The relationship between topography and vegetation growth

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Vegetation growth is affected by many factors such as soil moisture, air temperature, light, nutrients, soils, competition, predation, disturbance, species composition, etc. Variations in many of these variables are associated with attributes of local topography such as aspect, elevation, slope and inclination, as well as climate drivers. Topography strongly affects the distribution of insolation. Patterns of incoming solar radiation affect energy and water balances within a landscape, resulting in changes in air temperature, humidity and soil moisture, which in turn impact vegetation attributes.

In the Northern hemisphere, it is common sense that a southwestern slope is sunnier, hotter and drier than a northeastern slope because the apex of the sun is perpendicular to south-facing slopes. From the air, it is often easy to see the denser vegetation on north-facing slopes. However, in some parts of the world with plenty of moisture, vegetation may prefer south-facing slopes where they can thrive in the relative warmth. Other factors such as climate, elevation, and species composition may further complicate these relationships.

Imagery, will provide relevant information. Radar amplitude data will add a further informative layer. SAR data layers will be

coupled with information on the local topography, which is required to precisely determine slope aspect (direction), will be obtained from available global DEMs, such as that produced by the SRTM (Shuttle Radar Topography Mission) mission (Rebus et at., 2003).

Fekedulegn et al. 2004, found that mesic (north and east) aspects were 27-50% more productive, 5.55C cooler, 25% higher relative humidity, and 37% less vapor pressure deficit than the xeric (west and southwest) aspects for a forested

Appalachian watershed.   Mohammad (2008) found that vegetation biomass, density and cover, as well as soil organic matter, electrolyte concentration, available phosphorus and moisture content are all higher on the northern slope in

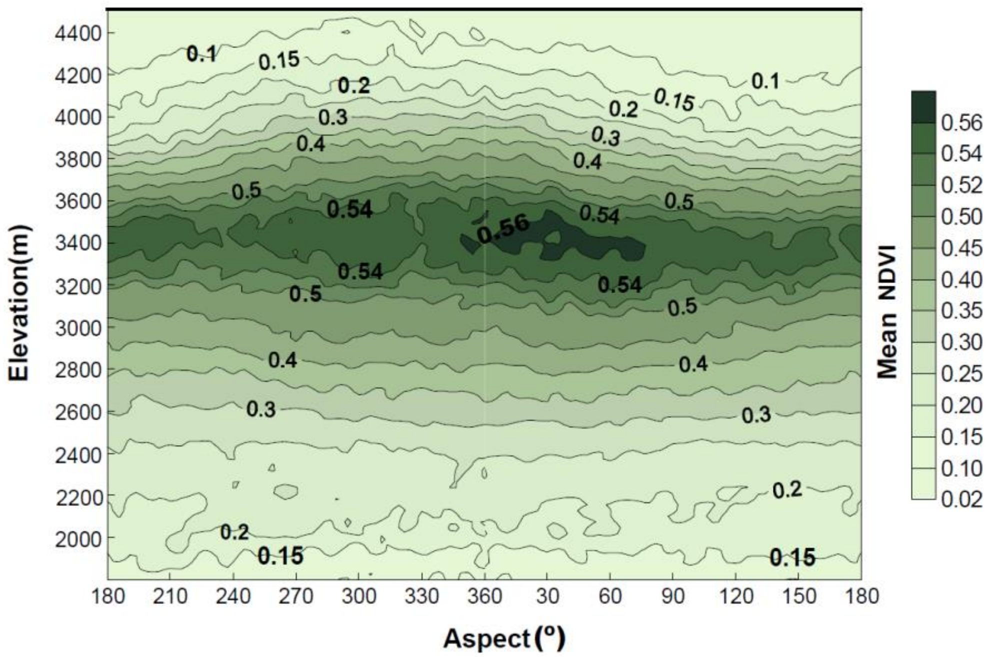

Figure 6: The change of the mean NDVI values with elevation and aspect in the northern part of Qilian Mountain. A Gaussian smooth filter was used and a low pass convolution was performed on the grid data to present a more consistent and smoother map. Note: a refiner scale (0.02) was used when the NDVI value is larger than 0.5 (Jin et al., 2008).

In his his West Bank studies Jin et al. 2008, shows that aspect has a large impact on vegetation at certain slopes and elevations due to changes in aspect, and Normalized Difference Vegetation Index (NDVI) based on remote sensing and elevation data.

In many areas, topographic aspect has a profound impact on vegetation growth, with significant covariance with other landscape features such as elevation, climate, species, and moisture availability. Therefore, I propose to derive a set of global maps and relationships based on remote sensing, digital elevation models (DEMs) and landscape models to predict areas where topographic aspects significantly impact vegetation growth. This research will proceed in well-defined steps, as follows:

Establish global potential energy maps for various slopes based on DEM, land surface modeling, and remotely sensed radiation datasets.

Use multi-variate covariance to study relationships between vegetation growth, slope, aspect, season, climate, latitude, elevation, precipitation, soil type, and vegetation type. This analysis may have significant impacts for landscape management, including optimizing crop growth and irrigation application, harvesting, flood control, and evapotranspiration management. This study will collaborate with plant scientists in the designated areas for NSE.

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