

## **CLOUD FORMATION**

Clouds form when invisible water vapour that is present in the air changes into its visible form as water droplets or ice crystals, via condensation or sublimation. This occurs when:

- the relative humidity is high;
- condensation nuclei are present; and
- there is a cooling of air.

## **LIFTING AGENTS**

### **Orographic Lift:**

Air blowing against a range of hills or mountains is forced upward into a region of lower pressure, expands and cools. Condensation will occur when the dew point is reached.

### **Frontal Lift:**

A mass of warm air is forced aloft and rises over the cold air. The rising warm air cools by expansion and clouds are formed.

### **Convection:**

The air over a very warm surface becomes buoyant due to its lower density and rises rapidly. A compensating flow of cold air descends to take its place. A vertical circulation is thereby created that distributes the heat through upper levels.

### **Convergence:**

Air is forced into a region, as at the center of a low, convergence is occurring. The excess air is forced to rise, as it rises it expands and cools. When the condensation level is reached, clouds form.

### **Turbulence:**

Friction between the air and the ground disrupts the lower levels of the air into a series of eddies (swirls). These eddies are confined to the lower few thousand feet of the atmosphere but may extend higher if the air mass is unstable and surface winds are strong.

## PRECIPITATION

When water droplets (visible as a cloud) grow sufficiently in size and weight to fall due to gravity.

### Forms of precipitation:

- drizzle, rain, freezing drizzle, freezing rain;
- hail, snow pellets (soft hail);
- snow;
- ice prisms; and
- ice pellets.

### Precipitation and cloud type:

<b><i>Precipitation</i></b>	<b><i>Cloud Type</i></b>
Drizzle, freezing drizzle, snow	Stratus and stratocumulus
Snow or rain (continuous)	Thick altostratus and nimbostratus
Snow or rain (intermittent)	Thick altostratus and stratocumulus
Snow showers, rain showers	Alto cumulus, heavy cumulus, cumulonimbus
Hail, ice pellet showers	Cumulonimbus
Ice pellets (continuous)	Any rain cloud (below freezing)
Ice Prisms	No cloud necessary
Snow pellets	Heavy cumulus

## **FOG**

Fog is a cloud, usually stratus, in contact with the ground. It forms when the air is cooled below its dew point, or when the dew point is raised to the air temperature through the addition of water vapour.

### **TYPES OF FOG:**

#### **Radiation fog:**

Usually forms on clear nights. Conditions that favour the formation of radiation fog are:

- clear skies;
- moist air; and
- light winds.

The ground cools losing heat through radiation. The air in direct contact with the earth's surface is cooled. If this air is moist and the temperature is lowered to the dew point, fog will form.

#### **Advection fog:**

Forms when warm moist air moves over a cold surface.

#### **Upslope fog:**

Caused by the cooling of air due to expansion as it moves up a slope. A light upslope wind is necessary.

#### **Steam fog:**

Forms when cold air passes over a warm water surface. Evaporation of the water into the cold air occurs until the air becomes saturated. The excess water vapour condenses as fog.

#### **Frontal fog:**

Often found near fronts. Warm front fogs are the most extensive and are caused by the cold air becoming saturated by evaporation from rain falling from the warm air. It is also known as precipitation-induced fog.

**Precipitation-induced fog:**

Caused by the addition of moisture to the air through evaporation of precipitation.  
(Example – pre frontal fog).

**Ice fog:**

At very low temperatures, the air may become full of ice crystals. The ice crystals, which form by sublimation, may suddenly appear when an aircraft engine has been started (the exhaust contains water vapour, condensation nuclei and the engine creates mixing).