ICTP Update: The ECMWF/ICTP pilot operational dynamical malaria forecasting system in Africa

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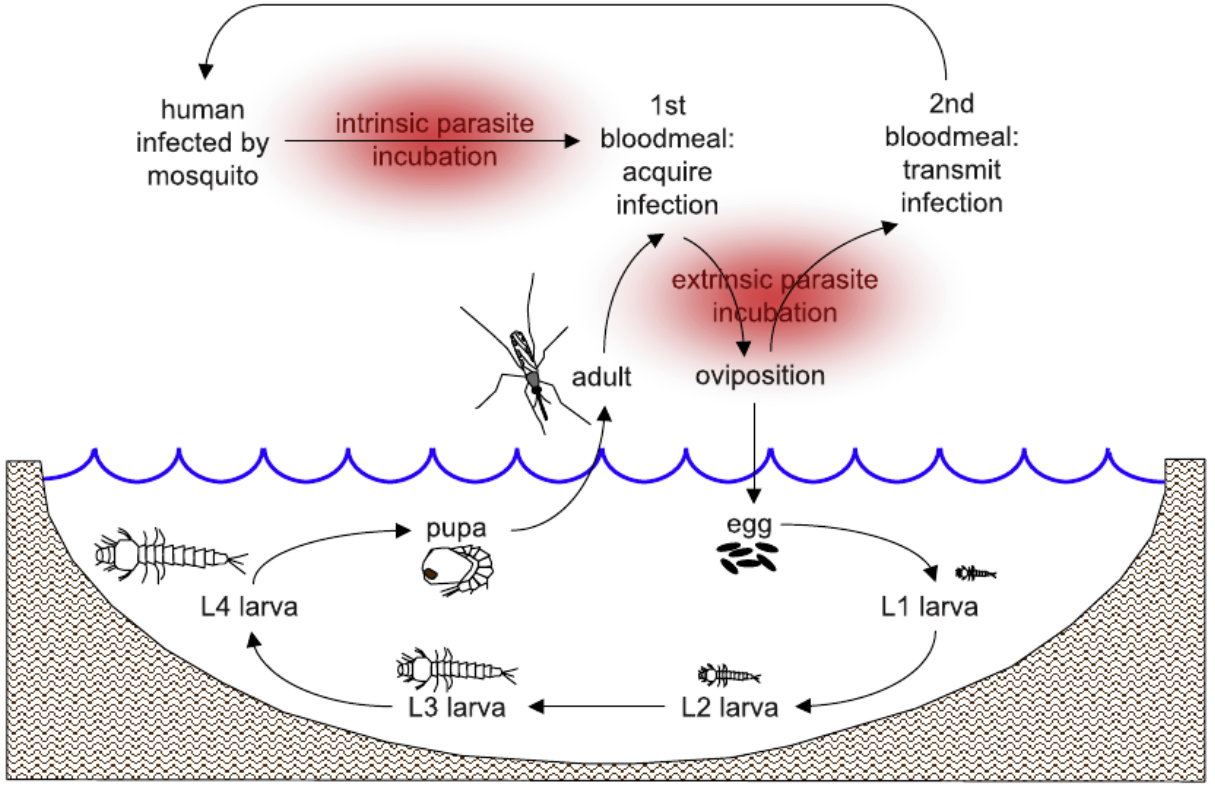
Outline

- The VECTRI-based dynamical malaria forecast system
- Pan-continent results
- Country Focus - Uganda and Kenya

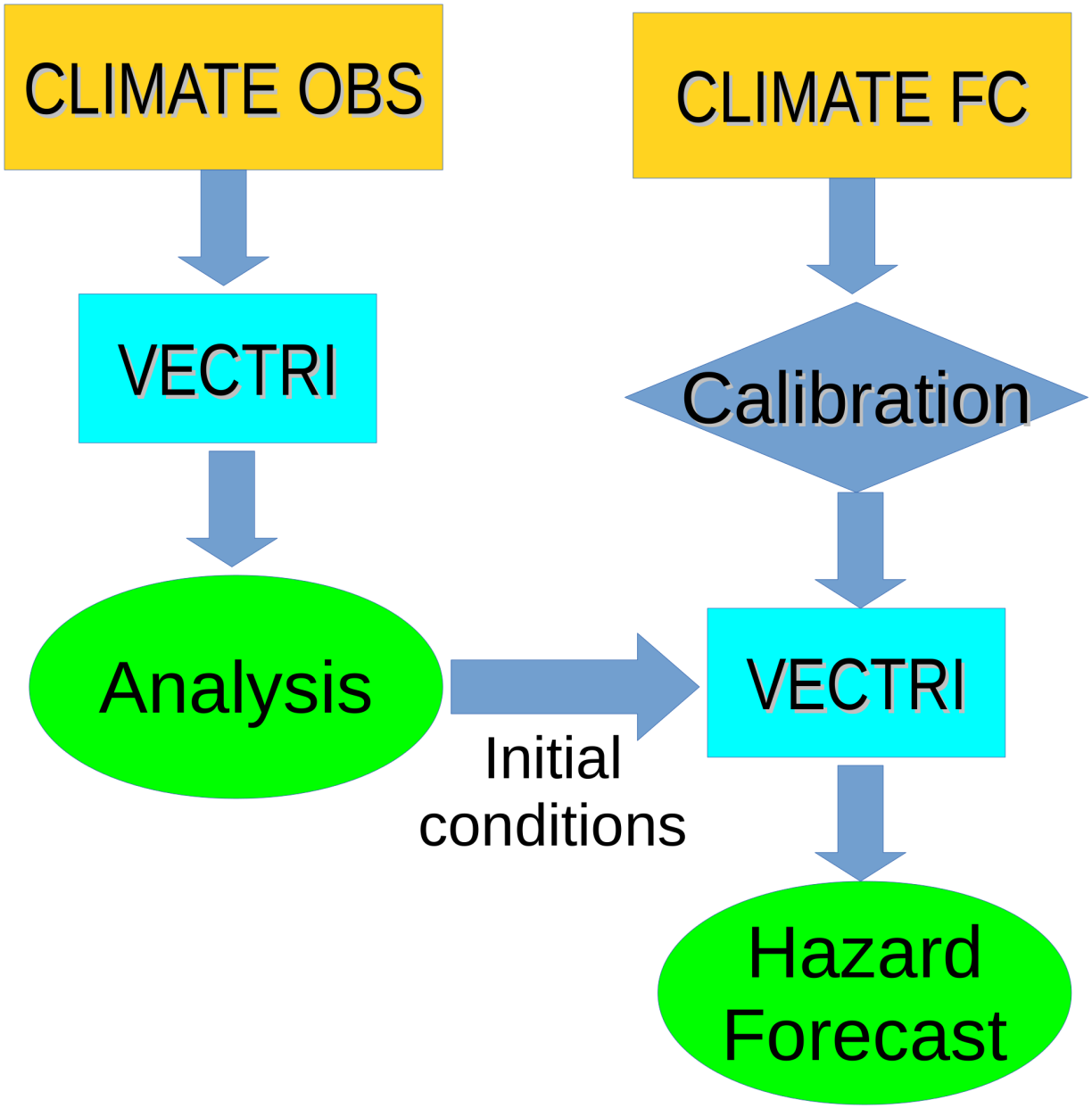
Climate drivers of malaria

- Rainfall : provides breeding sites for larvae.
- Temperature: larvae growth, vector survival, egg development in vector, parasite development in vector.
- Relative Humidity : dessication of vector.
- Wind : Advection of vector, strong winds reduce CO_2 tracking.

Climate predictions could be used to map climate-related transmission hazard while recognising that other factors contribute to changes in disease hazard and vulnerability.



Climate observations are used to create an analysis of entomological and epidemiological conditions in order to initialize the malaria forecasts.



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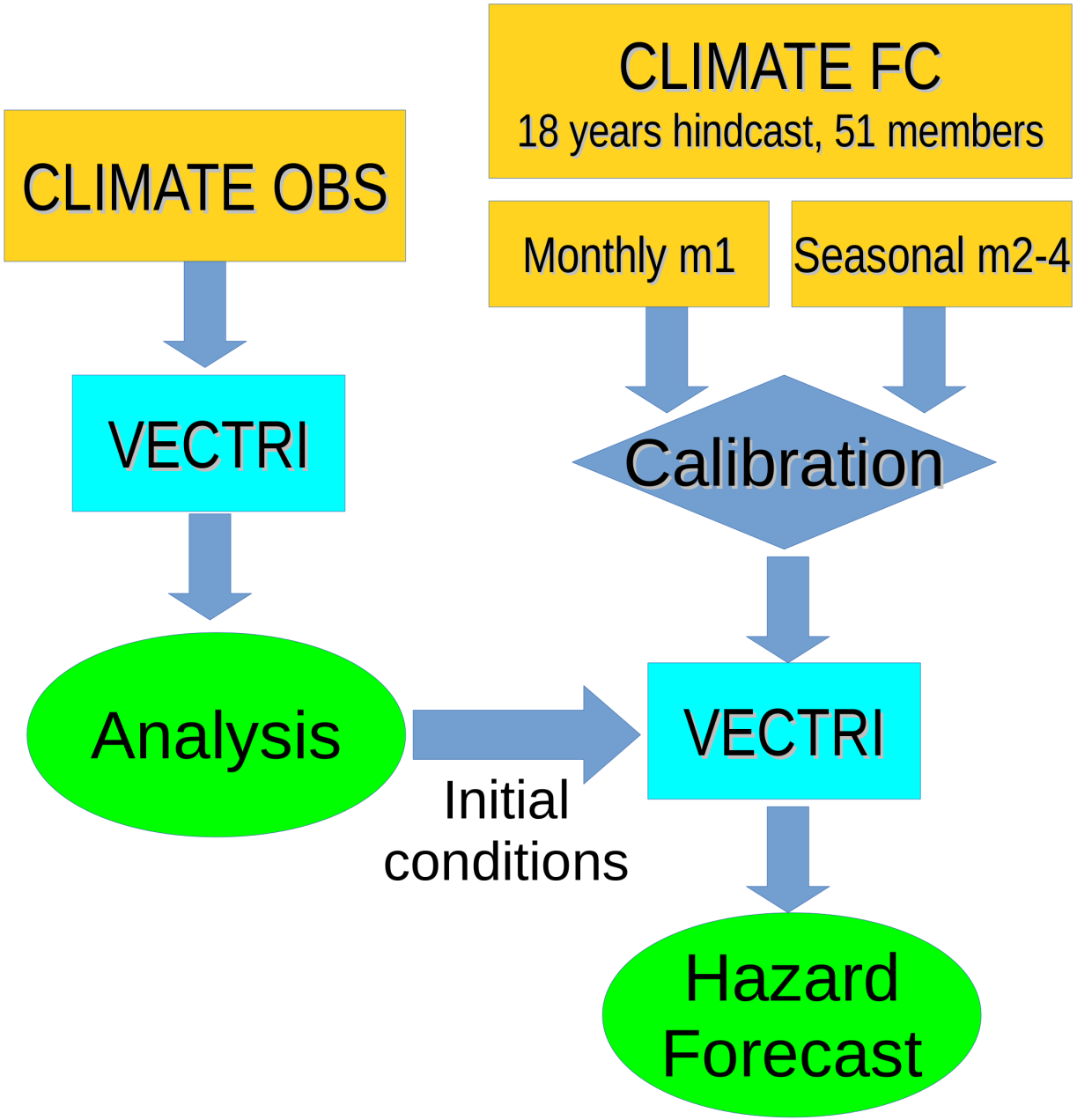
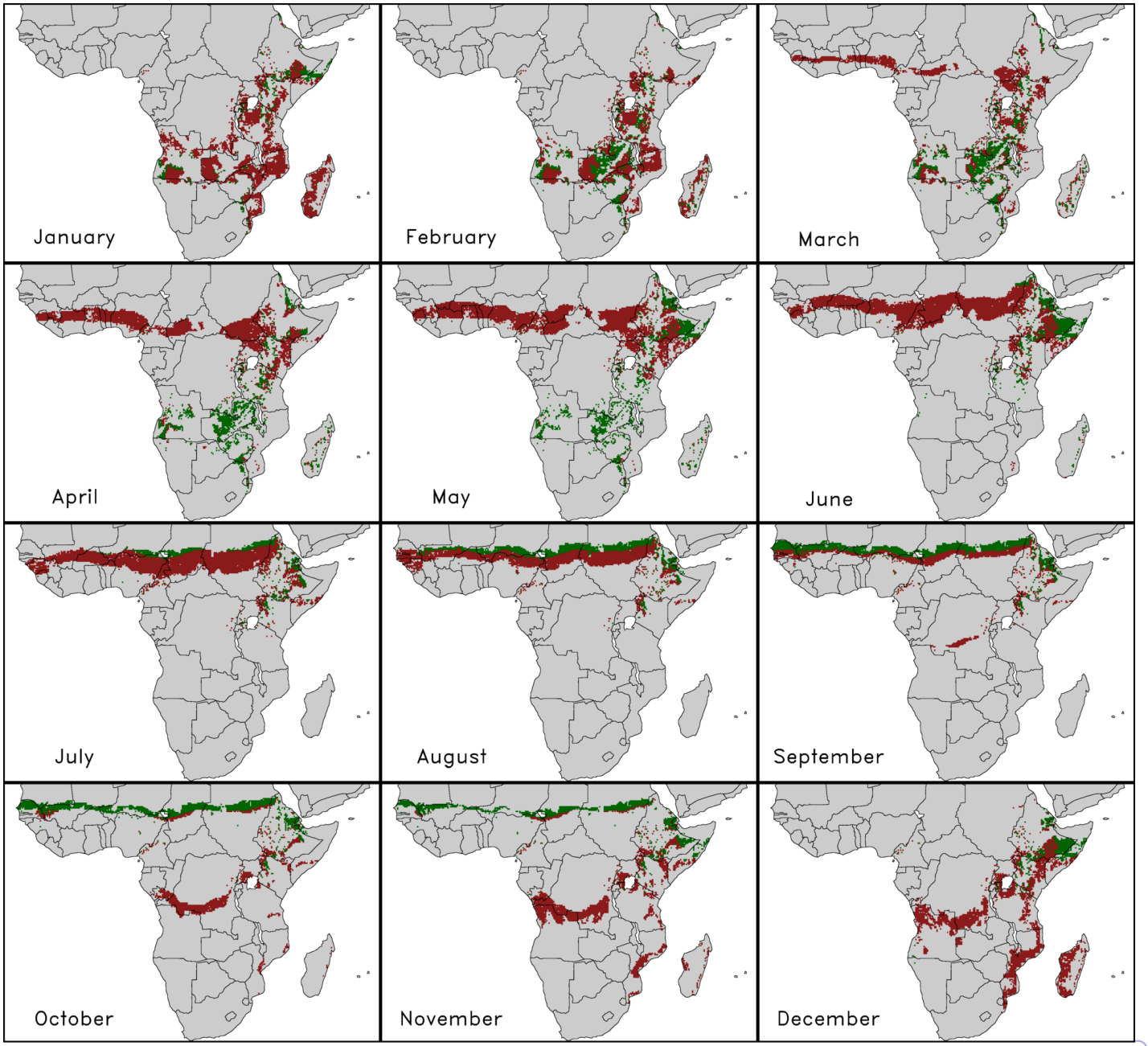


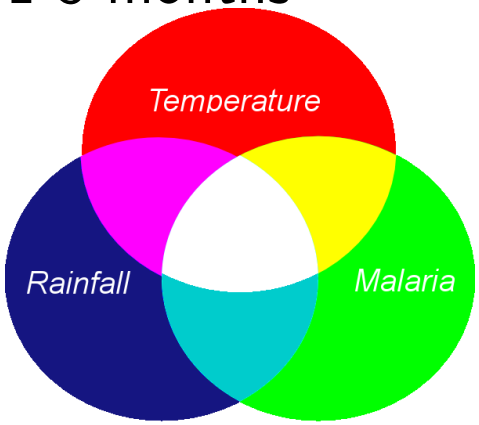
Where should such a system be focussed?
Use malaria analysis to identify points/months with high interannual variability divided between

- epidemic (green)
- endemic (red)

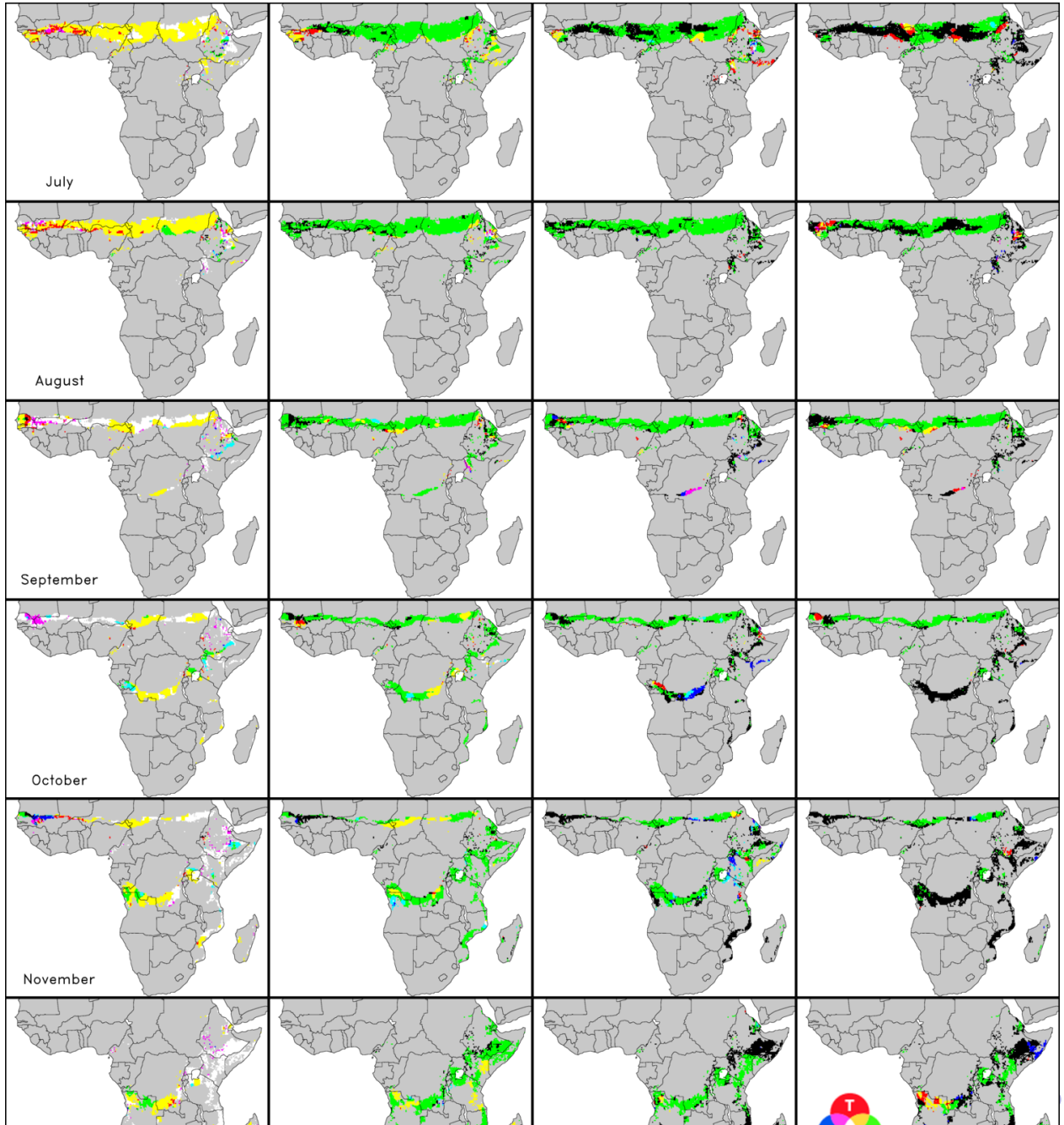
categories.



Skill in predicting temperature, rainfall and malaria PR at lead 1-3 months



Malaria skill in m2 and 3 derives from climate forecast in m1 and the analysis.



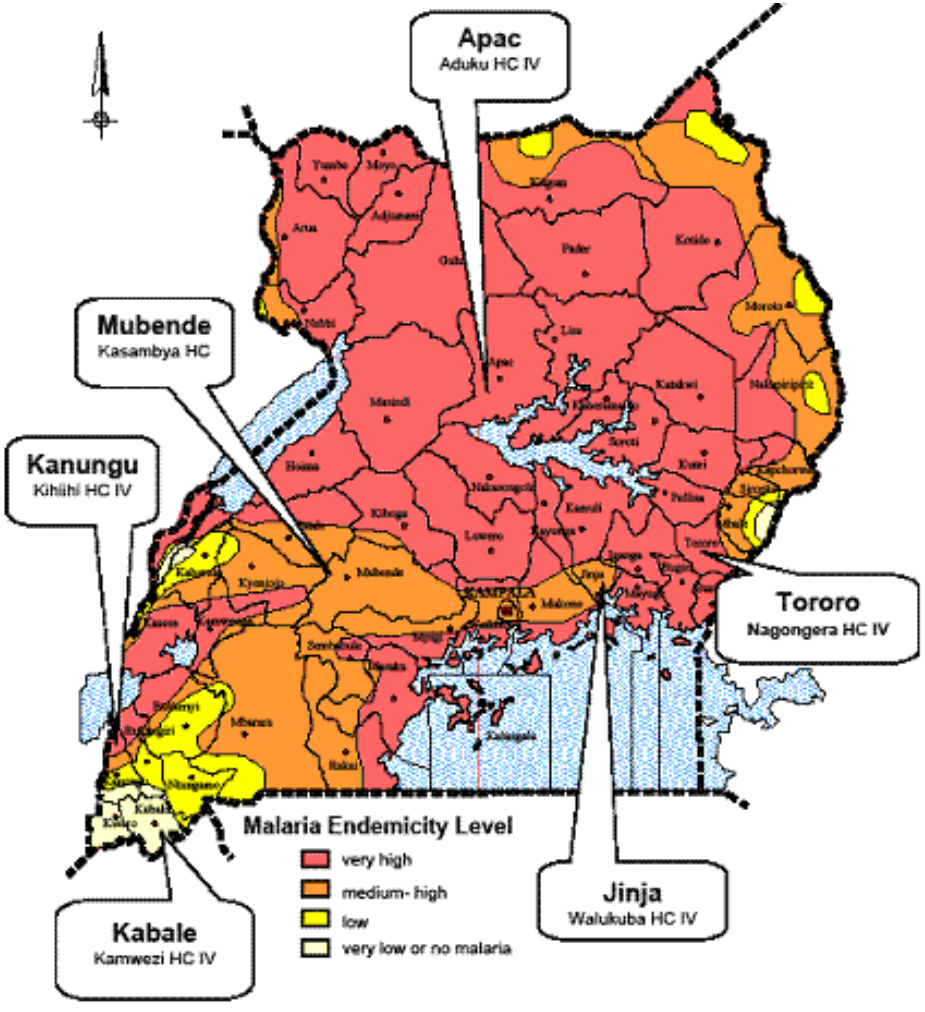
Uganda analysis

We present a preliminary evaluation of the normalized logarithm of the entomological inoculation rate, ln(EIR), from

- Malaria Analysis system
- Malaria Forecast system from 1 to 4 months ahead

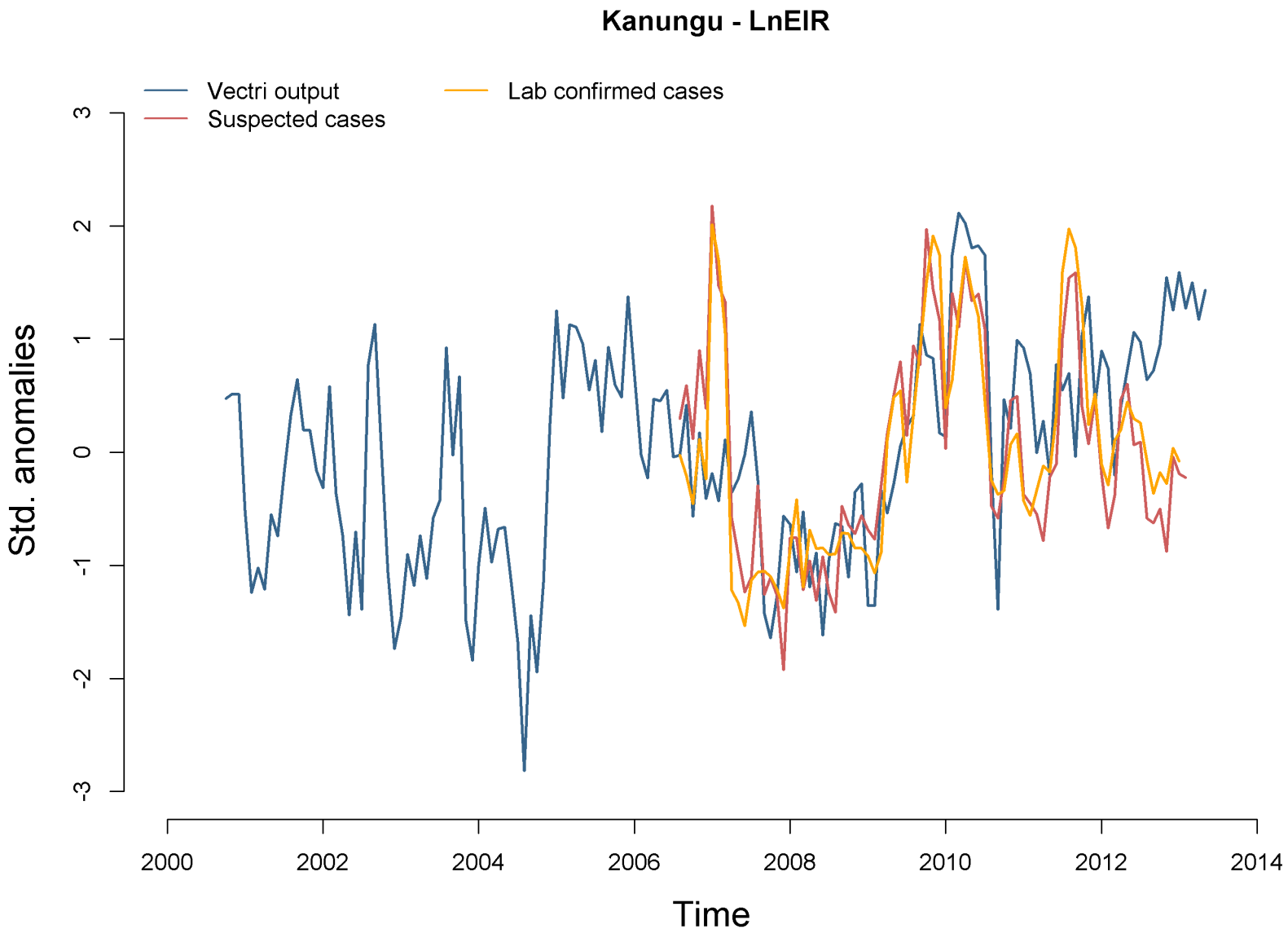
Comparing to observed malaria cases.

- MoH district data suspected cases 2002-2010
- UMSP confirmed cases from 6 sentinel sites 2006/09-2013

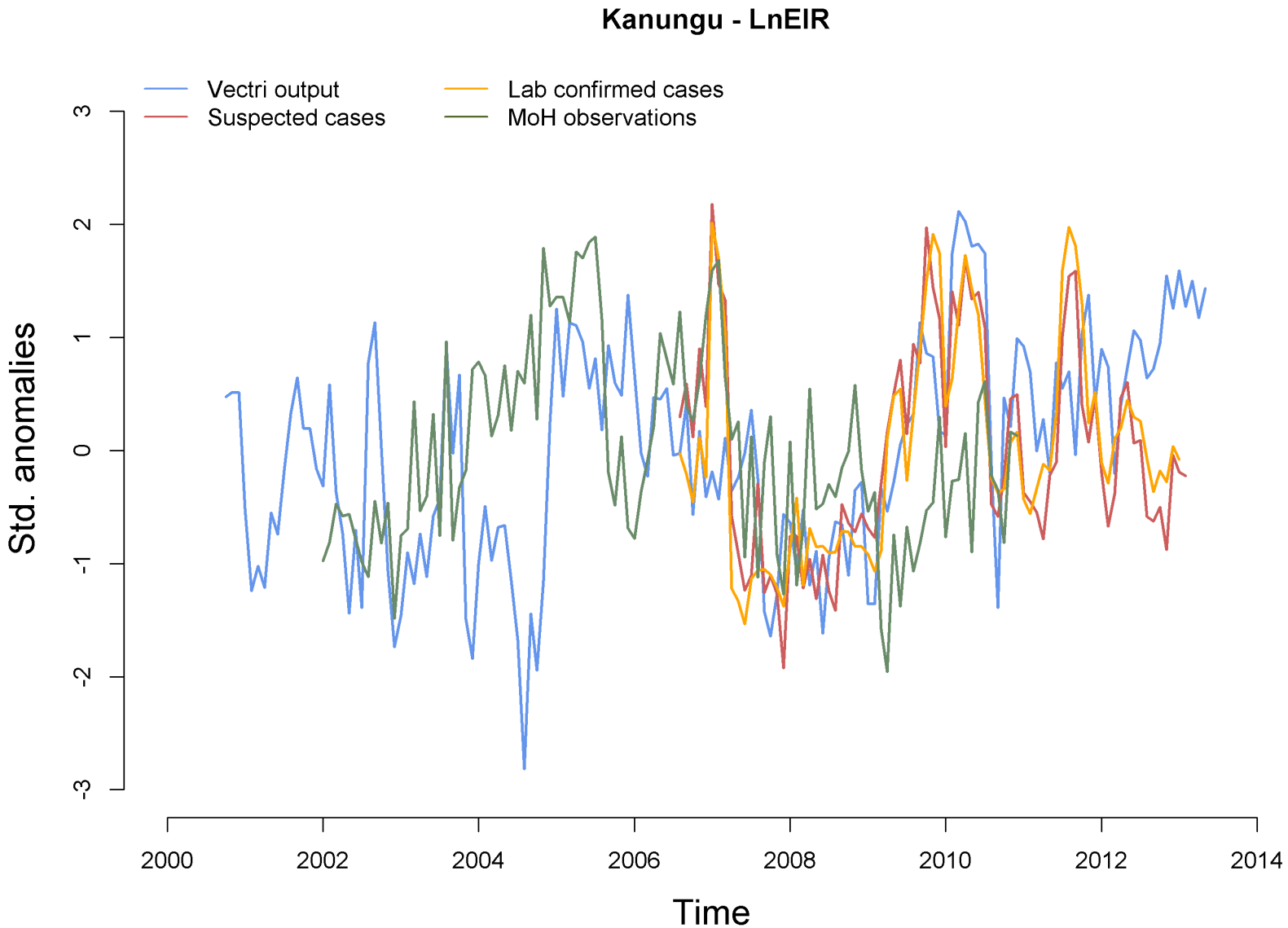


See Colón-González et al. (2013) for analysis of Uganda data.

Vectri analysis against Kanungu Sentinel site cases:
(1) Model performs well (2) Climate a driver of malaria variability

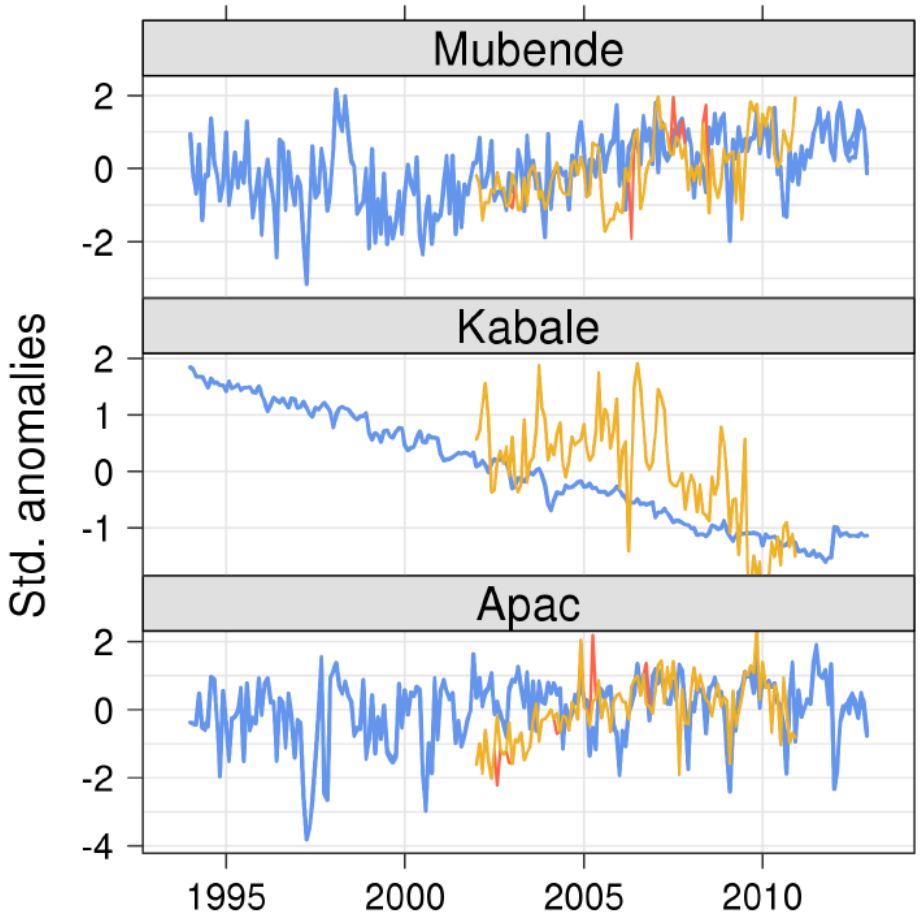


MoH district data shows disparities.

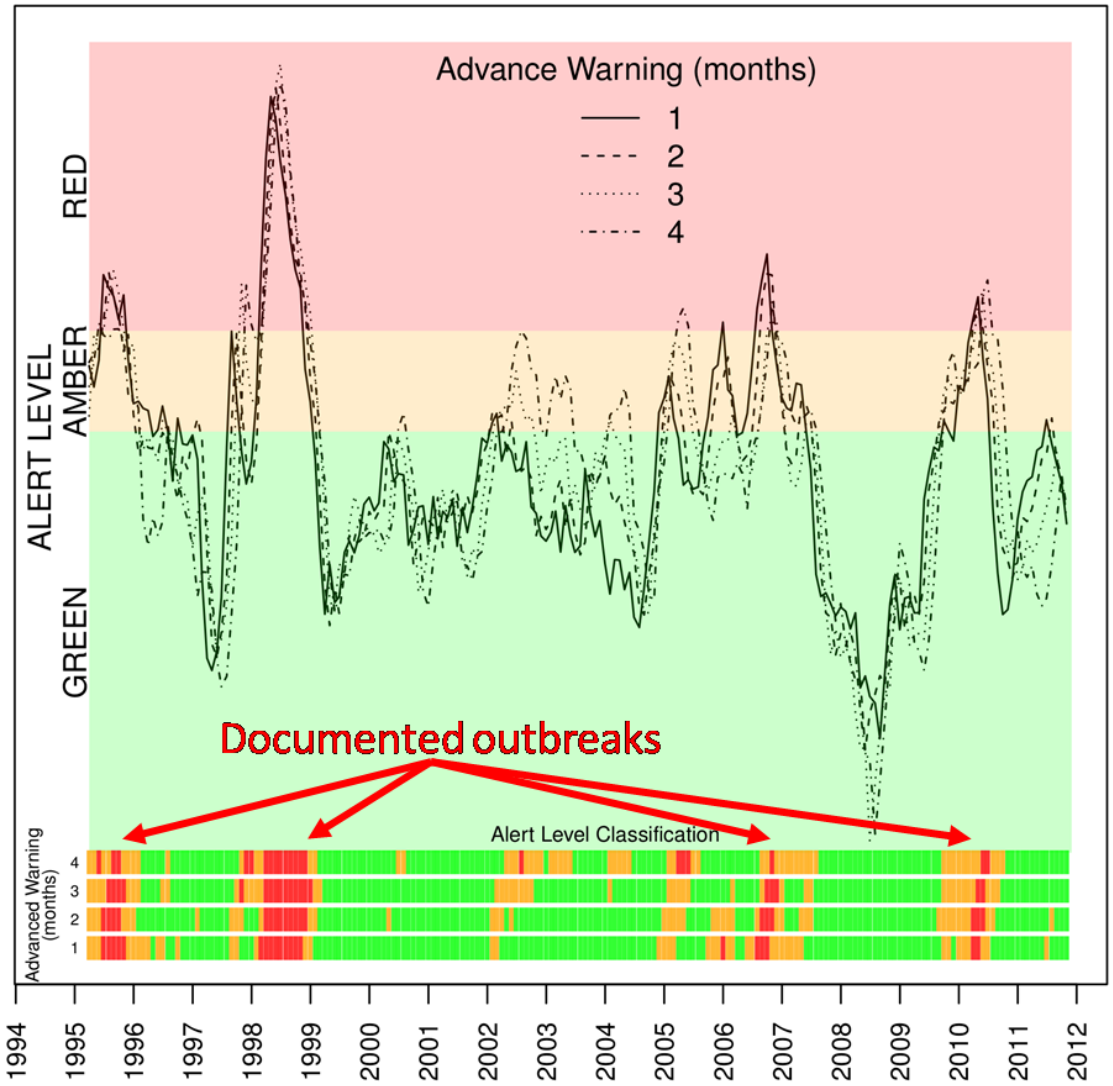


Comparison of lead 1 month forecasts to MoH district data for 3 districts:

1. Forecasts fail for Kunungu and Kabale due to cold temperature bias
2. Apac excellent from 2005 (initial transition trend?)
3. Peak in 1998 associated with El Niño



Malaria seasonal forecasting system for Ugandan and West Kenyan highlands



Conclusions

- A pilot malaria forecast system is ready
- Pan-continental test show *potential* skill out to 3 months and beyond
- Preliminary results from Uganda sentinel and MoH district data:
  - agreement between VECTRI analysis and sentinel data
  - clear signal of climate drivers
  - disparities in MoH data due to uncertainties as well as socio-economic factors and interventions
  - Preliminary: Forecasts skilful out to 4 months
  - Products for policy integration required

Next steps

- Proposal to EUAID to operationalize system in Senegal
- Obvious need to extend to EUROSIP
- Work continuing to evaluate and implement system in Uganda
- Stochastic physics for VECTRI to account for model uncertainty
- further model developmentments underway : Immunity, interventions, coupling to WISDOM.