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How do mosquitoes grow ? How do arboviruses propagate ? The case of chikungunya.

The chikungunya virus is an "arbovirus", i.e. a virus transmitted to vertebrates by blood-feeding insects called arthropods, such as mosquitoes. In 2006, again, an important chikungunya epidemic appeared on the Reunion Island with over 244,000 reported cases and 205 deaths. More recently, in 2007, a chikungunya epidemic of less impact occurred for instance in Italy. In these two cases, Aedes Albopictus mosquito is the main vector. The purpose of this work is first of all to propose mathematical models of the vector population and virus propagation dynamics. The first one is based on the Aedes albopictus life cycle while the second is of SIR-type. In a second part, the global asymptotic stability (GAS) analysis of equilibria is done. GAS of the nonlinear model, which is proposed to describe the vector population dynamics, is studied using Lyapunov functions. The same work is done for the propagation model using the theory of competitive systems.

This is a joint work with M. Cadivel and M.A. Aziz-Alaoui from Laboratoire de Mathématiques Appliquées du Havre (LMAH), Université du Havre.