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# OPTIMAL PENGUIN FORAGING STRATEGIES UNDER ENVIRONMENTAL VARIABILITY. A HYBRID DYNAMICAL SYSTEM APPROACH

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Penguins face extreme conditions during reproduction. They must nest at the coast but also travel very long distances to find food resources (sometimes hundred of kilometres), while keeping the nest under constant parental supervision during the chick rearing phase. Thus, a good synchronisation between both individuals in a couple is essential for reproduction success. We propose a theoretical model to study this foraging-breeding cycle using Hybrid Dynamical Systems which combine regular continuous dynamical systems, and discrete dynamical systems that switch between different state discontinuously. Using this framework, and under some reasonable and verifiable assumptions, we can derive predictive models for the reproduction success depending on the (stochastic) environmental conditions, and we show that different optimal strategies arise at the colony level, depending on these environmental conditions.