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Simulating infectious disease risk based on climatic drivers: from numerical weather prediction to long term climate change scenario

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Climate variability is an important component in determining the incidence of a number of diseases with significant health and socioeconomic impacts. In particular, vector born diseases are the most likely to be affected by climate; directly via the development rates and survival of both the pathogen and the vector, and indirectly through changes in the surrounding environmental conditions. Disease risk models of various complexities using different streams of climate forecasts as inputs have been developed within the QWeCI EU and ENHanCE ERA-NET project frameworks. This work will present two application examples, one for Africa and one for Europe. First, we focus on Rift Valley fever over sub-Saharan Africa, a zoonosis that affects domestic animals and humans by causing an acute fever. We show that the Rift Valley fever outbreak that occurred in late 2010 in the northern Sahelian region of Mauritania might have been anticipated ten days in advance using the GFS numerical weather prediction system. Then, an ensemble of regional climate projections is employed to model the climatic suitability of the Asian tiger mosquito for the future over Europe. The Asian tiger mosquito is an invasive species originally from Asia which is able to transmit West Nile and Chikungunya Fever among others. This species has spread worldwide during the last decades, mainly through the shipments of goods from Asia. Different disease models are employed and intercompared to achieve such a task. Results show that the climatic conditions over southern England, central Western Europe and the Balkans might become more suitable for the mosquito (including the proviso that the mosquito has already been introduced) to establish itself in the future.