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Spatial diffusion of deforestation in the Brazilian Legal Amazon

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Most recent models of deforestation in the Brazilian Legal Amazon concern the factors affecting this process, and are useful for understanding driving causes of deforestation and how to plan development with the lowest possible impact. Another way to look at deforestation is to understand its spatial distribution over the region, assessing the probability of deforestation based on the percentage of forest in the neighborhood. The spatial pattern of deforestation was obtained through semivariograms and correlograms including the entire Brazilian Legal Amazon.
Analyses were done at two different scales, using quadrats of 50 x 50 km (total coverage, N=1932), and a random sample of 5000 quadrats of 20 x 20 km (from the approximately 12000). To assess if the effect of distance is isotropic (i.e., has the same intensity) in all directions, we applied the semivariograms to different directions: 0^o, 45^o, 90^o and -45^o . Each model was adjusted using nugget, sill, and range, and the results for these directions were compared. Correlograms were applied to obtain the magnitude of spatial dependence of the deforestation process. The semivariograms indicated that deforestation is an anysotropic phenomenon, being more pronounced in the N-S and E-W directions. All variograms were adjusted using the exponential model, and the sill was similar for all directions, but shapes of the curves revealed different patterns. Variograms in the N-S and E-W directions had the most accentuated increment in variation for the first five intervals, for both scales. Correlograms detected a strong spacial dependence, with coefficients ranging from 0.8 to 0.5 for the first five classes. At the 50-km scale, correlograms showed a continuous trend falling as a function of distance, but at the 20km scale, the falling trend stabilized around a coefficient of 0.3. Thus, results indicate strong spatial dependence in the deforestation process, and this should be considered in further analysis and models.