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Influence of dryland vegetation dynamics in the sediment connectivity

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The sediment connectivity index shows potential for sediment connectivity in the landscape surface. The vegetation cover acts decreasing the runoff and erosion rate at the same time increase the surface roughness, showing an inversely proportional relationship between vegetation density and sediment connectivity. In tropical dryland landscapes, the vegetation has mainly semi-deciduous and deciduous dynamics controlled by the rainfall concentration, where the biomass density can change impressively during the season, like as neotropical dry forest cover. Understand how the dynamic of the dryland vegetation can affect the potential of sediment connectivity is necessary to understand the real connectivity dynamic of these areas. This research aims to understand how the biomass density dynamic modifies the potential of sediment connectivity in a semiarid watershed in Brazil with mainly neotropical dry forest cover. To identify the variability of the biomass density linked to the variation of soil moisture it was used precipitation data from 19 rain gauges inside of the watershed. It was chosen four scenarios; two in a very wet hydrological year, and two in a very dry hydrological year. For each year, one scenario was selected at the end of the rainy season and at the end of the dry season, to measure the maximum and minimum of biomass density, respectively. The biomass was calculated by NVDI, and this index was used to differentiate each scenario. With the definition of the vegetation, scenarios were calculated the Sediment Connectivity Index for each vegetation scenario. It was selected the very wet period between 2007 and 2009 (rainy season image of 19/06/2008 and dry season image of 13/01/2009), with an average annual rainfall of 578mm. The second one was the very dry period between 2015 and 20017 (rainy season image of 12/06/2017 and dry season image of 02/12/2016) with an average annual rainfall of 213mm in the watershed. In the very wet years, the average biomass index was 0.23 and 0.51, during the dry season and wet season respectively. On the other hand, in the very dry years, the average biomass index was 0.15 and 0.27, during the dry season and wet season respectively. Moreover, in the rainiest scenarios (rainy years after the rainy season) with 31% with biomass density similar to rainforests, reaching maximum values above 0.8. On the other hand, the scenario at the end of the rainy season during the very dry years only 0.001% of the area shows a rainforest density. These biomass variations affect directly the sediment connectivity index comparing the four scenarios. With the range between 31.2% and 0.04% of the area with high sediment connectivity and 0.06% and 0.22% of the area with low sediment connectivity, for the vegetation scenarios of 02/12/2016 and 19/06/2008 respectively. The results show that the vegetation density and the potential sediment connectivity is affected not only by the actual soil moisture expected by each season, but also by the average of rain in more than one year, so in this way, even two scenarios post rainy season can show very different connectivity index.