

## Abstract

Simultaneous measurements of vertical profiles of wind, temperature and humidity were carried out with various techniques at Tsukuba from November, 1988 to October, 1989. The techniques used in the comparisons were the rawinsonde, omega sonde, wind profiler, Doppler radar, Doppler sodar, tethered balloon and in situ sensors installed on a 200m observational tower.

This report is composed of two parts. In part 1, the method of the comparison, the outline of the instruments, the characteristics of the instruments and the results of the comparisons are discussed. In part 2, the data used in the comparisons are presented.

The difference of wind speeds measured by the rawin sonde and the omega sonde were 1-1.5, 1.5-2, and 2.1-2.7m/s at altitudes 500, 11000-13500 and 20000-29500m, respectively. The differences of the wind directions were less than 2 degrees for the layer from 8000 to 14000m in which the wind speed was pretty high. For layers lower than 2000m and higher than 22500m, however, the difference of the wind direction was as large as 10-20 degrees because the average wind speed was weaker than 10m/s in these layers. The temperatures measured by the two instruments were in good agreement. The correlation coefficients were 0.99 for 500, 1000, 1500, 2000 and 3000 seconds after the launch of the sondes, and 0.98 for 4000 seconds. The humidities measured by the two instruments were also in good agreement. The correlation coefficients were 0.96-0.99 for 500, 1000, and 1500 seconds after the launch. However, there were biases immediately after the sonde passed through a precipitation layer and during its passage through a layer of low humidity, that is below 20%.

The differences of the wind speed measured by the rawinsonde and the wind profiler were 1-1.6m/s for 750 to 6000m, which are almost identical with the differences between the rawinsonde and the omega sonde (1-1.3m/s) for the same layer. The difference of the wind direction was 7-15 degrees below 2000m in which the mean wind speed was smaller than 10m/s. From 3000 to 6000m, the difference decreased by as much as 4-5 degrees because of less fluctuation of wind in the layer. The value of the difference is almost equal to that between the rawinsonde and the omega sonde.

The difference of the wind speed measured by the wind profiler and the Doppler radar was smaller than  $\pm 1$  and 1-2m/s at altitudes of 2900 and 4000m, respectively. The

difference of the wind direction was smaller than  $\pm 10$  and  $\pm 5$  degrees at altitudes 2900 and 4000m, respectively. The correlation coefficient of the wind speed was 0.9.

The correlation coefficients of the wind speed measured by the tethered balloon and the Doppler sodar were 0.44, 0.80, 0.87, 0.79, 0.75 and 0.71 at 50, 100, 150, 200, 250 and 300m, respectively. The mean difference of the wind direction was 35 degrees at 50m and 20-29 degrees at other altitudes.