Will Outdoor Fresh Air bring more moisture to the inside of the house during winter raining days in New Zealand?

Don’t Worry

TIPS about

Moisture
Relative Humidity (RH)

O2VENT
Indoor Air Quality Mangement Specialist

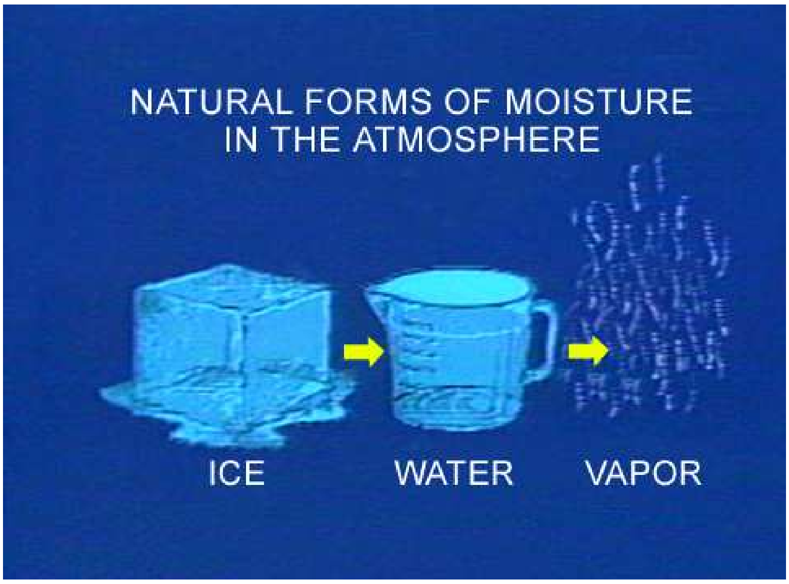
References[edit]

1. **From Link UtahState University of America**

http://ocw.usu.edu/Forest__Range__and_Wildlife_Sciences/Wildland_Fire_Management_and_Planning/Unit_4__Temperature-Moisture_Relationship_4.html

Atmospheric Moisture

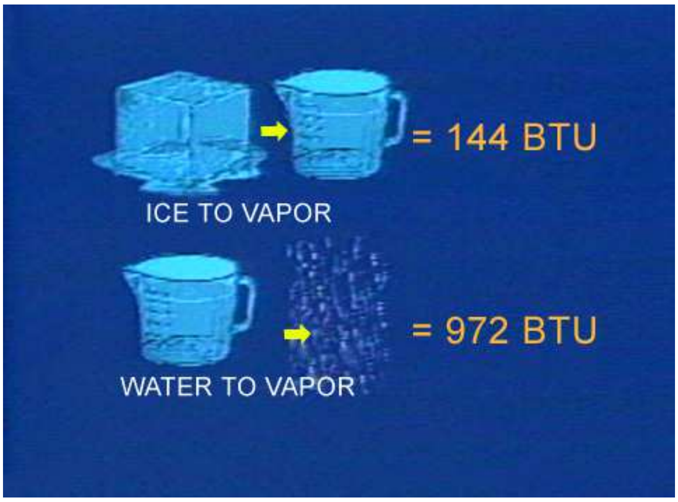
You should realize that moisture in the atmosphere can appear in three states--solid, liquid, and a gaseous vapor. It is very rare when the air does not contain some water vapor. When the air is cooled to its saturation point, condensation occurs in the form of clouds and perhaps precipitation. At very high altitudes where the air is very cold, clouds consist of tiny ice crystals. And, of course, precipitation can occur in the form of snow and hail.



Natural forms of moisture in the atmosphere

An important point to remember is that each time water changes state it either gives off or takes on heat energy. When ice melts it requires about 144 BTUs of heat to change 1 pound of ice to water with a temperature of 32°. This is called the heat of fusion. It takes additional heat to raise the temperature of the water to reach its boiling point. This is about 180 BTUs for 1 pound of water. To change the liquid state into water vapor, it requires an additional 972 BTUs per pound of water. By changing state twice; that is, ice to water to vapor, approximately 1,300 BTUs of heat energy per pound of water has been stored in the moisture which is bound to the air. Any time condensation and freezing occur, that amount of heat energy will be released, thus raising the temperature of the air.

It is possible in the atmosphere for ice crystals to go directly into water vapor, or water vapor directly to ice crystals. This process is called sublimation. The amount of heat involved in sublimation equals the sum of the heat of fusion plus the latent heat of vaporization.



Energy requirements to convert ice to liquid and liquid to vapor

When discussing moisture in the atmosphere, it's desirable to have some points of reference or means of qualifying the amounts present at any one time or place. The two most common points of reference used are dew point and relative humidity.

Dew Point: The temperature at which a parcel of air must be cooled to reach its saturation point.

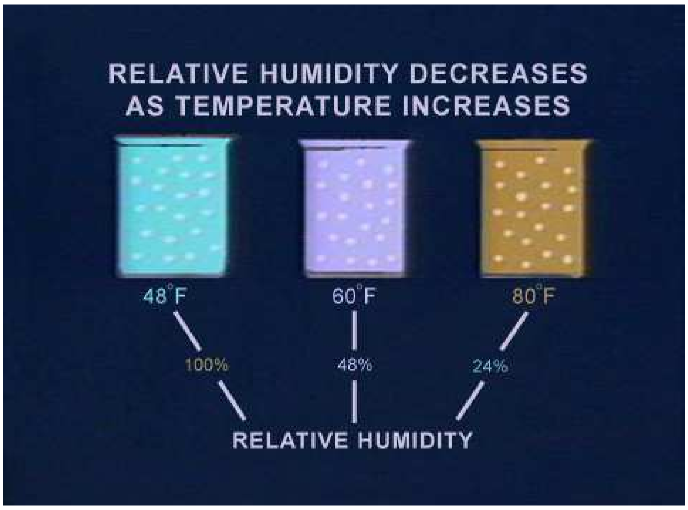
A dew point is a useful reference because it tells at which temperature clouds and precipitation will occur. Does dew point change with changes in temperature or relative humidity? First, you should understand that the temperature of the air influences the amount of water vapor that can be bound to the molecules of air. Water vapor capacity increases with temperature increase. There are three parcels of air, each in separate containers. Only relative values of moisture and temperature are shown. At low temperatures, the air will hold only two parts of water vapor. As the temperature increases, it will hold 6, then 12 parts of water vapor. If the very warm air on the right is cooled, it must lose some of its bound water vapor. This will occur through condensation.

In any one stationary parcel of air, the dew point of that air will remain the same as will the amount of moisture in that parcel, regardless of air temperature. But as air temperature increases, so will the capacity of that air to hold more water vapor. The higher the air temperature, the stronger the bond between water and air molecules, and the drier the air seems to be.

To determine how dry or wet the air is at any given temperature, we use a unit of measure called relative humidity.

Relative Humidity: The ratio of the actual amount of water vapor in a given volume of air to the amount which could be present if the air were saturated at the same temperature. It's commonly expressed as a percentage.

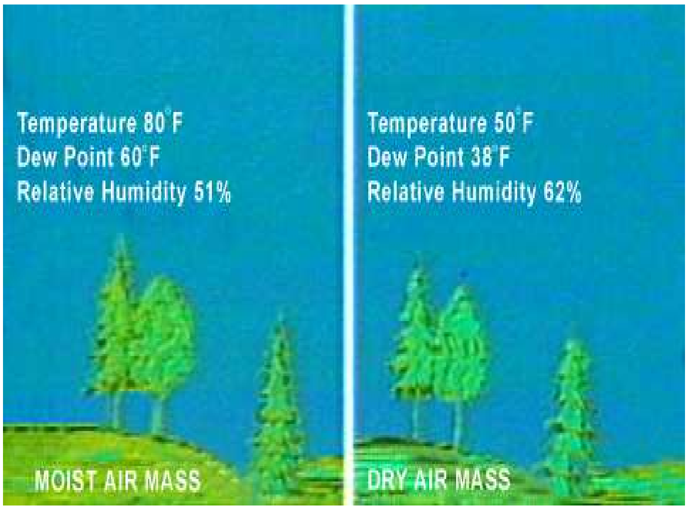
Since warm air will hold more moisture than cold air, the percentage of relative humidity must change with changes in air temperature. The graphic below illustrates this relationship. Again we have three parcels or containers of air. The number of water vapor molecules is the same in each container. At 40° air temperature, the parcel is saturated and will hold no more molecules of water vapor. The relative humidity is 100 percent. If the temperature of that air parcel is raised by 20°, it will hold about twice as many water molecules to reach saturation. Thus, the new relative humidity is now 48 percent. If the temperature is raised another 20°, it will again double its capacity to hold water vapor molecules. The relative humidity is only 24 percent.



Relative humidity decreases as temperature increases

The importance of air temperature to moisture is obvious. At 80°, the air has a relatively low humidity and is relatively dry. As it cools, the humidity increases, reaching its saturation point at 40°. Now the air is very moist, and clouds will form. The dew point of the air is 40° in all three containers in the illustration.

The example in the graphic below shows a relatively moist airmass with a dew point of 60°. A relatively dry airmass has a dew point of 38°. This illustration shows that a cool, dry airmass may actually have a higher relative humidity than a warm, moist airmass. Relative humidity alone can be misleading when comparing atmospheric moisture conditions.



A cool, dry air mass may actually have a higher relative humidity than a warm, moist air mass.

Rule of Thumb: Relative humidity doubles with each 20 degrees (Fahrenheit) decrease, or halves with each 20-degree increase in temperature.

Generally, as temperature goes up, relative humidity goes down and vice versa.

2.Temperature and Saturation Vapor Pressure under Standard atomaspheric Pressure

Temperature		Saturation Vapor Pressure	Weather	Vapor Pressure
(℃)	(℉)	10^{-3} bar		10^{-3} bar
-18	0	1.5		
-15	5	1.9		
-12	10	2.4		
-9	15	3		
-7	20	3.7		
-4	25	4.6		
-1	30	5.6		
2	35	6.9		
4	40	8.4		
7	45	10.3	Raining Outside Winter RH100%	10.3
10	50	12.3		12.3
13	55	14.8		
16	60	17.7	Winter Inside RH80%	14.16
18	65	21		16.8
21	70	25		20
24	75	29.6		23.68
27	80	35		
29	85	41		
32	90	48.1		
35	95	56.2		
38	100	65.6		
41	105	76.2		
43	110	87.8		
46	115	101.4		
49	120	116.8		
52	125	134.2		

You can see:

100% RH outdoor fresh air (10℃)contains less vapor (12.3x10^{-3} bar) than 80% RH indoor air (18 ℃)--. 16.8 x10^{-3} bar

3.Healthy Indoor Temperature

World Health Organisation guidelines recommend a minimum temperature of 18˚C in houses, or higher for more vulnerable groups like children, the elderly and people who are ill. This recommendation applies to all occupied rooms in your house. References Link to https://www.energywise.govt.nz/at-home/heating-and-cooling/heating-your-home/

4.O2VENT Positive Pressure Fresh Air Ventilation System provides controlled air flow by the temperature, Humidity, and VOV sensors, operators can choose the different default figures by themselves to keep the home drier and healthier.