

New York State Agricultural Experiment Station, Geneva, a Division of the New York State College of Agriculture and Life Sciences, a Statutory College of the State University, at Cornell University, Ithaca

SOIL AND AIR TEMPERATURE

AT GENEVA, N.Y.

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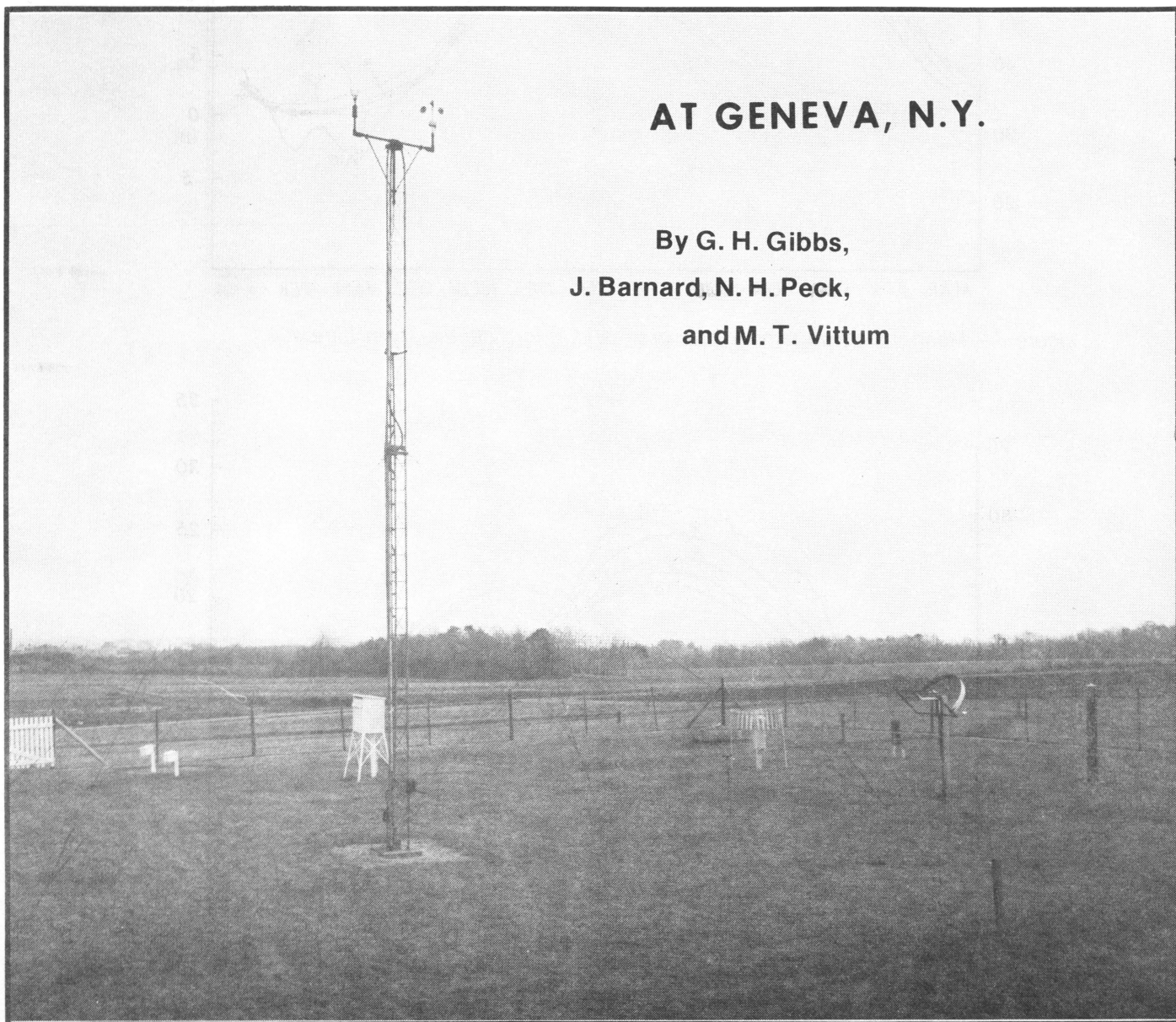


Figure 1.—General view of the Climatological Reference Station at Geneva. Air temperatures are measured by maximum-minimum thermometers mounted in the white instrument shelter which is seen behind the tower. Soil temperatures are measured by remote reading thermometers whose dials are located in the two small white boxes which are seen at the left of the instrument shelter.

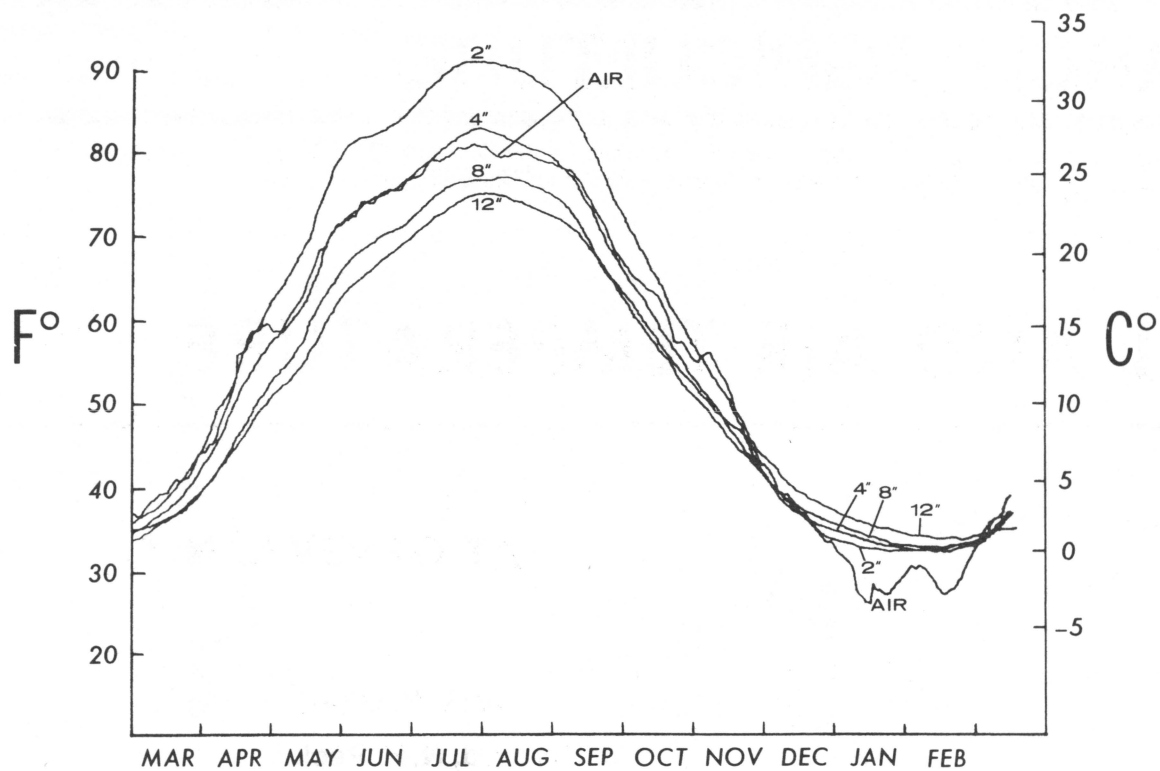


Figure 4.—Mean maximum temperature of air and at four depths under bare soil.

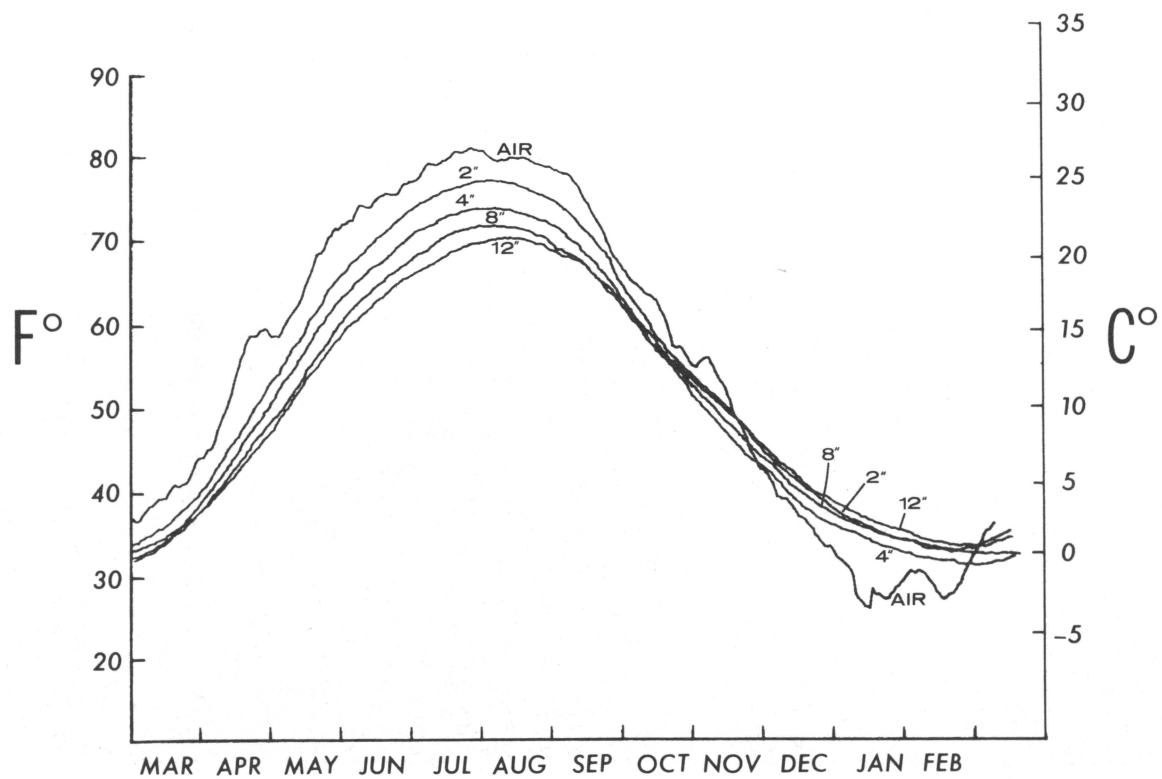


Figure 5.—Mean maximum temperature of air and at four depths under bluegrass sod-cover.

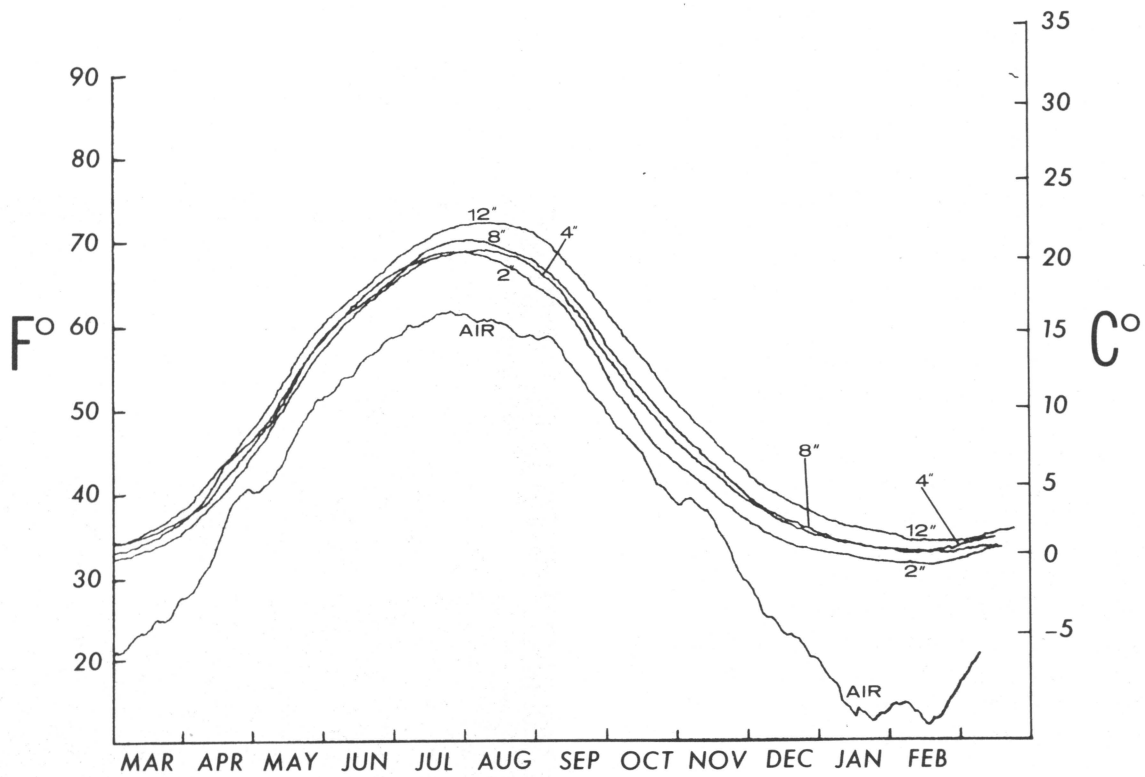


Figure 6.—Mean minimum temperature of air and at four depths under bare soil.

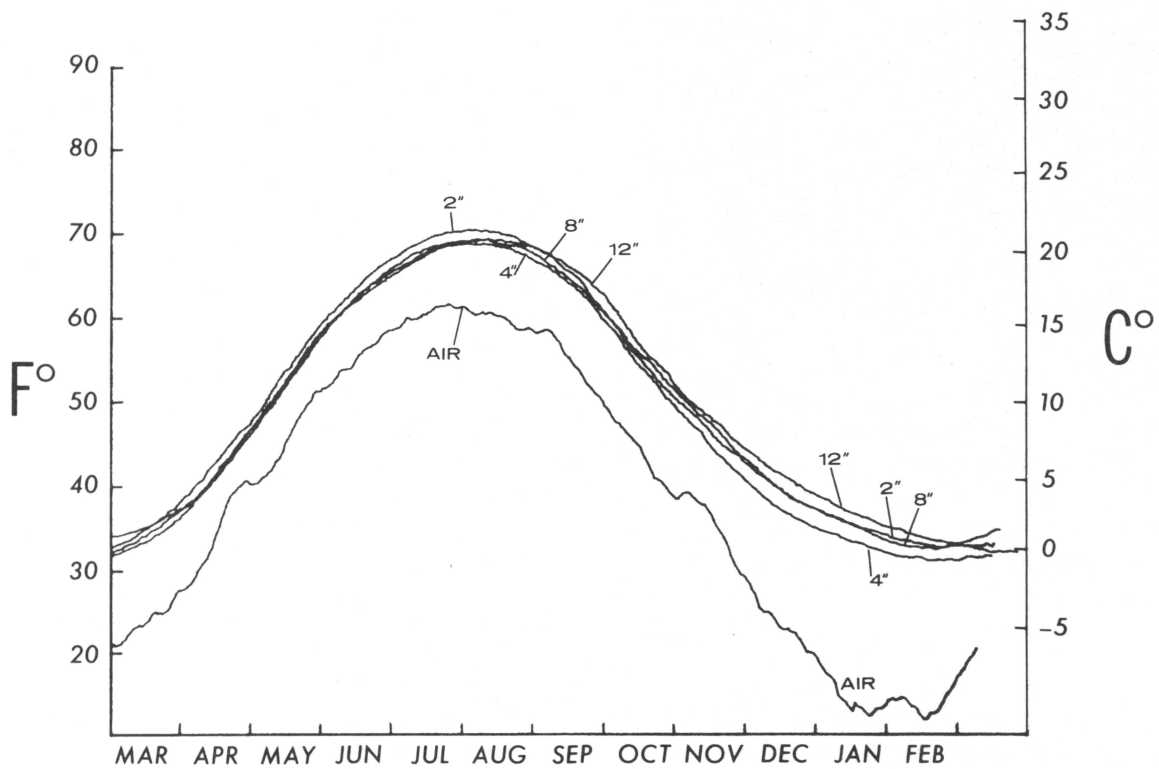


Figure 7.—Mean minimum temperature of air and at four depths under bluegrass sod-cover.

Most people are interested in maximum and minimum air temperatures but, with the exception of agriculturists, few think much about soil temperatures. Soil temperature is a critical factor controlling germination of crop and weed seeds. Thus, even though corn is planted in early spring, it will not germinate until temperature of the surrounding soil reaches 10 C (50 F). Furthermore, root penetration into deeper zones of the soil is slowed by the cooler temperatures the roots encounter as they grow down, especially in the spring planting season.

To demonstrate the annual progression of temperature at different soil depths, 15-day moving averages of 10 years (1969—1978) of air and soil temperatures are presented here. Instruments were located at the Climatological Reference Station (Fig. 1) operated by the New York State Agricultural Experiment Station at Geneva in cooperation with the U. S. Weather Bureau. The latitude is 42°53', longitude 77°02'W, and elevation 187 m (615'). Air temperatures were obtained from maximum/minimum thermometers located approximately 1.5 m (5') above the surface of the soil in a standard Weather Bureau instrument shelter (Fig. 2). Soil temperatures were measured at 5, 10, 20, and 30 cm (2, 4, 8, and 12 in) under bare ground and

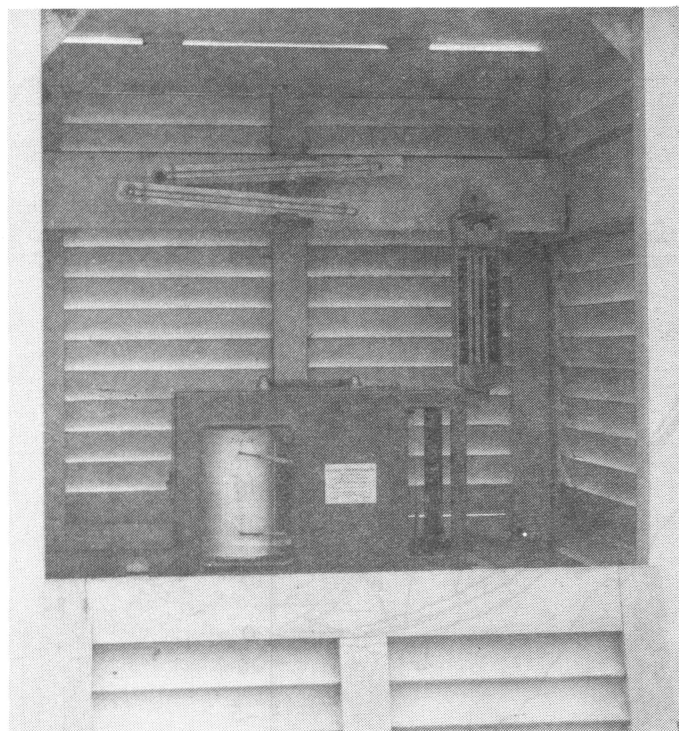


Figure 2.—Air temperatures are measured inside a standard Weather Bureau instrument shelter. Maximum-minimum thermometers of liquid-in-glass type are mounted 5° from horizontal on a wooden post which comes up through a hole in the bottom of the shelter. This prevents faulty readings when the shelter vibrates in heavy wind. The thermometers are seen near the top in this photograph.

also under a permanent bluegrass sod, using remote reading dial instruments (Fig. 3).

All temperature data used in this study are for the 24-hour period ending at 8 AM Eastern Standard Time.

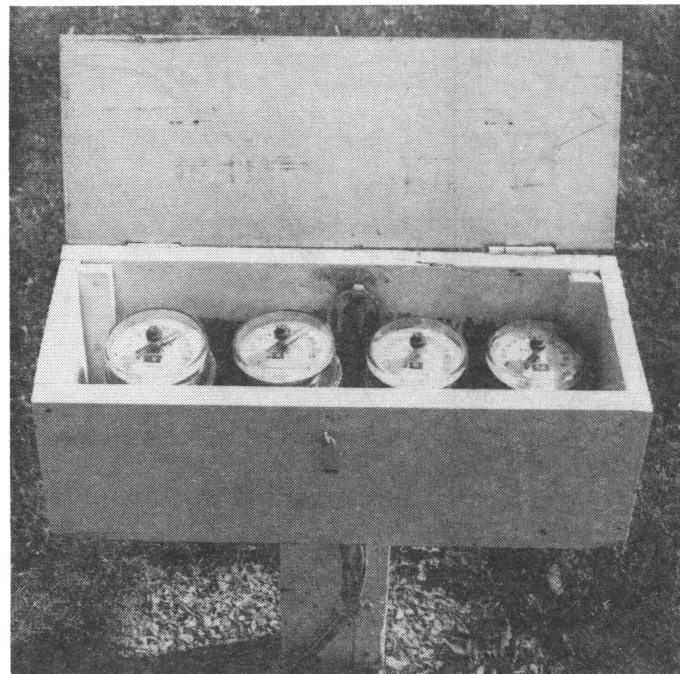


Figure 3.—Soil temperatures are measured by remote-reading maximum-minimum dial thermometers. Cables leading to the buried sensing units can be seen attached to the post below the box.



RESULTS

Figures 4 and 5 show the yearly change of maximum temperatures under bare soil and sod, respectively, while Figures 6 and 7 show the same for minimum soil temperatures. In each case, the appropriate air temperature is shown for comparison.

Note that on the average, maximum temperature at the 5 cm (2") depth in bare soil reached 10 C (50 F) about April 10 (Fig. 4), while minimum soil temperature did not reach that value until May 20 (Fig. 5). These dates encompass the normal planting season for corn or other warm season crops in New York State.

Note also the large insulation effect of a bluegrass sod. This is particularly evident at the 5 cm (2") depth where the fluctuations under sod are not nearly as large as they are under bare soil, regardless of whether maximum (Fig. 5 vs 4) or minimum (Fig. 7 vs 6) temperatures are being compared.