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Greenhouse gas emissions in the Brazilian semiarid region: environmental, climate and social constraints

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The process of removing a forest to open new agricultural lands, which has been very intensive in developing countries like Brazil during the last decades (Lapola et al, 2014), contributes to about 12% of the global anthropogenic emissions (Le Quéré et al., 2009). Forest cover removal releases carbon dioxide (CO_2) and other greenhouse gases (GEE) like methane (CH4) and nitrous oxide (N2O), as a result of burning trees, followed by gradual decomposition of the forest biomass left on the ground while pasture or crop plantations are being established (Ramankutty et al., 2007). In Brazil, the 2nd Brazilian National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), presents the mean annual net CO_2 emissions caused by changes in land use in each Brazilian biome and the first place in the ranking is occupied by the Amazon Rainforest Biome (860,874 Gg), followed by Savannah (302,715 Gg), Atlantic Forest (79,109 Gg), Caatinga (37,628 Gg), Pantanal (16,172 Gg) and Pampa (-102 Gg) (MCT 2010). Despite these results, the estimates of CO_2 emissions caused by land use changes in the Brazilian semiarid region (Caatinga) are very limited and scarce, and associated to uncertainties which are directly related to the estimated biomass in different types of vegetation which are spatially distributed within the biome, as well as the correct representation of the dynamics of the deforestation process itself, and the more accurate mapping use and land cover. Based on such facts, this project is estimating the emissions of the main greenhouse gases (CO_2, N2O and CH4) caused by land use changes in an area of Caatinga biome in Pernambuco State through the model INPE-EM. So far, it is known that from decades of 1940 up to 1995, Caatinga biome has contributed with about 3.2 % to total land use change emissions in the country (Leite et al, 2012), and recently (1990-2005), the contributions of Caatinga are even higher (over 30%), according to the 2nd Brazilian National Communication (2010). By means means of the model INPE-EM (data still being acquired), we are trying to diminish the uncertainties and identify specific and integrated emissions of GHG, as well as the stocks and flows of C and N, in order to contribute to the current information about GEE dynamic in the Brazilian Northeast and also to enhance the Brazilian GHG inventory. Besides, the model will incorporate the temporal dynamics related to the deforestation process, and accounts for the biophysical and socioeconomic heterogeneity of the region in study.