



**Western Region Technical Attachment  
No. 93-24  
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**RADIOSONDE DATA PROCESSING CHANGES**

On September 1, 1993, several changes will be implemented in the Micro-ART software. These changes will affect the accuracy, quality, and homogeneity of radiosonde measurements from both an archive and an operational standpoint. The changes being implemented are:

1. The gravity constant used in the calculation of geopotential heights will change from  $9.8 \text{ m s}^{-2}$  to  $9.80665 \text{ m s}^{-2}$  to conform with the international standard.
2. The relative humidity (RH) equation will change to reflect a resistor change in the radiosonde instrument from 1.2 megohm to 1.0 megohm.
3. RH will be reported over a broader range of values; when the RH is below 20%, or when the ambient temperature is less than  $-40^{\circ}\text{C}$ .

**Gravity constant change**

The gravity constant change will slightly lower all geopotential height fields. Figure 1 shows the difference between the new calculations and the old calculations.

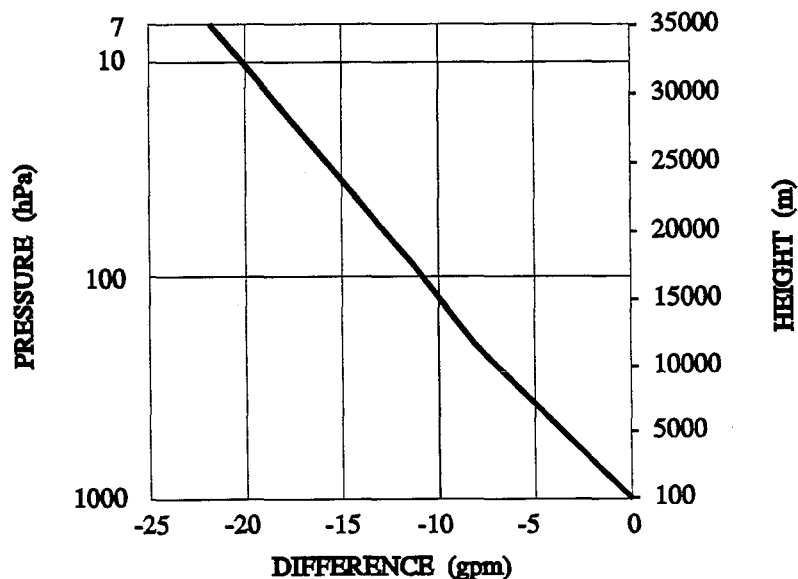


Figure 1 - Mean differences in height of the geopotential height calculations using the new value of  $g$  ( $9.80665 \text{ m s}^{-2}$ ) minus the old value of  $g$  ( $9.8 \text{ m s}^{-2}$ ).

Estimates are that the virtual temperatures calculated from geopotential heights will decrease by 0.17, 0.15 and 0.13°C for the 850-300mb layer, the 300-100mb layer, and the 100-50mb layer, respectively. As shown in Figure 1, near 500mb the geopotential heights will average about 5 geopotential meters less using the new gravity constant.

### Relative humidity calculation changes

The change in the RH equation will increase the values of the higher humidity observations. Maximum in-cloud RH measurements are expected to increase from 94.4% using the old resistor values to 97.6% using the new resistor values. In-cloud RH will still fall short of 100%. Figure 2 depicts the mean difference in RH using the new equation. As can be seen in Figure 2, the effect of this change is negligible for RH values below 80%.

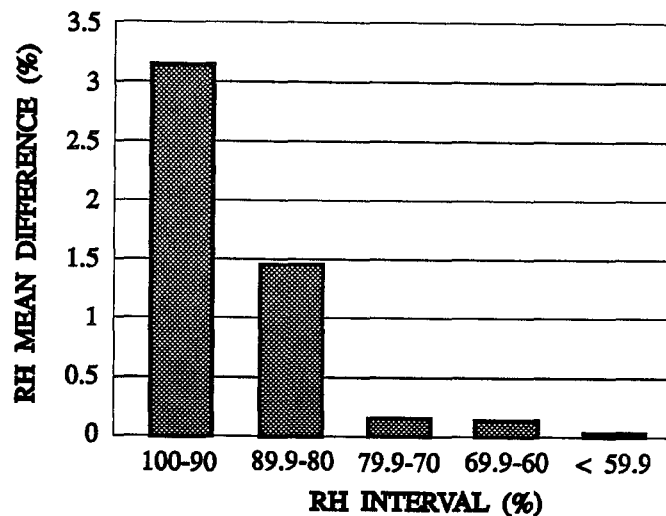


Figure 2 - The mean difference in RH, new resistor values minus old resistor values for selected RH ranges.

### Relative humidity reporting changes

The practice of not reporting humidities when: (1) less than 20%, and (2) air temperature is less than -40°C will be discontinued. The 20% RH threshold has been in effect since 1973. Up to this time, RH has never been reported when the temperature was less than -40°C. This change will introduce an apparent drying of the atmosphere in already dry locations. In 20 NWS test flights, the RH did go below 20%, but values did not go below 12%. Expectations are that a moist bias will still remain in the observations.

The net effect of the resistor value and reporting procedure changes is to increase the variance of the distribution at the endpoints. Thus, high RH observations become higher and low RH observations become lower.

### References

NOAA Data Quality and Continuity Program, 1993: Upper Air Processing Changes, Issues and Status, Vol. 1 No. 2, July.