ECOLOGY – POSTER #20

Cold Air Drainage Flow Along a Narrow Wash Within a Montane to Pinyon Juniper Ecotone

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Cold air drainage (CAD) flows are a naturally occurring physical process of mountain systems. Plant communities that exist in cold air drainage basins respond to these localized cold air trends, and have been shown to be decoupled from larger global climate weather systems. The assumption that air temperature decreases with altitude is violated within these systems and climate model results based on this assumption would ultimately be inaccurate This study is being conducted in the Mojave desert on Sheep Mountain located between two NSF EPSCoR network sites. Monitoring of CAD was initiated in September of 2011within a narrow ravine located between the 2164 and 2350 meter elevation. A total of 25 towers were installed at equal distances up the sides and center of the ravine on both the N and S facing slopes to assess air temperatures from 0.1 meters to a height of 3 meters. Our goal is to better understand the connection between cold air movement and plant physiological response. The species monitored in this study include: *Pinus ponderosa* (common name: Ponderosa Pine), *Pinus pinyon* (Pinyon Pine*), Juniperus osteosperma* (Utah juniper), *Cercocarpus intricatus* (Mountain Mahogany) and *Symphoricarpos* (snowberry). Hourly air temperature measurements within the wash are being captured from 100 ibuttons placed within PVC solar radiation shields. We are also developing a modeling approach to assess the three dimensional movement of cold air over time by incorporating wind vectors captured from 5 2D sonic anemometers. Wind velocities will be paired with air temperatures to better understand the thermal dynamics of CAD. Granier probes were installed in the five test species to monitor transpirational flow relative to cold air movement. Mid day soil – plant - water measurements are also being taken on a monthly basis during the growing season at all locations. Measurements include: leaf xylem water potential, stomatal conductance, chlorophyll index readings, canopy minus ambient temperatures and surface soil moisture contents. To date, the systems reveal cold air drainage is occurring at all sites and during both winter and summer seasons. Night time average temperature increased with elevation demonstrating cold air movement and pooling at lower elevations. Also, 3D modeling using the Slicer Dicer 5.1 program confirmed night time pooling was occurring. March and October CAD led to below freezing conditions at lower elevations that reduced the active growing period. PRISM minimum air temperature for the pixel containing the 10 m EPSCoR towers tracked the min. tower air temperature but over estimated 3m CAD sites (> 4 ^{o}C) in winter months and by 2 ^{o}C in the summer. Localized air temperature within the CAD suggests a decoupling is occurring from the larger tower and PRISM prediction.