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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°, 45°, 90° and -45°. 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 anisotropic 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 spatial 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.

Figure 1 The Brazilian Legal Amazon divided into 2500-km² quadrats. The 120 quadrats used in this study are shown in three shades (light grey, 0-33.3% deforested; dark grey, 33.3-66.7% deforested; black, >66.7% deforested). In this study, we tolerated some spatial autocorrelation to ensure that sampled sites included a wide range of deforestation values. Finally, many of the predictors we assessed were both spatially autocorrelated (e.g. population density, highways and roads) and functionally related (e.g. highways promote forest colonization, leading to local population increases), and thus it is difficult to assess the impacts. Deforestation of the Brazilian Amazon surged last month to the highest May level since the current monitoring method began, prompting concerns that president Jair Bolsonaro is giving a free pass to illegal logging, farming and mining. The world's greatest rainforest which is a vital provider of oxygen and carbon sequestration lost 739sq km during the 31 days, equivalent to two football pitches every minute, according to data from the government's satellite monitoring agency. Although a single month is too short to confirm long-term trends, May is considered an important guide because it marks the start of the dry season, which is when most burning and other forms of forest clearance are carried out. Unless the government sends a... The deforestation rate of the Legal Amazon region in Brazil reached the highest level in over a decade. * The 'Legal Amazon' is an area of more than five million square kilometers, which comprises the Brazilian states of Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima and Tocantins. Figures have been rounded. Open this statistic in...