# SPECIAL PROJECT PROGRESS REPORT

Progress Reports should be 2 to 10 pages in length, depending on importance of the project. All the following mandatory information needs to be provided.

**Reporting year** 2013

**Project Title:** Use and value of ECMWF short-range and seasonal forecast products for developing countries in terms of end-user impact variables

**Computer Project Account:** SPITP4DC

**Principal Investigator(s):** Adrian Tompkins

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**Affiliation:** Abdus Salam International Institute for Theoretical Physics (ICTP)

**Name of ECMWF scientist(s) collaborating to the project** (if applicable) ……

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**Start date of the project:** 1 January 2013

**Expected end date:** 31 December 2015

**Computer resources allocated/used for the current year and the previous one** (if applicable)
Please answer for all project resources

| | | Previous year | | Current year | |
|---|---|---|---|---|---|
| | | Allocated | Used | Allocated | Used |
| **High Performance Computing Facility** | (units) | 300 | 283 | 300 | 0 |
| **Data storage capacity** | (Gbytes) | 100Gb | | 100 Gb | |

## Summary of project objectives

(10 lines max)

The projects examines the scope for operational seasonal forecasting of health risks in developing countries, with the primary interest concerning the prediction of malaria transmission in Africa, with a focus on Malawi, Uganda and Rwanda. The project aims to couple the (bias corrected) monthly EPS and SYSTEM4 seasonal forecast system to the ICTP dynamical malaria model VECTRI. The precipitation and temperature forecasts then lead to forecasts of malaria transmission intensity, prevalence rates and eventually also actually hospital case data. The project will set up the pilot system, examine the skill in the target countries using hindcast datasets, analyze if improvements can be made including non-climatic factors, and finally, but most importantly, work directly with the ministry of health in the target countries to develop and hone end-user products that are directly useful to stakeholders and decision makers.

## Summary of problems encountered (if any)

(20 lines max)

none to report

## Summary of results of the current year (from July of previous year to June of current year)

### a) VECTRI model completed and documented

VECTRI (VECtor borne disease community model of ICTP, TRIeste) is a mathematic dynamical model for malaria transmission that accounts for the impact of climate variability and population. It was written in the early period of 2011 and officially launched at the second workshop for East Africa Climate and impacts at the university of Addis Ababa in November 2011. The underlying aim of the model is to provide a research tool to understand what drives malaria transmission that can be applied on a regional scale but at spatial resolutions of 10km or less. Over the past year, the release beta version of VECTRIwas finalized and released to the broad community (over 6 groups across the world are now seriously using the model from a total of 20+ web enquiries), with this version documented in Tompkins and Ermert (2013).

The VECTRI model has been designed to have a flexible netcdf-based interface structure and has so far been coupled to the following driving fields:

- Observations of precipitation from FEWS, CMORPH and TRMM
- Renanalysis fields from ERA-Interim
- ECMWF monthly and seasonal forecast fields
- AR4 and AR5 climate model output

Work using the model driven by AR5 climate models has documented in Kovats et al. (2013) and Piontek et al. (2013)

### b) VECTRI-ECMWF pilot early warning system system complete

Over the past year, a coupled system has been set up that uses monthly and seasonal hindcasts, which are bias corrected using the method of Di Giuseppe et al. 2013. These are then used to drive the malaria model to produce an ensemble malaria forecasting system. The hindcasts have been validated against their own analysis and show that skill in the rainfall and temperature out to month 1 lead to skill in malaria transmission intensity and prevalence predictions out to month 3. Essentially the lead time of environmental monitoring based systems is extended by the length of time for which the ECMWF forecasts have skill, up to one month for most of Africa, but up to 2 or 3 in areas such as southern and eastern Africa with strong El-Nino teleconnections.

Note that the results from this initial work are under consideration for publication in Science magazine and thus can't be included in this progress report as plots since online publication can prejudice the journals decision.

## List of publications/reports from the project with complete references

Tompkins, Adrian M., and Volker Ermert. "A regional-scale, high resolution dynamical malaria model that accounts for population density, climate and surface hydrology." Malaria journal 12.1 (2013): 65.

Kovats RS, Rocklov J, Caminade C, Tompkins AM, Morse AP, Jesus Colon-Gonzalez F, Stenlund H, Martens P, Lloyd SJ, 2013: Modelling the impact of climate change on malaria: a comparison of global malaria models, PNAS submitted

Franziska Piontek et al (including Tompkins AM) . 2013: Leaving the world as we know it: Hotspots of global climate change impacts, PNAS in press

## Summary of plans for the continuation of the project

The next steps of the project for the following 12 months are

- Upgrade the VECTRI model version in the forecast system from 1.26 to 1.31
- Develop some specific country and district level plots for Uganda, Rwanda and Malawi
- Begin the process of country level validation of hindcasts against health databases
- Investigate methods for improving the representation of uncertainty, for example by introducing a VECTRI perturbed ensemble (stochastic physics) for the impacts component.