Micrometeorology Defined

What is Micrometeorology?

Related Terminology
- Environmental Physics
- Environmental Biophysics
- Biometeorology
- Boundary Layer Meteorology
- Agricultural Climatology

Definition of Micrometeorology and Environmental Physics

*Micrometeorology* is the study of processes that govern the movement, transformation, and fate of energy and matter within soils, plants, and the lower atmosphere. *Environmental Physics* is a term often considered synonymous with micrometeorology, but in practice covers a broader domain of topics, especially when applied to environmental issues. Both fields require measuring and modeling transport processes in the environment and call on many disciplines, including: physics, heat transport, thermodynamics, chemistry, ecology, soil science, plant physiology, hydrology, meteorology, and engineering.

How is micrometeorology different than other types of meteorology, climatology and atmospheric science?

**Spatial and temporal scales**

Micrometeorology focuses on the part of the atmosphere called the surface boundary layer (SBL), a layer of air adjacent to surface and typically extending 10s of meters above the surface. Above crops and other short vegetation the SBL is about 10 to 100 m thick during the day. In the SBL, the flow of air is affected by the characteristics of the surface (roughness, temperature, evaporation, etc). Because the SBL is closely linked to soil and plant processes, most micrometeorologists are interested in transport and processes in the root zone as well. Many early micrometeorologists came from soil physics backgrounds.

The “field scale” (i.e., crop field, pasture, watershed, feedlot, etc.) and is the most common areal unit of study in micrometeorology. However, researchers might be interested in large group of fields or watersheds, which greatly expands the spatial extent of interest. They might also be interested in much smaller scales (e.g., leaf, plant, insect).

The transport processes in the surface boundary layer are very dynamic. Thus, the time scales of interest are often short (20 Hz to hourly) compared to traditional meteorology. Micrometeorology is typically *not* focused on historical weather patterns; this is the purview of climatology.

Linkages to other fields
- Hydrology – Evapotranspiration
- Civil Engineering
- Soil Physics
- Biological and Agricultural Engineering
- Plant-Water Relations and Plant Environment Interactions
- Ecology
- Atmospheric Sciences
- Instrumentation
- Remote Sensing
- Modeling
- Life support in space stations
Figure 5.1. Schematic diagram of the location of flux measuring instruments, shown as rectangles on the top of each tower, in relationship to the various layers of the boundary layer in both weakly and strongly unstable conditions. Instruments mounted a few meters above low vegetation are usually within the surface layer. This layer may completely disappear over forests as the outer layer extends downwards into the layer directly influenced by the vegetation (up to at least twice forest height). Measurements from a forest tower may often be in the transition or outer layer during the day. This affects the averaging times needed to make reliable observations of scalar fluxes.

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