 100 intermediate, and in epidemic zones it is often below 10 per year.

Mean transmission is calculated over the hindcast period (not including the forecast)



Malaria Product 2: Mean inter-annual variability

Inter-annual variability is calculated using the hindcast years. It shows areas where the malaria is epidemic for that period of the year.

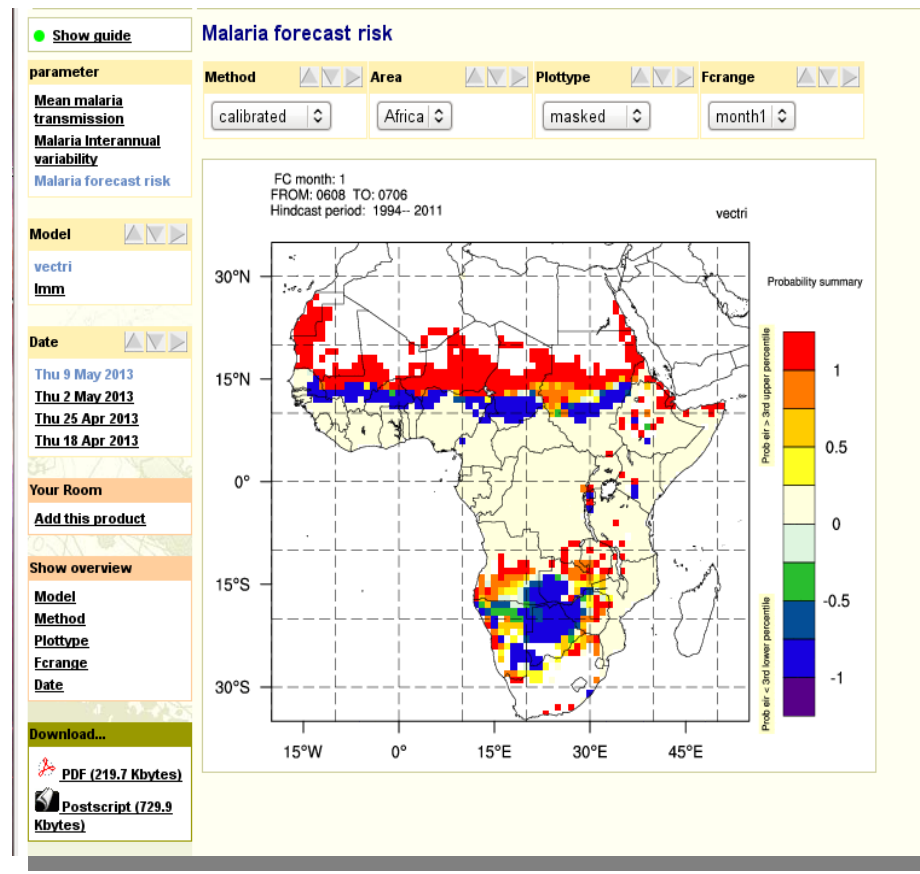
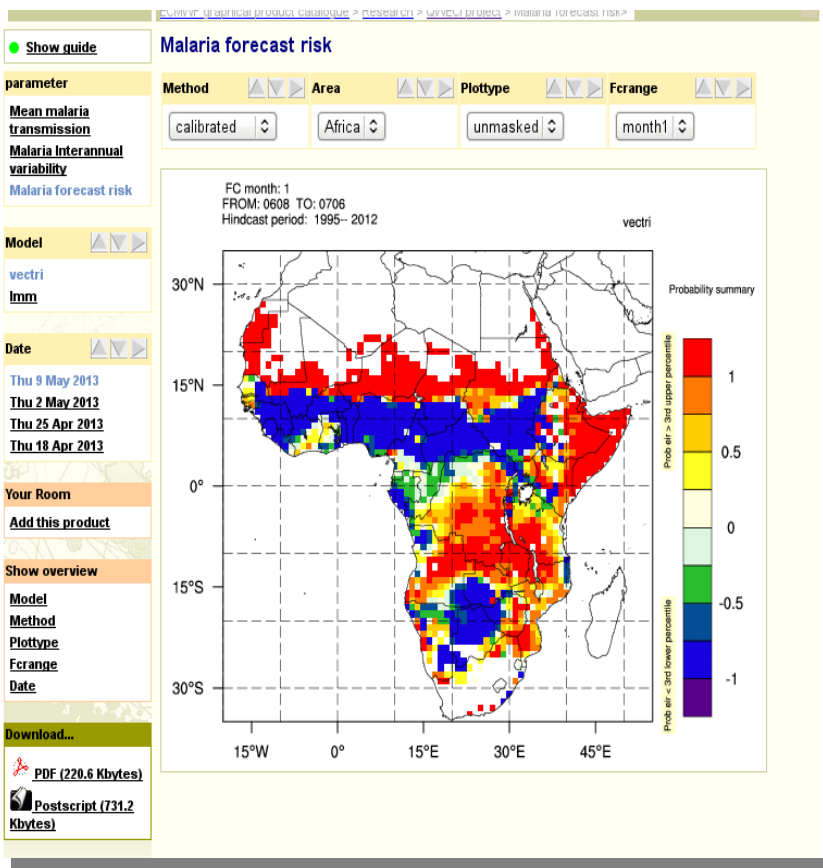


Malaria Product 3: Forecast Probability

Forecast probability summary:

Shows the number of ensemble members which predicts transmission above or below the 3th upper or lower percentile.

1 = all the 51 members in agreement



Conclusions

We have seen the example of a prototype malaria early warning system.

The meteorological inputs from the long-range forecast of ECMWF required rainfall calibration before they could be used to drive the dynamical malaria models.

In this preliminary validation stage the system has been tested against reanalysis runs (i.e. in the “model world!”) showing reasonable results compared to early studies. More of this in Anne and Adrian talks

The system will be tested over Malawi, Uganda and Rwanda with ministry of health partners from the QWeCI and HEALTHY FUTURES projects.