# On the Geographic Spread of Chikungunya between Brazil and Florida: A Multi-patch Model with Time-delay

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Chikungunya (CHIK) is a viral disease transmitted to humans through the bites of Aedes mosquitoes infected with the chikungunya virus (CHIKV). CHIKV has been imported annually to Florida in the last decade due to Miamiâ€™s crucial location as a hub for international travel, particularly from Central and South America including Brazil, where CHIK is endemic. This paper presents a comprehensive mathematical model for the geographic spread of CHIKV, incorporating pivotal factors such as human movement, temperature, rainfall, vertical transmission, and incubation period. Central to the model is the integration of a multi-patch framework, considering human movement between endemic Brazilian states and Florida. We establish crucial correlations between the mosquito reproduction number Rm and the disease reproduction number R0, thereby advancing our understanding of CHIKV transmission dynamics in complex multi-patch environments. Through numerical simulations, validated with real population, temperature and rainfall data, it is possible to understand the disease dynamics under many different scenarios and make future projections, offering crucial insights for devising effective control strategies. This is a joint work with A. Gondim, X. Huo and S. Ruan.t

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