Microclimatological Feedbacks at Treeline

Kummel, Michelle

This research investigates the microclimatic patterns created by the interactions between an abrupt treeline and wind, the effect of microclimates on seedlings, and the creation of feedbacks affecting treeline structure. It was hypothesized that an abrupt treeline acted as a shelterbelt or caused a pool of still air, creating a sheltered zone with very warm daytime and cold nighttime ground temperatures. This should affect seedling distribution. The first study investigated air movement above the treeline and found that a sheltered zone with drastically lowered windspeed was always present through all wind conditions. Daytime air temperatures were warmest and nighttime air temperatures were coldest close to the ground within the sheltered zone. A second study investigated the distribution of ground temperatures. It found that during the night the upper sheltered zone was the coldest, the lower half of the sheltered area and the tundra slightly warmer, and the forest the warmest. In the day, the sheltered zone contained the warmest sections, followed by the tundra, with the forest coldest. A third study investigated the distribution of live and dead seedlings. The majority of live seedlings were found in the upper sheltered zone, which experienced both the warmest and coldest temperatures, and the majority of the dead seedlings were in the lower sheltered zone, where they may have bee negatively affected by saplings already present. It is possible to conclude that the treeline creates feedbacks that facilitate it remaining abrupt even through upslope movement in response to climate changes.

Awards Won:

American Meteorological Society: Certificate of Honorable Mention