Assume that the number found positive for malaria parasitaemia at location i is Y_i out of N_i examined then Y_i is a binomial random variable:

$$Y_i \approx Bin(N_i, p_i)$$

The bivariate ordinary logistic regression model is given by:

$$\log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 env_i$$

Where β_o is the intercept, env_i is the environmental covariate, β_1 is the corresponding regression parameter. The spatial correlation is modelled by inclusion of a random effect S_i:

$$\log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 env_i + S_i$$

The spatial component, S_i, is defined by the isotropic, exponentially decaying correlation function:

$$f(d_{ij};\phi) = \exp\left[-(\phi.d_{ij})\right]$$

The range Φ measures the rate of decay of spatial autocorrelation, and $d_{i,j} = x_i - x_j$ measures the Euclidian distance between locations x_i and x_j.