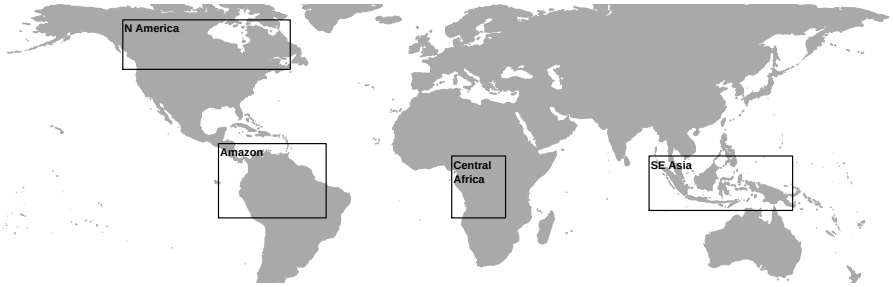

Figure 1. A map of the forest regions used in the study. Regions are: Amazon 15°S - 15°N, 270°E - 315°E; Central Africa; 15°S - 10°N, 7.5°E - 30°E; SE Asia 12°S - 10°N, 90°E - 150°E; North America 45°N - 65°N, 230°E - 300°E.

1 The emulator

Throughout the study, we use a kriging function, similar to a Gaussian process regression emulator, as coded in the R package DiceKriging (**?**) for prediction of climate simulator output at untried inputs.

We treat the output of the simulator (y) as an uncertain function f() of the simulator inputs x, so that y = f(x). We wish to produce a predictive distribution for Y = f(x) at any model input, conditional on the points already run, or the design X.

The kriging model or Gaussian Process regression is specified hierarchically with a separate mean and covariance function. For prediction purposes, we assume that the trend is a simple linear function of the inputs.

$$f(x) = h(x)^T\beta + Z(x)$$

Where $h(x)^T\beta$ is the mean function, and the residual process Z is a zero mean stationary Gaussian process. The covariance kernel c of Z

$$Cov(Z, Z') = \sigma^2 c(x, x')$$

can be specified in a number of different ways: we use the default diceKriging option of a Matern v=5/2 function so that

$$c(x, x') = (1 + \frac{\sqrt{5}|x - x'|}{\theta} + \frac{5|x - x'|^2}{3\theta^2})exp(-\frac{\sqrt{5|h|}}{\theta})$$

We use Universal Kriging, with no 'nugget' term, meaning that the uncertainty on model outputs shrinks to zero at the design points.

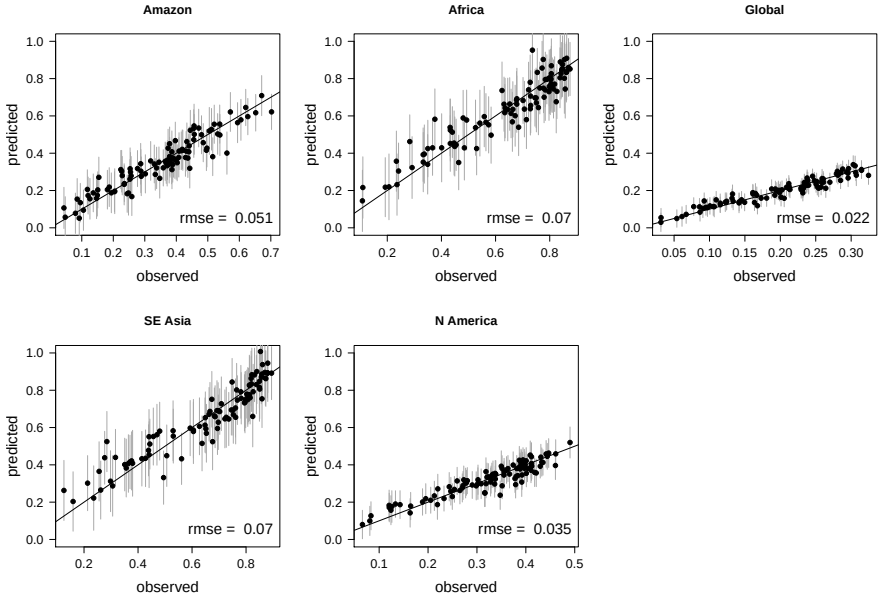

Figure 2. Leave-one-out cross validation performance of the emulator, when reproducing each forest fraction. Black points represent the emulator central estimate of a held-out point, with grey lines representing $\pm$ 2 standard deviations.