Dew Point — Theory & Reference

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What is the Dew Point?

The **dew point temperature** (T_d) is the temperature to which air must be cooled, at constant pressure and water vapor content, until it becomes saturated — the point at which condensation (dew, fog, frost) begins to form.

Unlike relative humidity, the dew point is an absolute measure of the moisture content in the air. A higher dew point means more moisture is present.

The August-Roche-Magnus Formula

The Magnus formula provides an accurate approximation of dew point over the range −40 °C to 60 °C:

Step 1 — Compute α:

$$\alpha = \ln(RH / 100) + (a \cdot T) / (b + T)$$

Step 2 — Compute T_d:

$$T_d = (b \cdot \alpha) / (a - \alpha)$$

Constants

a = 17.625 (dimensionless) **b** = 243.04 °C

T = Air temperature in °C **RH** = Relative humidity in %

Worked Example

For T = 25 °C and RH = 60 %:

$$\alpha = \ln(60/100) + (17.625 \times 25) / (243.04 + 25)$$
$$\alpha = \ln(0.6) + 440.625 / 268.04$$
$$\alpha = -0.5108 + 1.6440 = \mathbf{1.1332}$$

$$T_d = (243.04 \times 1.1332) / (17.625 - 1.1332)$$
$$T_d = 275.39 / 16.4918 \approx \mathbf{16.70\ °C}$$

Interpretation Guide

- **Spread < 3 °C** — Air is near saturation; mist and fog likely.
- **Spread 3–10 °C** — Moderate humidity; comfortable but noticeable.
- **Spread > 10 °C** — Dry air; condensation unlikely.
- When T_d is above **24 °C** — Oppressively humid (tropical conditions).

Reference Table — Dew Point (°C)

T (°C)	RH 30%	RH 50%	RH 70%	RH 90%	Spread @RH50%
-10	-24.33	-18.47	-14.44	-11.33	8.47
0	-15.54	-9.2	-4.82	-1.44	9.2
10	-6.8	0.05	4.78	8.43	9.95
15	-2.45	4.66	9.57	13.37	10.34
20	1.89	9.26	14.36	18.31	10.74
25	6.22	13.86	19.15	23.24	11.14
30	10.54	18.45	23.93	28.18	11.55
35	14.85	23.03	28.71	33.11	11.97
40	19.14	27.6	33.48	38.04	12.4

Formula source: O.A. Alduchov and R.E. Eskridge, "Improved Magnus Form Approximation of Saturation Vapor Pressure," Journal of Applied Meteorology, vol. 35, no. 4, pp. 601–609,

1996.
Accuracy: ±0.1 °C for −40 °C to 60 °C.