Секция «Охрана окружающей среды»

Use of remote sensing to determine the vegetation state and biomass in Ecuadorian forests through the Normalized Differential Vegetation Index (NDVI)

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Nowadays, the world is suffering the effects of climate change as result of anthropogenic impacts. Conservation and sustainable development of forests is one mitigation mechanism because they absorb and store carbon in biomass and soils. The biomass estimation allows to evaluate forest productivity, control carbon budgets and understand the carbon cycle [4]. Biomass and carbon sequestration studies in Ecuador are scarce and the applied field methodology needs resources investments. Therefore, to determine the Ecuadorian vegetation state and biomass by remote sensing and NDVI is a fast and low-cost option. NDVI algorithm takes advantage of the light absorption in dependence of the plant vigor. The formula is NIR-RED/ NIR+RED, where NIR is the reflectivity in the near infrared zone and RED in the red one [2].

Ecuador Landsat images were processed (radiometric calibration and atmospheric correction) to determine NDVI histograms in ENVI 5.3. The NDVI Map of Ecuador (Fig. 1) was created in ArcGIS 10.3 and the biomass estimation followed the methodology applied in [1]. The map shows that the Amazon region has the best plant vigor. The Coast was classified as degraded and uncovered land, mainly it is due to the past expansion of agriculture [5]. The estimated biomass for 2017 was 4,86 Gt. The increase detected in comparison with the biomass of 2012 (3,22 Gt) is owing to the deforestation rate decrease. Between 2014 and 2016, it was 61 thousand ha/year, which represents a reduction of 33,7% compared to 1990 - 2000 period (92 thousand ha/year). The advance in the forest conservation is thanks to the current government that consider the nature as a subject of law and projects like REDD program [5]. A second explanation is a compensatory effect between the atmosphere and the forest ecosystems which points out an increase in biomass production with the increase in the CO2 emissions [3]. These results are useful for planning environmental practices such as forest conservation and reforestation in order to increase carbon storage.

References

1) Григорец Е.А., Пермитина, Л. И., Капралова Д.О. Использование российских данных дзз для изучения динамики восстановления эколого-ресурсного потенциала лесных регионов после воздействия пожаров // Егиональные проблемы дистанционного зондирования земли, III Международной научной конференции, Сибирский Федеральный Университет. 13–16 сентября. Красноярск, 2016. С. 234 – 237.
2) Черепанов А.С., Дружинина Е.Г. Спектральные свойства растительности и вегетационные индексы// Геоматика. М., 2009. №3(4). С. 28-32.
3) Kurbatova A.I., Tarko A.M., Kozlova E.V. An impact of rising atmospheric concentrations of carbon dioxide on plants in Central and South America. RUDN Journal of Ecology and Life Safety, M, 2017. No. 25(1). P. 58-72.
4) Walker, W., Baccini. Field Guide for Forest Biomass and Carbon Estimation. Woods Hole Research Center, Falmouth, Massachusetts, USA, 2011.
5) www.ambiente.gob.ec (Environmental Ministry of Ecuador).

Illustrations

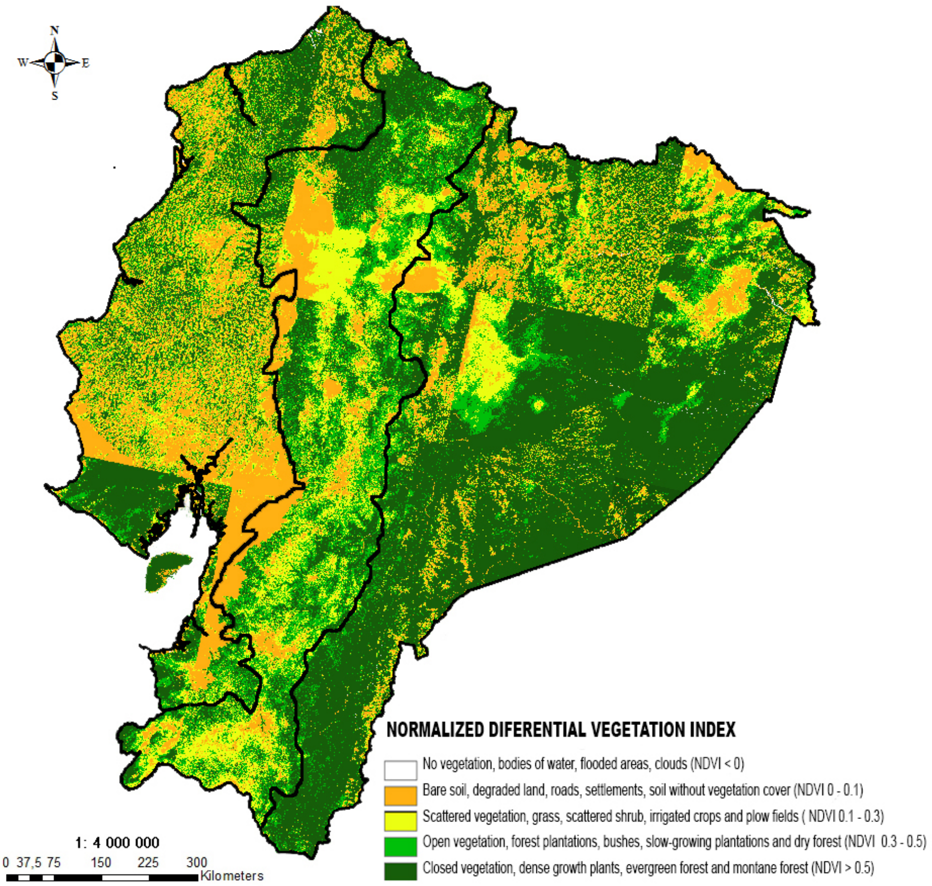

Рис. 1. Normalized Differential Vegetation Index Map of Ecuador for 2017. Coast, Sierra and Amazon region (from left to right).