Arctic Microclimates

ARM Education Program

Teacher In-service

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Information on Climate!

The climate that is measured by satellites is a broad-scale thing, an ‘average’. Weather stations make their observations from a particular place, a place carefully chosen to be out in the open to sample the average for the general locality.

However, if we look at the world on any scale, there are differences in the average climate. For example:

- A south facing hill has a different climate from a north facing one.
- The temperature just above the soil surface is different from the temperature right on the surface.

What is a microclimate?

A microclimate is a spot where temperature, dampness, wind speed, or some other climate factor differs from the surrounding area. Microclimates are the little local climates that exist to some extent everywhere which vary on a scale from a few tens of meters, a few centimeters, or even a few millimeters.

THE ARCTIC

Terrain in the Arctic varies considerably, and thus contributes to the formation of different microclimates. Microclimates are also influenced by wind and sun exposure, nearby water sources, and changes in snow and ice cover.

On the tundra, microclimates are responsible for much of the diversity of the region, and these microclimates are dynamic.

There are many factors involved in making microclimates:

THE BOUNDARY LAYER AND WIND SPEED

If a spot is sheltered, between rocks, in a little hollow, the wind speed is lower, and you have a little bit of static air with no wind movement.

If solar energy is falling onto the surface and heating things up, the heat will get trapped in this static air boundary, and it will be warmer than the mixed air in the wind above.

ARCTIC PLANTS CREATE THEIR OWN MICROCLIMATES

- Dark Colors
- Freeze-Thaw Protection
- Cushion Plants

THE IMPORTANCE OF SUN ANGLE

Just as sun angle makes the difference between temperatures at different latitudes, and between winter and summer, it makes a significant difference on a local scale too.

In the Northern Hemisphere, south facing slopes are the warmest. Such local slope angle effects can be important to local ecology.

HOLLOWS AS HEAT AND FROST COLLECTORS

Small hollows in the landscape can act as solar energy collectors, concentrating heat into the center. Being sheltered from the wind helps them to retain the heat.

In tundra, the grassy vegetation that exists in very cold arctic environments, the extra heat concentrated in small hollows in the landscape is crucial to the growth of certain plants, and the survival of certain species of insects.

Also, a hollow can have more severe winters. Cold air forming at the ground surface is heavy and drains down-slope.

SNOW AND MICROCLIMATE

The snow on top of the land can actually help protect the tundra plants underneath from the worst of the cold above. When it is very cold outside, take a thermometer and measure the temperature underneath the snow, and you will see that it is quite a bit warmer! This helps not only the tundra, but small rodents such as the red-backed vole.