Geophysical Research Abstracts
Vol. 12, EGU2010-12172-1, 2010
EGU General Assembly 2010

Pseudo-spectral methodology for a quantitative assessment of the cover of in-stream vegetation in small streams

Yaron Hershkovitz (1), Yaakov Anker (2), Eyal Ben-Dor (2), Guy Schwartz (2), and Avital Gasith (1)

(1) Faculty of Life Sciences, Department of Zoology, Tel Aviv University, Tel Aviv, Israel (yaronhe@post.tau.ac.il), (2) Faculty of Humanities, Remote Sensing Laboratory, Tel Aviv University, Tel Aviv, Israel

In-stream vegetation is a key ecosystem component in many fluvial ecosystems, having cascading effects on stream conditions and biotic structure. Traditionally, ground-level surveys (e.g. grid and transect analyses) are commonly used for estimating cover of aquatic macrophytes. Nonetheless, this methodological approach is highly time consuming and usually yields information which is practically limited to habitat and sub-reach scales.

In contrast, remote-sensing techniques (e.g. satellite imagery and airborne photography), enable collection of large datasets over section, stream and basin scales, in relatively short time and reasonable cost. However, the commonly used spatial high resolution (1m) is often inadequate for examining aquatic vegetation on habitat or sub-reach scales.

We examined the utility of a pseudo-spectral methodology, using RGB digital photography for estimating the cover of in-stream vegetation in a small Mediterranean-climate stream. We compared this methodology with that obtained by traditional ground-level grid methodology and with an airborne hyper-spectral remote sensing survey (AISA-ES).

The study was conducted along a 2 km section of an intermittent stream (Taninim stream, Israel). When studied, the stream was dominated by patches of watercress (*Nasturtium officinale*) and mats of filamentous algae (*Cladophora glomerata*). The extent of vegetation cover at the habitat and section scales (10^0 and 10^4 m, respectively) were estimated by the pseudo-spectral methodology, using an airborne Roli camera with a Phase-One P 45 (39 MP) CCD image acquisition unit. The swaths were taken in elevation of about 460 m having a spatial resolution of about 4 cm (NADIR). For measuring vegetation cover at the section scale (10^4 m) we also used a 'push-broom' AISA-ES hyper-spectral swath having a sensor configuration of 182 bands (350-2500 nm) at elevation of ca. 1,200 m (i.e. spatial resolution of ca. 1 m). Simultaneously, with every swath we used an Analytical Spectral Device (ASD) to measure hyper-spectral signatures (2150 bands configuration; 350-2500 nm) of selected ground-level targets (located by GPS) of soil, water; vegetation (common reed, watercress, filamentous algae) and standard EVA foam colored sheets (red, green, blue, black and white). Processing and analysis of the data were performed over an ITT ENVI platform. The hyper-spectral image underwent radiometric calibration according to the flight and sensor calibration parameters on CALIGEO platform and the raw DN scale was converted into radiance scale. Ground level visual survey of vegetation cover and height was applied at the habitat scale (10^0 m) by placing a $1m^2$ netted grids (10x10cm cells) along 'bank-to-bank' transect (in triplicates).

Estimates of plant cover obtained by the pseudo-spectral methodology at the habitat scale were 35-61% for the watercress, 0.4-25% for the filamentous algae and 27-51% for plant-free patches. The respective estimates by ground level visual survey were 26-50, 14-43% and 36-50%. The pseudo-spectral methodology also yielded estimates for the section scale (10^4 m) of ca. 39% for the watercress, ca. 32% for the filamentous algae and 6% for plant-free patches. The respective estimates obtained by hyper-spectral swath were 38, 26 and 8%.

Validation against ground-level measurements proved that pseudo-spectral methodology gives reasonably good estimates of in-stream plant cover. Therefore, this methodology can serve as a substitute for ground level estimates at small stream scales and for the low resolution hyper-spectral methodology at larger scales.