Regession analysis of geomorphic-vegetation cover relationships with emphasis on spatial scale (case study, Arsbaran catchments: naposhtehcay, ilghinehcay and mardanqumcay)

Extended Abstract:
1- Introduction: Special and sensitive role of vegetation cover in ecosystem sustainability and moderating hazards such as floods, erosion and pollution of water resources persuades us to understand the environmental variables affecting the growth and development of it. This issue particularly is important for susceptible mountainous catchments. In these environments, geomorphic variables as special representative of environmental factors have close and interweaved relation to vegetation cover. So, knowledge of the relationships between geomorphology and vegetation can help us to better manage and maintain the mountainous ecosystems. The understanding requires analysis the spatial relationships and scientifically accurate spatial modeling. In this regard, the emergence and development of remote sensing (RS) and geographic information system (GIS) have widely improved modelling the spatial variations of vegetation cover. However, a few issues that are fundamental and important in geomorphic-vegetation relations must be noticed. Maybe, the scale is the most important issue in phytogeomorphic researches. This study aimed to assess and determine the relationships between geomorphology and vegetation cover using spatial regression approach in Arasbaran catchments (3 catchments: Naposhtehchhay, Ilginehchay and Mardanqumchay). We have particular stress for effect the scale on the relations and comparison of predictive regression models in multiple scales based on catchment and subcatchment divisions.
2-Materials and Methods: Our approach is based on spatial multiple regression analysis between geomorphologic parameters and abundance of vegetation. In this regard, 27 geomorphomety parameters as independent variables and Normalized Difference Vegetation Index (NDVI) as the dependent variable were computed from Landsat imagery (ETM sensor) and digital elevation model (DEM) SRTM. First, preprocessing operations including atmospheric correction (noise reduction) and geometric correction were performed on the sattellite image. DEM is preprocessed by removal of sinks in GIS environment. After radiometric and geometric corrections, raster layers of geomorphic parameters extracted and prepared using GIS and SAGA softwares and NDVI layer computed using IDRISI software. Furthermore, determination and mapping the cathments and subcatchments performed by ArcHydro extension of GIS.Given the various scales of the variables, it was necessary to normalize the scale of data using the following formula: In the formula, x: raw value of the variable; min (x): minimum of the variable; max (x): maximum of the variable.We use the SAGA for performing the spatial multiple regression (stepwise method) with 0.01 signisicance level. We examine the regression relations in two scales: 1- catchments 2- subcatchments. Finally, we compare different spatial multiple ression models at 2 scale for selection of best models.
3- Results and Discussion: Initial results of showed that many of geomorphological parameters had significant relations with vegetation cover in spite of their low correlation coefficients. The results of rgression steps indicated that 8 parameters including valley depth, topographic position index, elevation, slope, slope position, transformed aspect, earth surface convexity and general curvature are the most important inependent variables in explaining the variance of dependent variable at catchment scale. The best linear regression model was abtained in Mardanqumchay catchment (R^2= 0.32) in among regression models. In contrast, the weakest regression model is abtained in Naposhtehcay catchment (R^2= 0.11) in among regression models. It appears that Ilghinehcay catchment have moderate phytogeomorphic conditions having moderate rgression model (R^2= 0.21) in among regression models. It is found that there is a correspondence between ruggedness of catchments and prediction power and efficiency of the regression models. The results of regression analysis at subcatchment scale were significantly different. At this scale, best regression models observed with 0.42, 0.51 and 0.62 R^2 values in Naposhtehchhay, Ilginehchay and Mardanqumchay, respectively. In contrast, weakest regression models observed with 0.08, 0.15 and 0.13 R2 values in Naposhtehchhay, Ilginehchay and Mardanqumchay, respectively. Hence, not only there are many differences among subcatchments, but there is considerable difference between catchments and subcatchments in the respect of intensity of relations between geomorphic parameters and vegetation cover.

4- Conclusion: Results of the research showed the geomorphic parameters including valley depth, topography position index, elevation, slope, slope position, transformed aspect, earth surface convexity and general curvature valley are the most effective variables in explaining the spatial variations of vegetation cover in Arasbaran catchments. The selected geomorphic variables, Wholly, are partly complete reflection of geomorphology of a site, not only keeping the relation between form and process, are the special representative of other environmental factors. Although significant portion of spatial variations of the vegetation cover could not be explained by final regression models at cathment scale, but the predictive models are valuable, considering the application of pixel-based spatial approach in regression analysis, in one hand and complex non-linear relationships between vegetation cover and geomorphology, in other hand. At subcatchment scale, some of these relations are stronger than catchment scale and regression models are more efficient, leading to inhance the understanding of relationships between geomorphology and vegetation. Furthermore, we can give preference to subcathments based on strength of regression relations (R2 rates), which determines the phytogeomorphic sensivity of them, in order to manage and support the mountainous ecosystems. It is concluded that important information about relationships between geomorphology and vegetation can be acquireed at multiple scales, simultaneously.

spatial regression, geomorphic parameter, vegetation cover, scale, Arasbaran