

MEASURES OF WATER VAPOR CONCENTRATION
(no standard notation has been adopted)

- X 1. Vapor pressure, e (mb): pressure exerted by water vapor.
 actual vapor pressure, e_a : pressure of vapor actually present.
 saturation vapor pressure, e_s : pressure of vapor in equilibrium with
 a plane water surface, both at the same temperature, t_d
- X 2. Saturation deficit: $e_s - e_a$.
- X 3. Relative humidity, U : (Z): $100 e_a/e_s$, where e applies at the actual temperature t_a
- X 4. Absolute humidity, vapor concentration, or vapor density, w or ρ (g/m^3): mass of
 water vapor in unit volume. Actual vapor density, w_a or ρ_{wa} , corresponds to
 actual vapor pressure, saturation vapor density, w_s or ρ_{ws} , to saturation
 vapor pressure.
5. Specific humidity, q (Z or g/kg): ratio of mass of water vapor in a unit volume
 to the total mass of all gases in the volume.
6. Mixing ratio, r (Z or g/kg): ratio of mass of water vapor in a unit volume to
 the total mass of all other gases in the volume, $r=w/\rho$.
- X 7. Dewpoint, t_d ($^{\circ}\text{C}$ or $^{\circ}\text{F}$): temperature at which saturation vapor pressure would
 equal existing vapor pressure ($e_s = e_a$), or at which $w_a = w_s$.
8. Virtual temperature, t_v ($^{\circ}\text{C}$ or $^{\circ}\text{F}$): temperature at which dry air would have the
 same density, at the same pressure, as the existing moist air.
- X 9. Wetbulb temperature, t_w ($^{\circ}\text{C}$ or $^{\circ}\text{F}$): lowest temperature to which a free water surface
 can be cooled by evaporation into existing moist air.
10. Precipitable water, W (cm or inch): total amount of water vapor in a column of
 air if completely condensed into liquid.

$$e = \frac{rp}{r + 0.622} \quad \text{or} \quad r = \frac{0.622e}{p - e} \quad (p = \text{total pressure, mb})$$

$$w = \frac{e_w}{R_w T_w} \quad \left\{ \begin{array}{l} R_w = \text{gas constant for water vapor, } 4.6150 \times 10^6 \\ T_w = \text{absolute temperature (K) of water vapor} \end{array} \right.$$

Short Table of e_s , the saturation vapor pressure (mb) over water.
(Smithsonian Meteorological Tables, 6th ed., pp. 351-353)

°C	0	1	2	3	4	5	6	7	8	9
40	73.777	77.802	82.015	86.432	91.034	95.855	100.89	106.16	111.66	117.40
30	42.430	44.927	47.551	50.307	53.200	56.236	59.422	62.762	66.264	69.934
20	23.373	24.861	26.430	28.086	29.831	31.671	33.608	35.649	37.796	40.055
10	12.272	13.119	14.017	14.969	15.977	17.044	18.173	19.367	20.630	21.964
+0	6.1078	6.5662	7.0547	7.5753	8.1294	8.9192	9.3465	10.013	10.722	11.474
-0	6.1078	5.6780	5.2753	4.8981	4.5451	4.2148	3.9061	3.6177	3.3484	3.0971
-10	2.8627	2.6443	2.4409	2.2515	2.0755	1.9118	1.7597	1.6186	1.4877	1.3664
-20	1.2540	1.1500	1.0538	0.9649	0.8827	0.8070	0.7371	0.6727	0.6134	0.5589
-30	0.5088	0.4628	0.4205	0.3845	0.3453	0.3139	0.2842	0.2571	.2323	0.2097
-40	0.1891	0.1704	0.1534	0.1239	0.1239	0.1111	.09961	.08918	.07975	.07124

Short table of w or e_v , the absolute humidity, vapor concentration,
or density of saturated water vapor, in grams per cubic meter.
(Smithsonian Meteorological Tables, 6th ed., pp. 382-383.)

°C	0	1	2	3	4	5	6	7	8	9
40	51.19	53.82	56.56	59.41	62.39	65.50	68.73	72.10	75.61	79.26
30	30.38	32.07	33.83	35.68	37.61	39.63	41.75	43.96	46.26	48.67
20	17.30	18.34	19.43	20.58	21.78	23.05	24.38	25.78	27.24	28.78
10	9.40	10.01	10.66	11.35	12.07	12.83	13.63	14.48	15.37	16.31
+0	4.847	5.192	5.559	5.947	6.360	6.797	7.260	7.750	8.270	8.819
-0	4.847	4.523	4.217	3.930	3.660	3.407	3.169	2.946	2.737	2.541
-10	2.358	2.186	2.026	1.876	1.736	1.605	1.483	1.369	1.264	1.165
-20	1.074	0.988	0.909	0.836	0.768	0.705	0.646	0.592	0.542	0.496
-30	.4534	.4141	.3779	.3445	.3138	.2856	.2597	.2359	.2141	.1940
-40	.1757	.1590	.1438	.1298	.1172	.1055	.0950	.0854	.0767	.0689

Fahrenheit to Celsius

°F in 10-degree increments	°F in 1-degree increments									
	0	1	2	3	4	5	6	7	8	9
-60	-51.1	-51.7	-52.2	-52.8	-53.3	-53.9	-54.4	-55.0	-55.6	-56.1
-50	-45.6	-46.1	-46.7	-47.2	-47.8	-48.3	-48.9	-49.4	-50.0	-50.6
-40	-40.0	-40.6	-41.1	-41.7	-42.2	-42.8	-43.3	-43.9	-44.4	-45.0
-30	-34.4	-35.0	-35.6	-36.1	-36.7	-37.2	-37.8	-38.3	-38.9	-39.4
-20	-28.9	-29.4	-30.0	-30.6	-31.1	-31.7	-32.2	-32.8	-33.3	-33.9
-10	-23.3	-23.9	-24.4	-25.0	-25.6	-26.1	-26.7	-27.2	-27.8	-28.3
-0	-17.8	-18.3	-18.9	-19.4	-20.0	-20.6	-21.1	-21.7	-22.2	-22.8
+0	-17.8	-17.2	-16.7	-16.1	-15.6	-15.0	-14.4	-13.9	-13.3	-12.8
10	-12.2	-11.7	-11.1	-10.6	-10.0	-9.4	-8.9	-8.3	-7.8	-7.2
20	-6.7	-6.1	-5.6	-5.0	-4.4	-3.9	-3.3	-2.8	-2.2	-1.7
30	-1.1	-0.6	0.0	0.6	1.1	1.7	2.2	2.8	3.3	3.9
40	4.4	5.0	5.6	6.1	6.7	7.2	7.8	8.3	8.9	9.4
50	10.0	10.6	11.1	11.7	12.2	12.8	13.3	13.9	14.4	15.0
60	15.6	16.1	16.7	17.2	17.8	18.3	18.9	19.4	20.0	20.6
70	21.1	21.7	22.2	22.8	23.3	23.9	24.4	25.0	25.6	26.1
80	26.7	27.2	27.8	28.3	28.9	29.4	30.0	30.6	31.1	31.7
90	32.2	32.8	33.3	33.9	34.4	35.0	35.6	36.1	36.7	37.2
100	37.8	38.3	38.9	39.4	40.0	40.6	41.1	41.7	42.2	42.8
110	43.3	43.9	44.4	45.0	45.6	46.1	46.7	47.2	47.8	48.3