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Potential for malaria seasonal forecasting in Africa

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As monthly and seasonal dynamical prediction systems have improved their skill in the tropics over recent years, there is now the potential to use these forecasts to drive dynamical malaria modelling systems to provide early warnings in epidemic and meso-endemic regions. We outline a new pilot operational system that has been developed at ECMWF and ICTP. It uses a precipitation bias correction methodology to seamlessly join the monthly ensemble prediction system (EPS) and seasonal (system 4) forecast systems of ECMWF together. The resulting temperature and rainfall forecasts for Africa are then used to drive the recently developed ICTP malaria model known as VECTRI. The resulting coupled system of ECMWF climate forecasts and VECTRI thus produces predictions of malaria prevalence rates and transmission intensity across Africa. The forecasts are filtered to highlight the regions and months in which the system has particular value due to high year to year variability. In addition to epidemic areas, these also include meso and hyper-endemic regions which undergo considerable variability in the onset months. We demonstrate the limits of the forecast skill as a function of lead-time, showing that for many areas the dynamical system can add one to two months additional warning time to a system based on environmental monitoring. We then evaluate the past forecasts against district level case data in Uganda and show that when interventions can be discounted, the system can show significant skill at predicting interannual variability in transmission intensity up to 3 or 4 months ahead at the district scale. The prospects for a operational implementation will be briefly discussed.