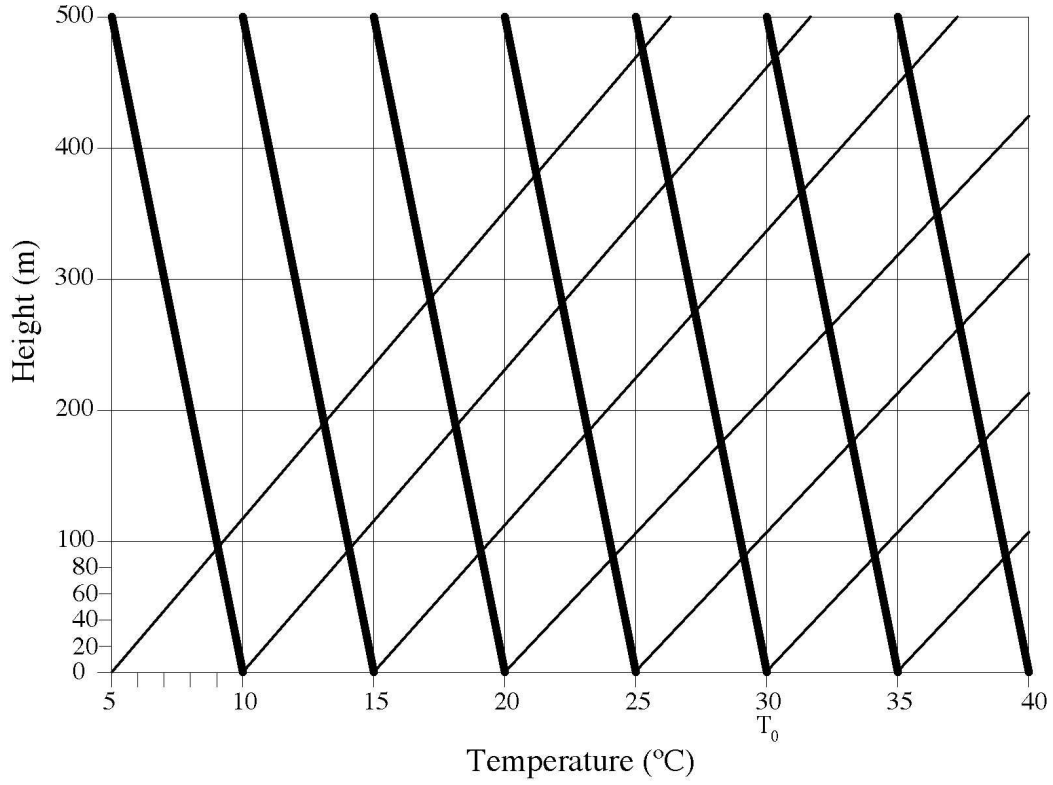
Graphical Determination of the Presence and Depth of a Nocturnal Inversion

Two sets of lines are shown on the nomogram: 1) the dry adiabatic lapse rate, DALR, of temperature (heavy black line), cooling at -1°C/100 m, and 2) a characteristic positive lapse rate of +4.2°C/100 m occurring over the tropical and subtropical savannas on clear nights (light black line).

Three measurements are required: a) two air temperatures, T_1 and T_6, at 1 m and 6 m above the ground and b) wind speed at 1 or 6 m. The onset (or decay) of the nocturnal inversion is signaled when $T_1 = T_6$ designated T_o. T_o determines the reference DALR which parallels the sloping heavy black lines. The DALR line is shown as a heavy black line.

The growth of nocturnal inversion will occur as the 1 m temperature, T_1, continues to drop below T_o. The height (depth) of the inversion is determined by the intersection of the observed T_1 temperature following the positive lapse rate line (light or dashed black line) upwards to intersect the DALR and read off the vertical height axis on the left of the diagram.

Optimum atmospheric acoustic conditions for the transmission of low-frequency sounds exist when the height of the inversion lies between 50 and 200 m and surface winds are less than 2 m/s. Model calculations show that under these conditions a loud, low-frequency elephant call can be detected by another elephant at a range of approximately 10 km.



Dry Adiabatic Lapse Rate: -1.0°C/100m: Heavy black lines
Average Nocturnal Lapse Rate: +4.2°C/100m: Light black lines