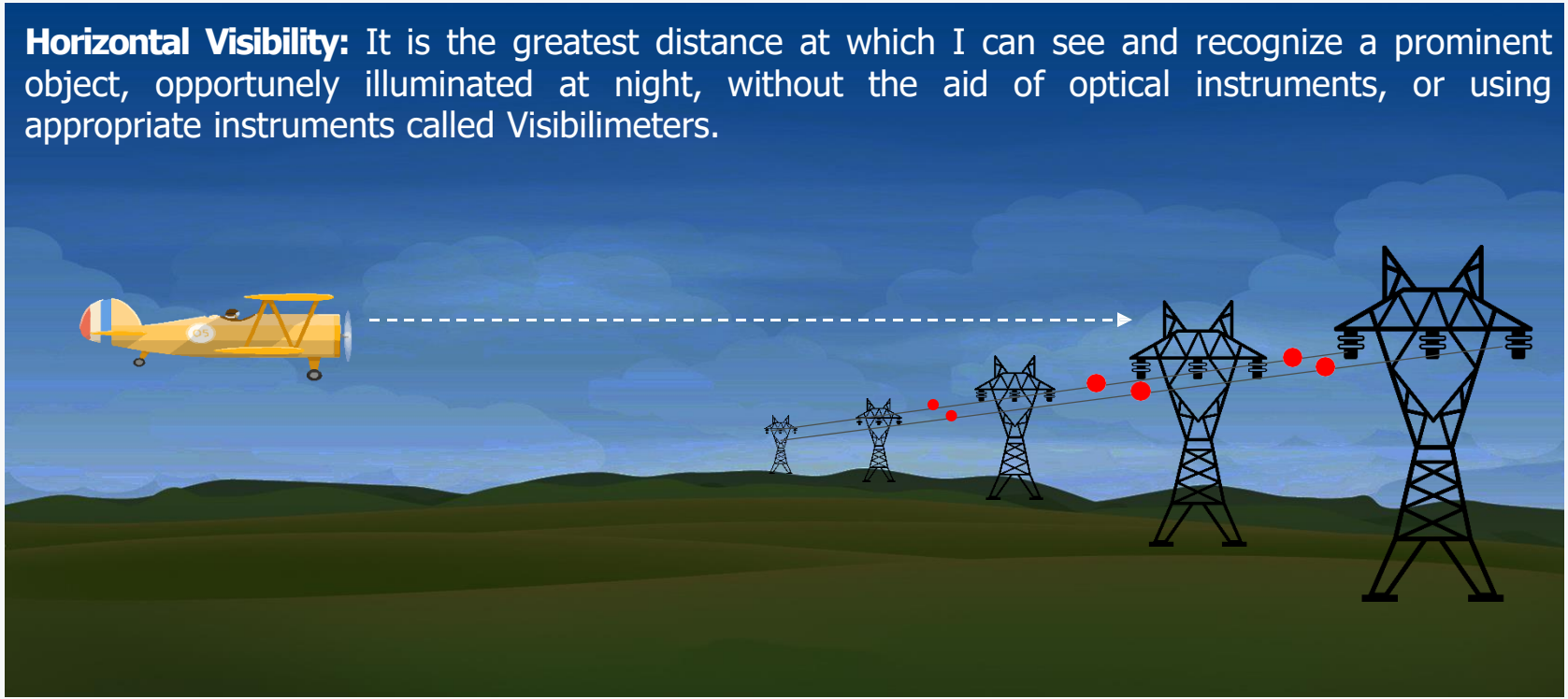

DRONESVIP
CIVIL AERONAUTICAL
TRAINING CENTER

VISIBILITY

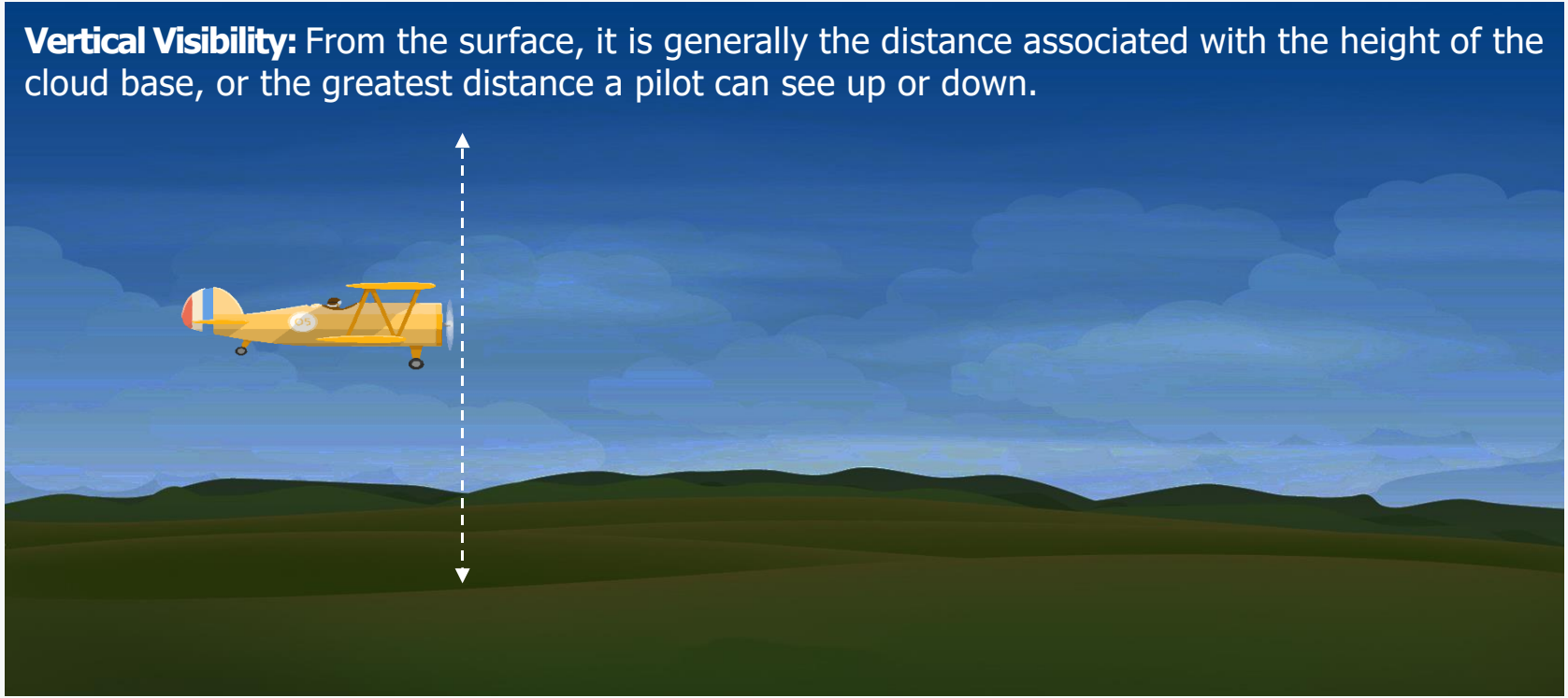
DEFINITION

Horizontal Visibility: It is the greatest distance at which I can see and recognize a prominent object, opportunely illuminated at night, without the aid of optical instruments, or using appropriate instruments called Visibilimeters.



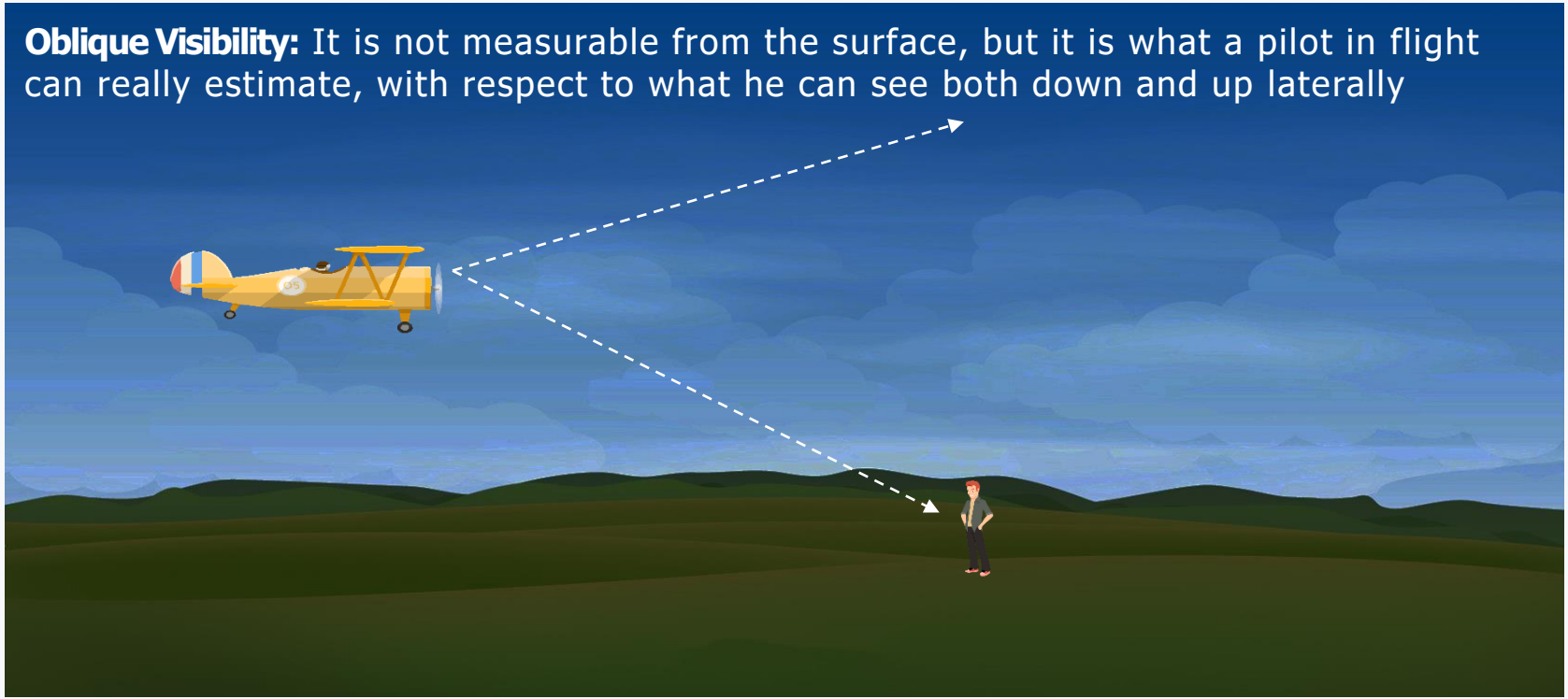
DEFINITION

Vertical Visibility: From the surface, it is generally the distance associated with the height of the cloud base, or the greatest distance a pilot can see up or down.



DEFINITION

Oblique Visibility: It is not measurable from the surface, but it is what a pilot in flight can really estimate, with respect to what he can see both down and up laterally



PHENOMENA THAT REDUCE VISIBILITY

PHENOMENA THAT REDUCE VISIBILITY

01 **Hydrometeors:** Fog and precipitation (rain, drizzle, Snow, Blizzard.)

02 **Lithometeoros:** Polvo o arena levantados por el viento o en suspensión. Humo, Smog, Ceniza Volcánica.

PHENOMENA THAT REDUCE VISIBILITY

RAINFALL

01 The value of visibility reduced by precipitation is generally inversely proportional to the intensity and density of these phenomena.

02 In many cases, drizzles, although they are made up of very small droplets, their significant density of particles reduces visibility even more than rain or snowfall of moderate to low intensity.

03 But in cases where rainfall is associated with intense storms, particularly in regions between the tropics, showers reduce visibility, to values similar to that of a fog bank, for short periods of time, due to the significant flow of rainfall.

PHENOMENA THAT REDUCE VISIBILITY

BLIZZARD

It is the snow deposited on the surface that is raised and spread by the effect of the wind at different heights, a very frequent phenomenon in high latitudes or in mountain areas, where horizontal and vertical visibility can suffer significant reductions, and be sustained for long times.

PHENOMENA THAT REDUCE VISIBILITY

AIRBORNE POWDER

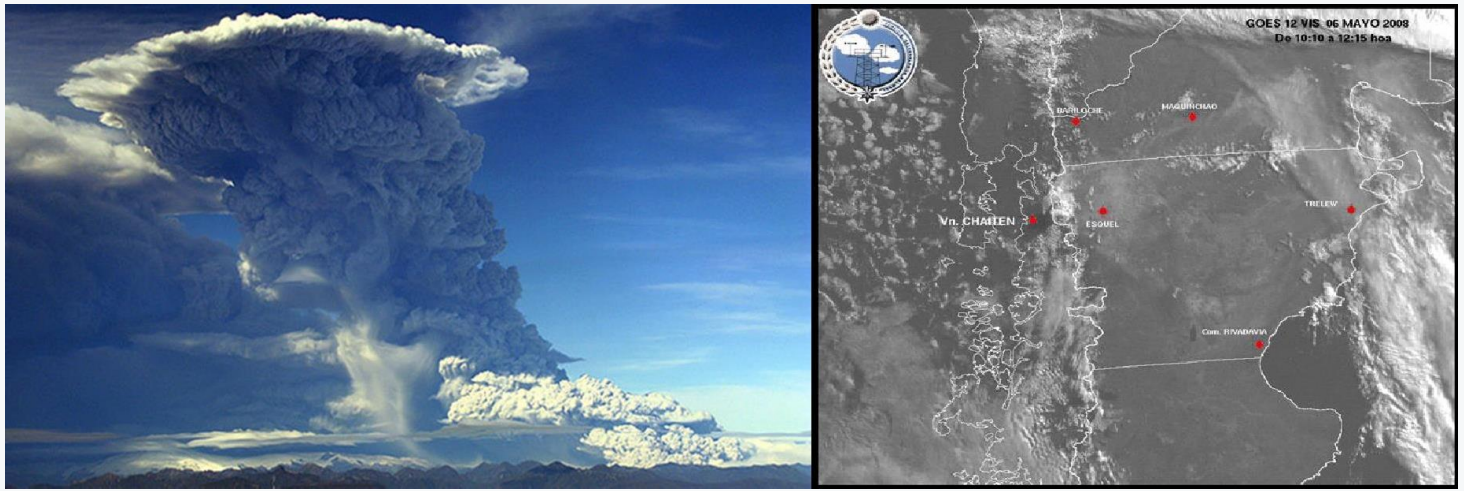
Litho-meteors, although they are usually of non-meteorological origin, the wind plays a very important role, since it will depend on the latter so that solid particles of different types can or cannot be re-mobilized from the surface or transported to different heights and distances from the origin

PHENOMENA THAT REDUCE VISIBILITY

DUST OR SAND STORMS

PHENOMENA THAT REDUCE VISIBILITY

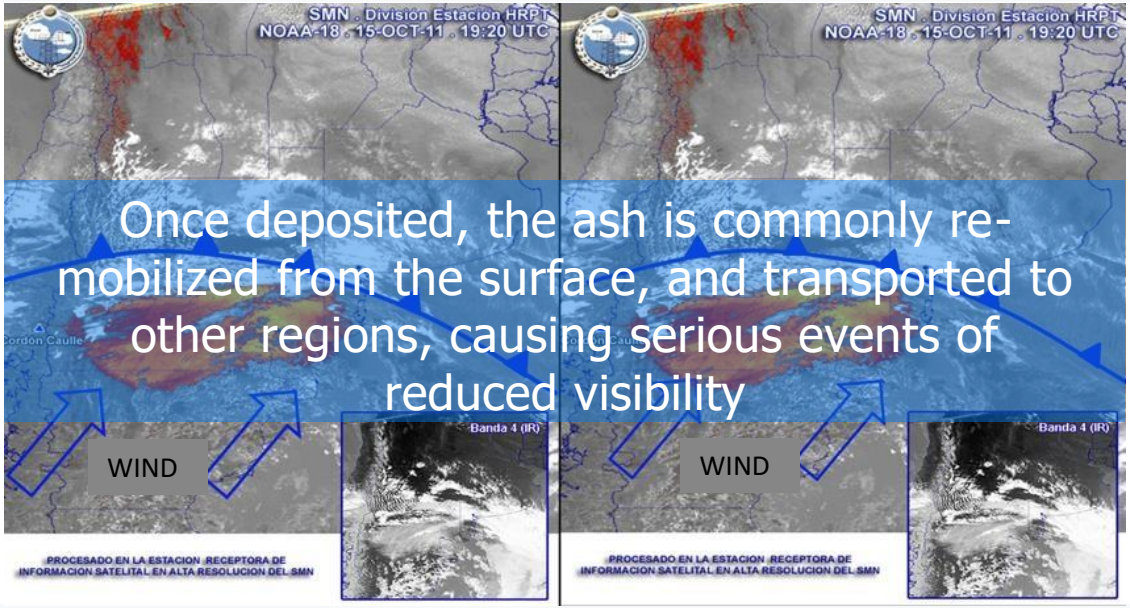
VOLCANIC ASH



Volcanic ash alarmingly reduces visibility values, not only in the vicinity of the emitting volcano, but can also be transported by the wind over great distances and generate great inconveniences with respect to visibility.

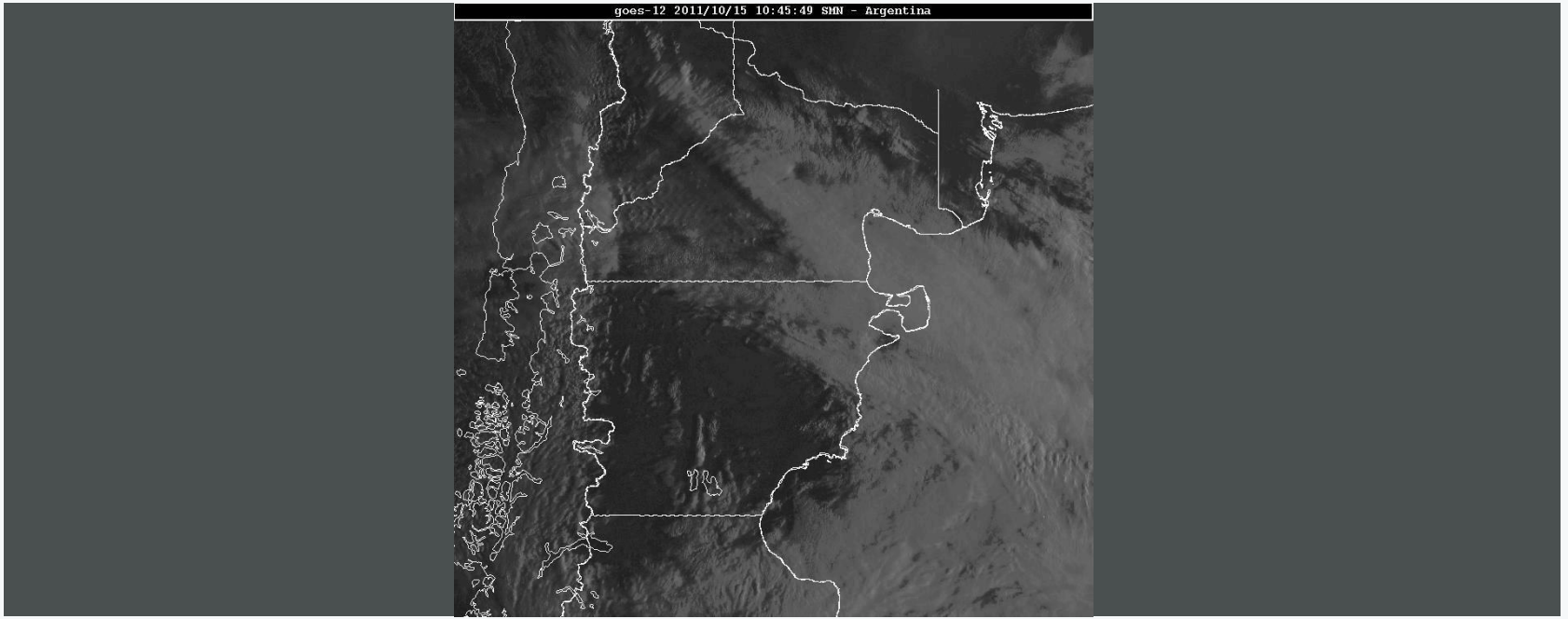
PHENOMENA THAT REDUCE VISIBILITY

VOLCANIC ASH RE-SUSPENDED



PHENOMENA THAT REDUCE VISIBILITY

REMOBILIZED VOLCANIC ASH



PHENOMENA THAT REDUCE VISIBILITY

FOG / SNOWY

01 Water droplets and/or ice crystals suspended in the lower or boundary layer of the atmosphere.

02 The difference between the two lies only in the density and size of the particles, being then defined as Fog when the Horizontal Visibility is equal to or less than 1km and Fog when the visibility exceeds this value.

03 There are several atmospheric processes that give rise to this phenomenon, but the end result is that the surface air is saturated with humidity and from this the H2O vapor contained is transformed into water droplets and/or ice crystals, resulting in the phenomenon being visible.

PHENOMENA THAT REDUCE VISIBILITY

TYPES OF FOG

EVAPORATION

FRONT

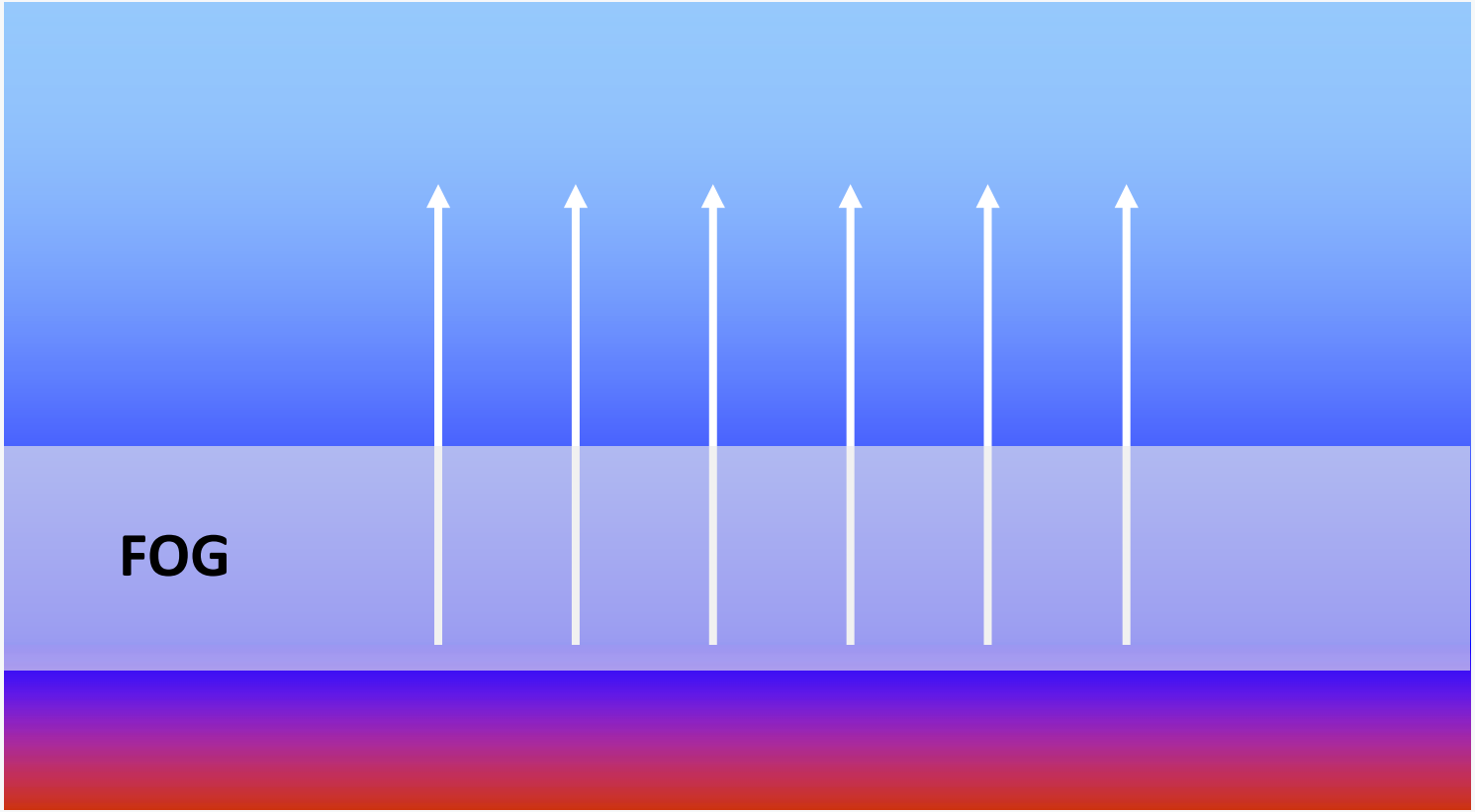
RADIATION

ADVECTION

RADIATION MISTS

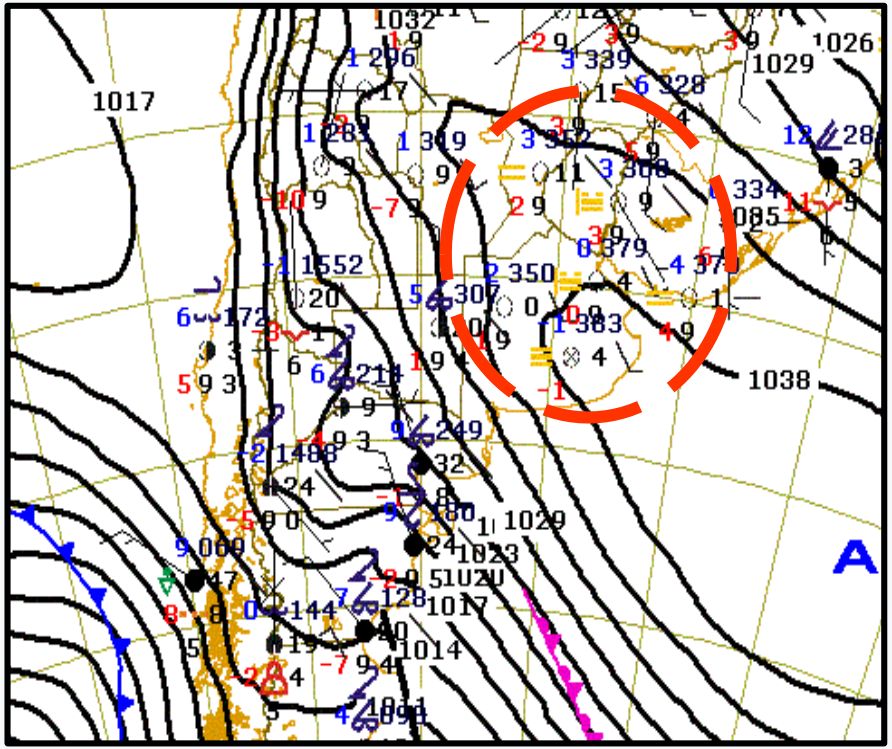
The process of air saturation is caused by cooling.

This is achieved by conduction with the earth's surface from the loss of energy or electromagnetic radiation in long wave, until the surface is cooled enough to achieve heat transfer with the boundary layer of the atmosphere.


FOG

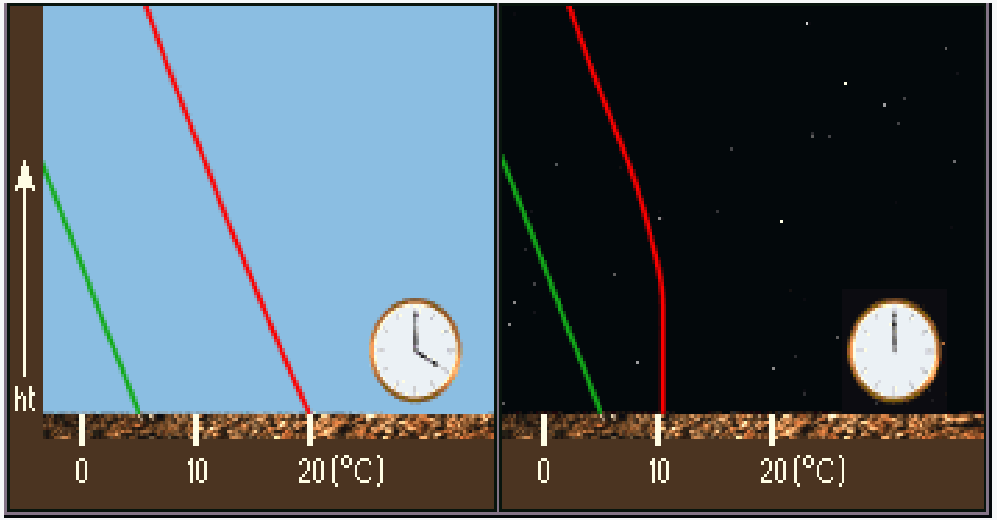
PRECONDITIONS AT LOW LEVELS

- High moisture content
- Light Winds / Calm
- Clear skies / Low cloud cover
- Low absorption of daytime solar radiation
- Rapid surface cooling (prolonged nights)



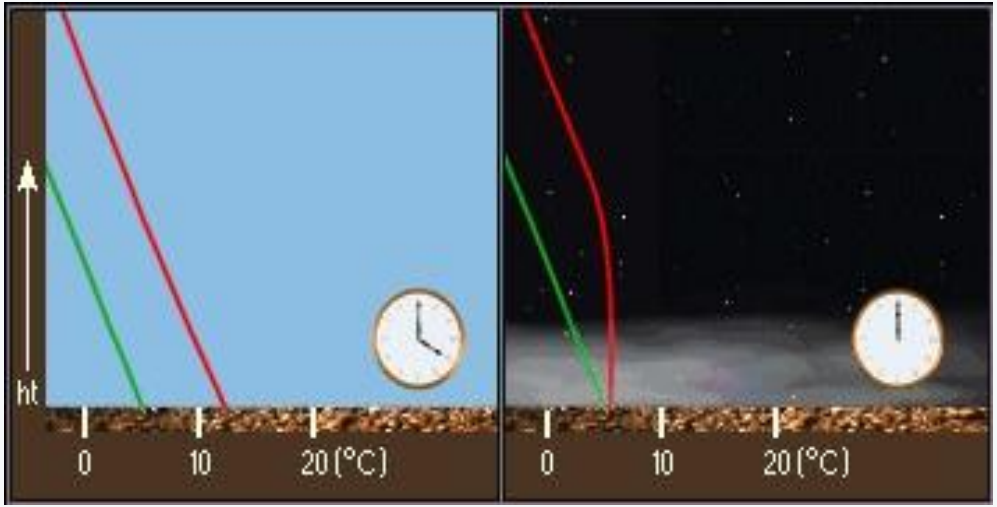
RADIATION MISTS

Clear skies, which favor high daytime temperatures, prolong the period of surface cooling required for air saturation, these conditions are frequent during late spring and summer.



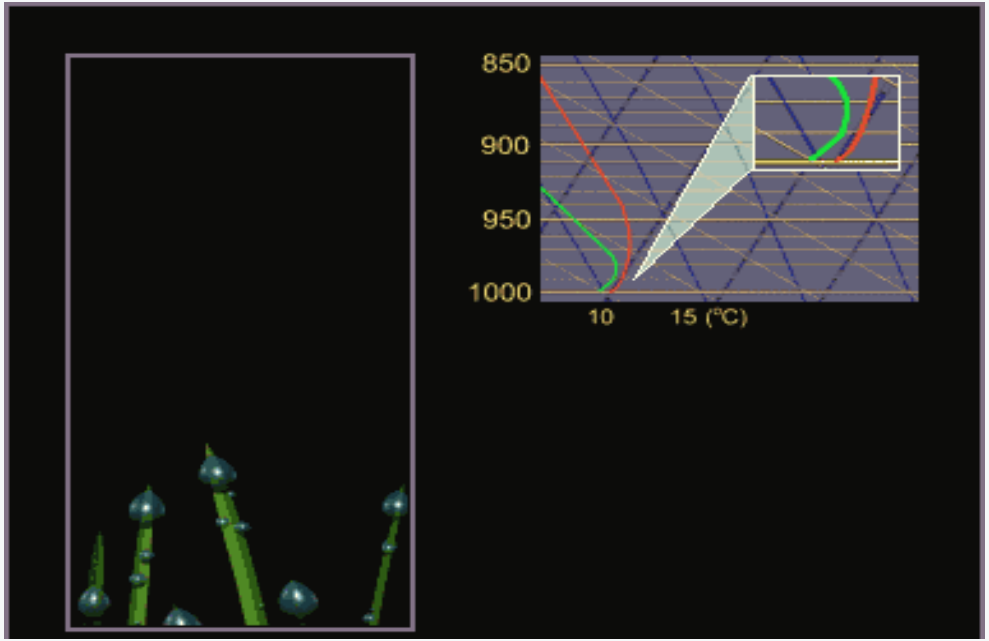
RADIATION MISTS

Low daytime temperatures decrease the period of surface cooling required for air saturation, these conditions are frequent during late autumn, winter, and early spring.

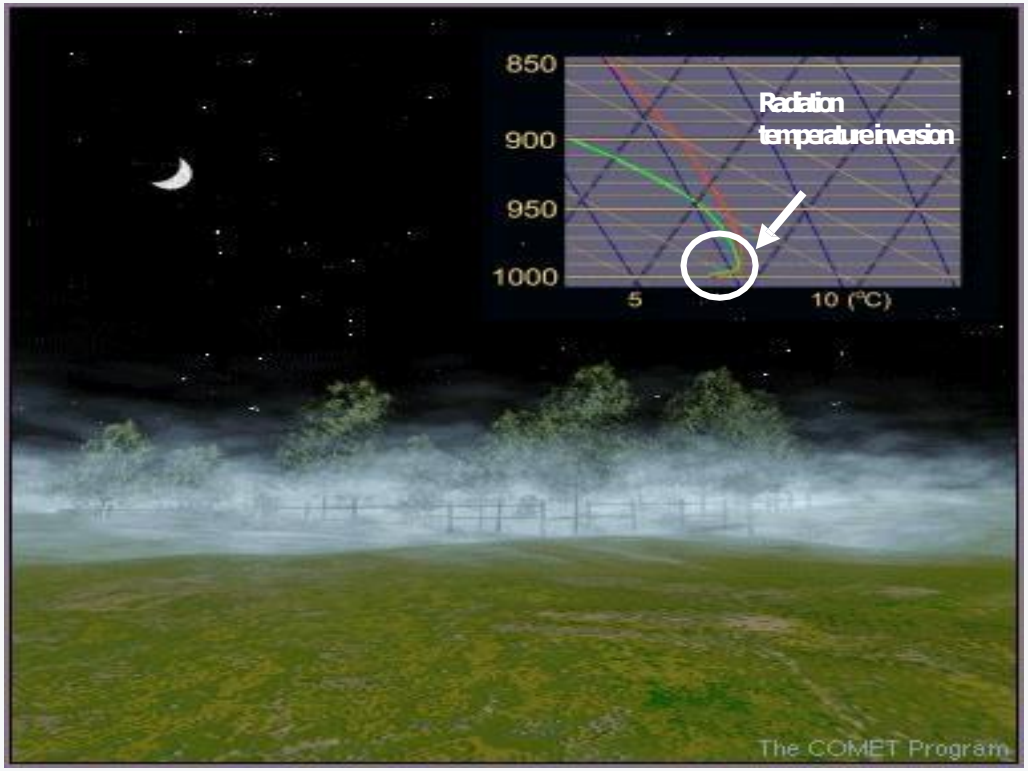


RADIATION MISTS

When the surface layer stabilizes and turbulent diffusion ceases, the H2O vapor molecules combine with the condensation nuclei present, forming the mist droplets

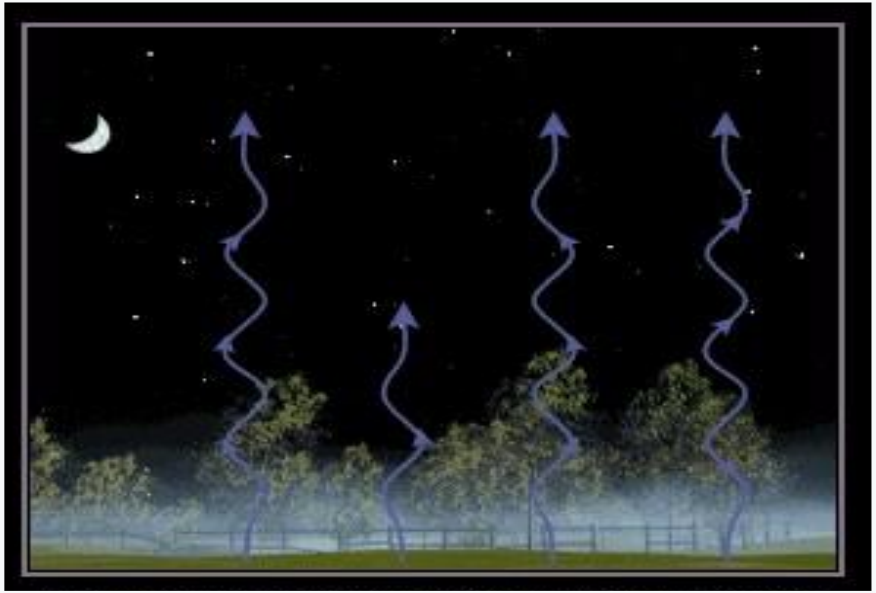


RADIATION MISTS



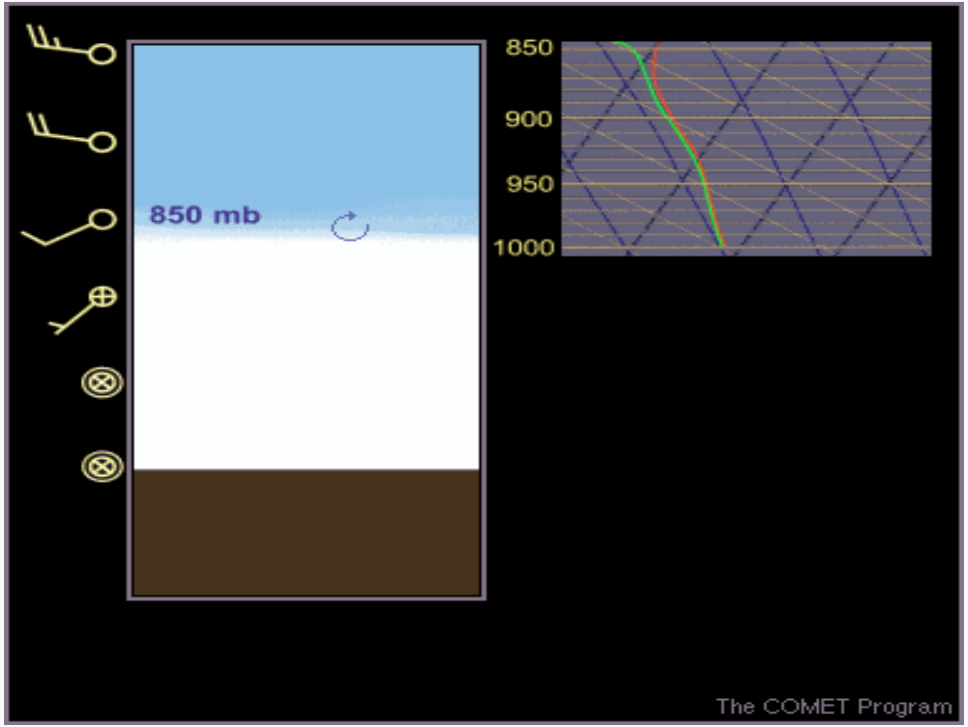
RADIATION MISTS

The thickness of the fog layer depends on the degree of radioactive cooling of the surface, the distribution of moisture, and the vertical shear of wind

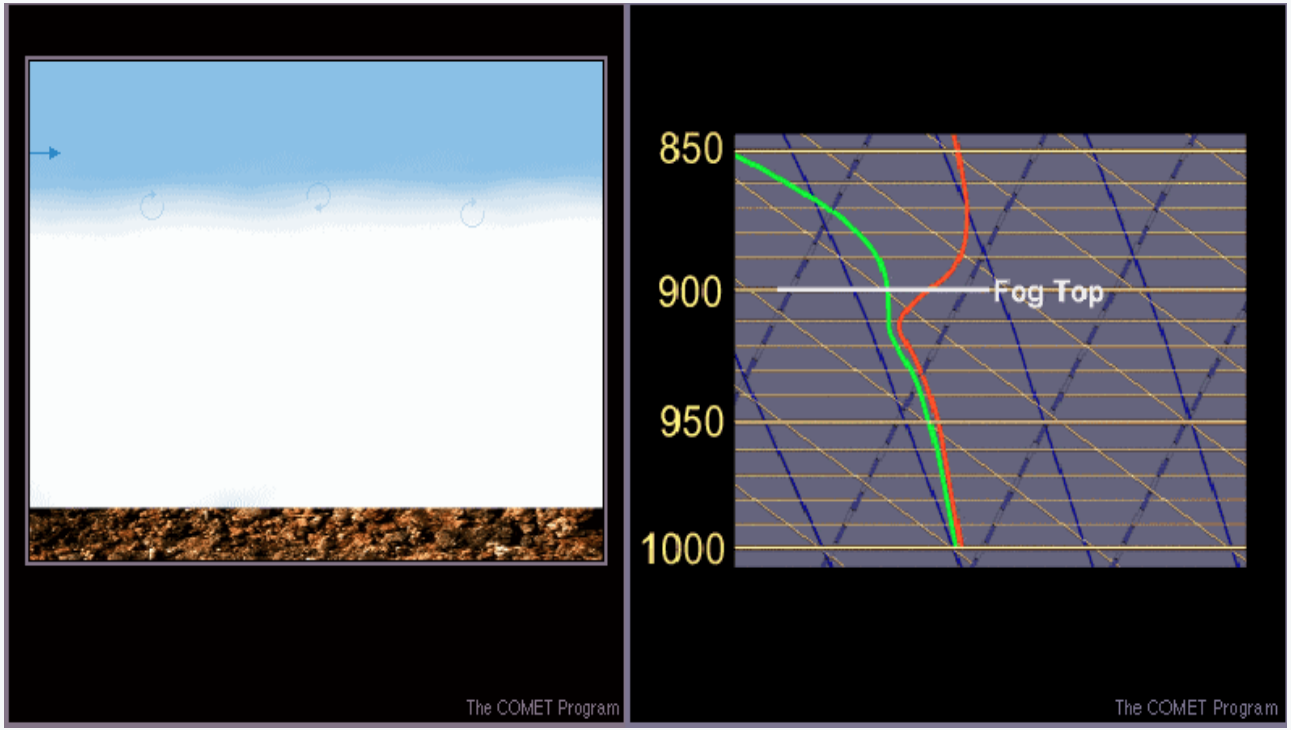


RADIATION MISTS

The increase in the vertical shear of the wind generates the turbulent mixture necessary for the fog layer to be consumed from top to bottom (evaporation of H2O droplets by heating)

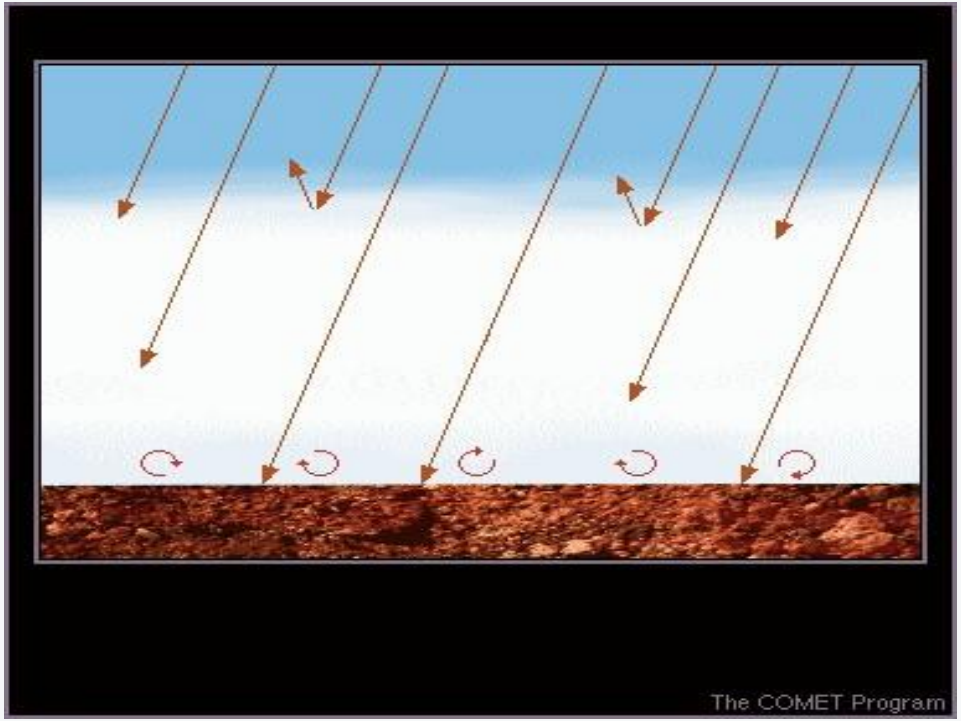


RADIATION MISTS



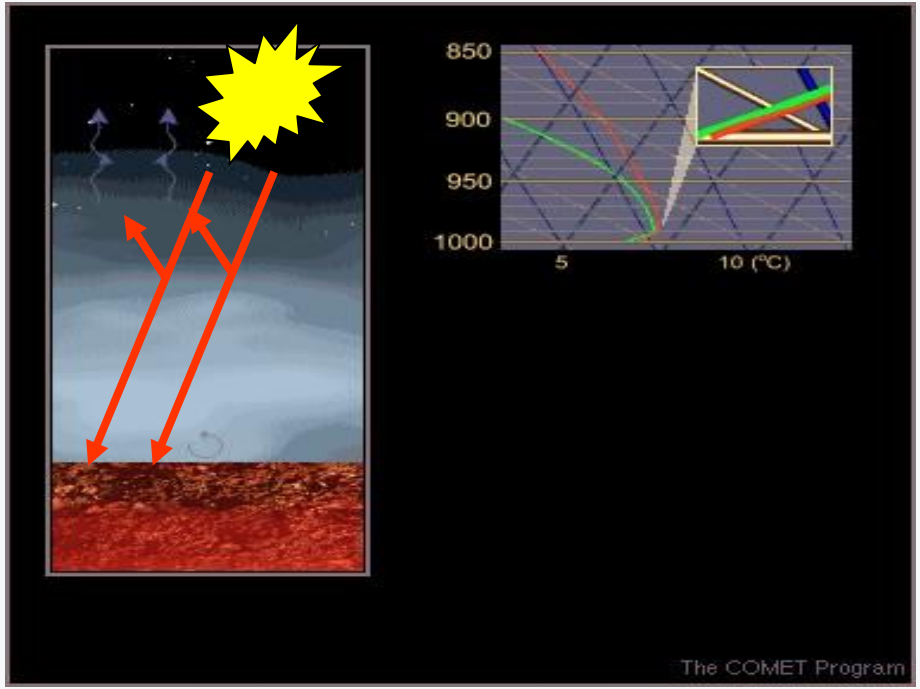
RADIATION MISTS

The dissipation of fog depends on the increase in air temperature, this can be achieved by solar radiation or by the increase of wind in the saturated layer.



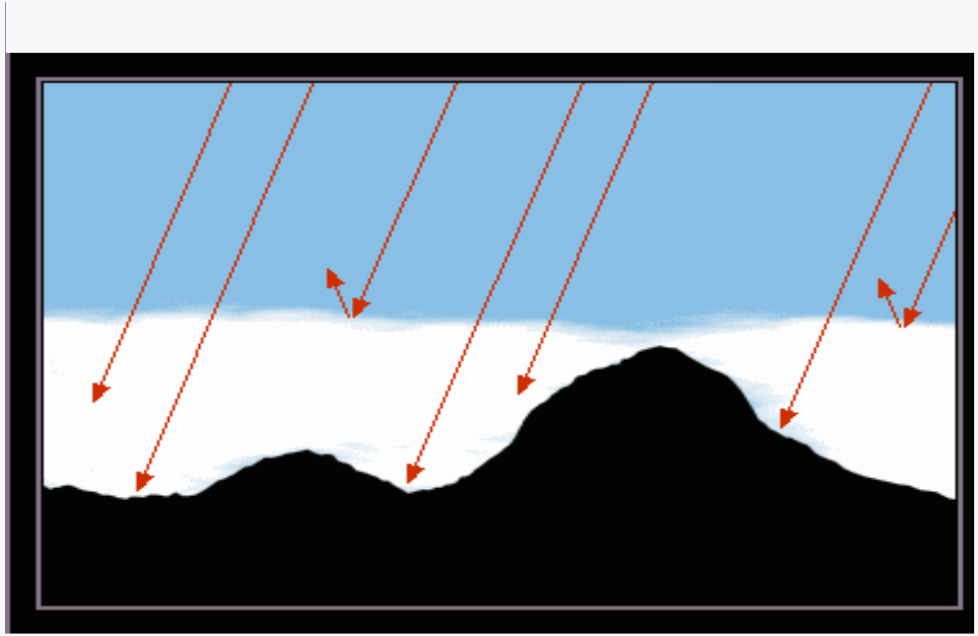
DISSIPATION

Surface heating transfers heat to the adjacent air and the temperature is separated from the dew point, causing the droplets to evaporate.



RADIATION MISTS

In the case of surface heating by solar radiation, the fog begins to evaporate from below. On rough terrain, areas of better sun exposure dissipate more easily.



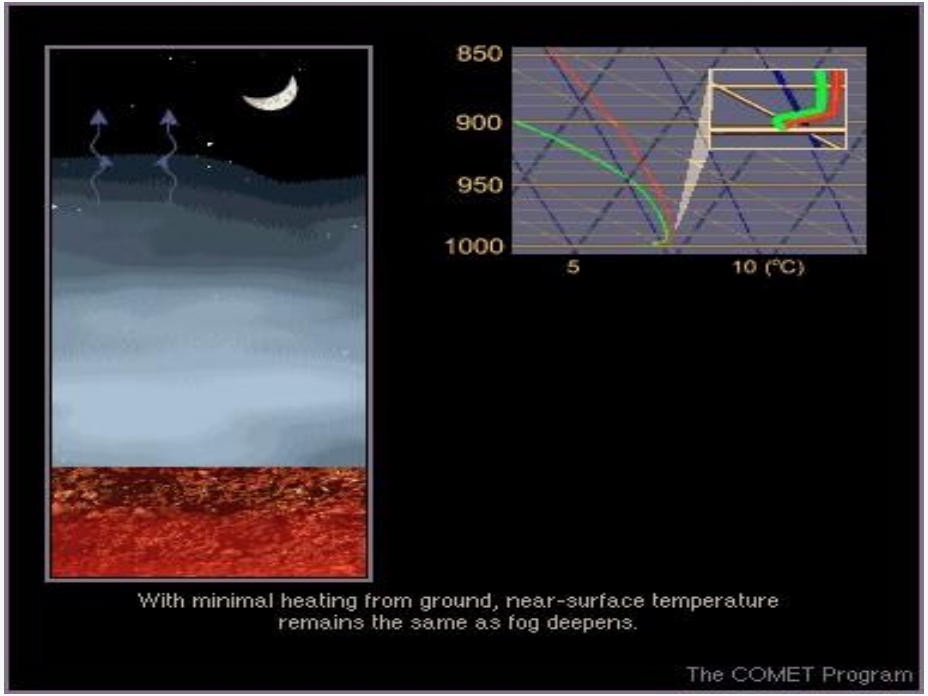
RADIATION MISTS

On the shortest days of the year, solar radiation falls at a shallow angle on the ground, which limits the use of this energy, as it is reflected by the same layer of fog, limiting the possibilities of dissipation.

This also happens with layers of very deep fogs.

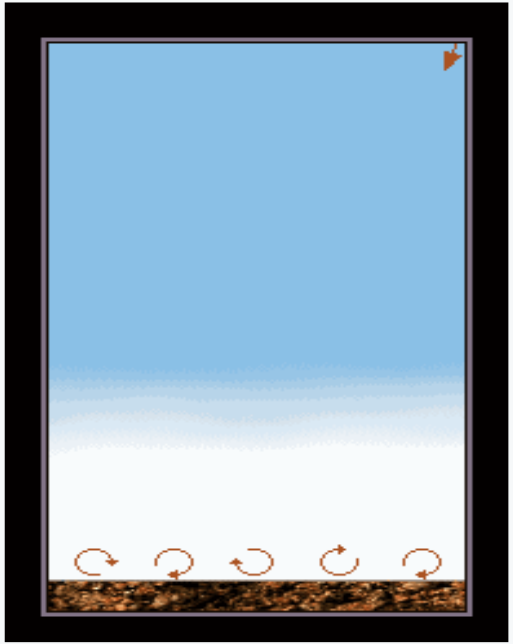
DISSIPATION

With a slight surface heating, the fog can only partially dissipate or only slightly improve the visibility values



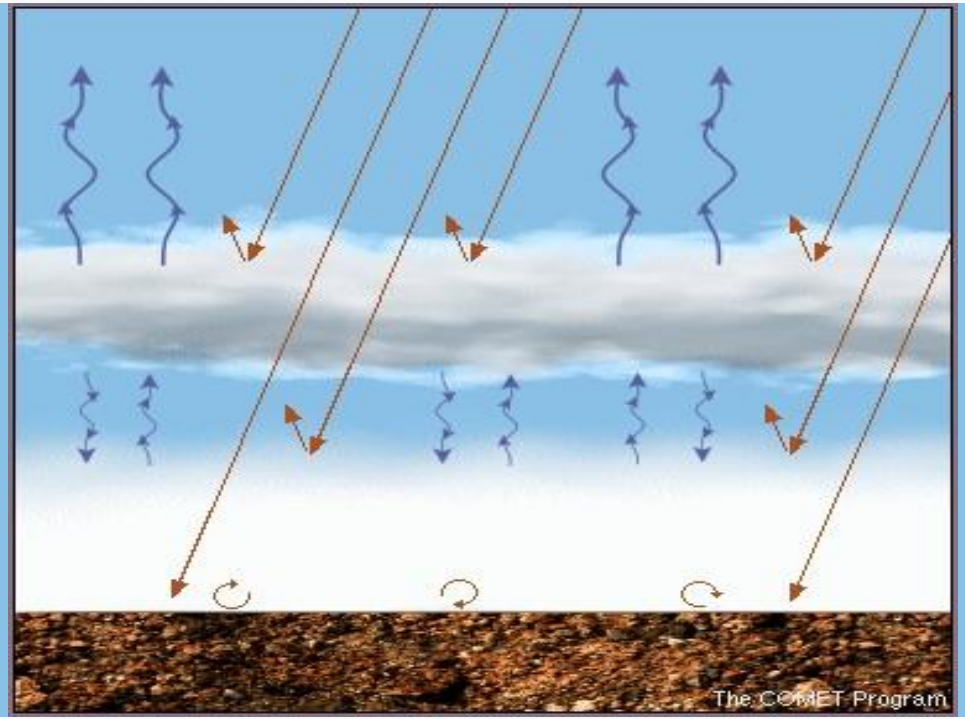
RADIATION MISTS

The appearance of a layer of cloudiness will limit the arrival of sufficient solar radiation for the heating process.



This will keep fog above the surface, or else a layer of low stratiform clouds.

RADIATION MISTS



FRONTAL FOGS

FRONTAL FOGS

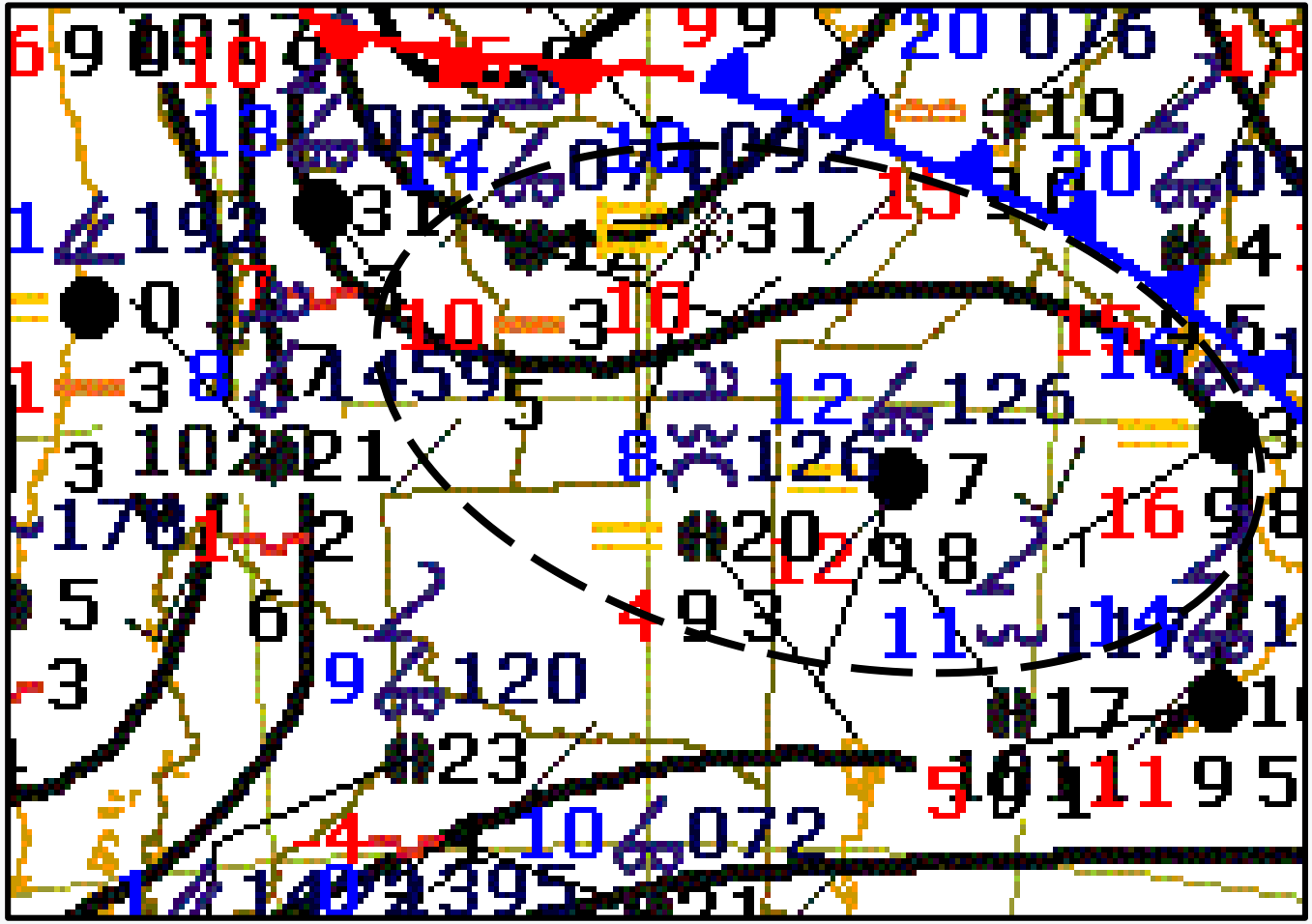
Fog and low stratiform clouds that develop in relation to different types of frontal boundaries are among the most common causes of visibility and restricted cloud ceilings. Fog events can develop in the following situations:

1. Fogs or stratus in front of a warm front
2. Fogs or strata behind a cold front
3. Fogs or strata on stationary fronts

Such events can commonly develop in situations of stability as they are less common in cases of frontal systems with convective developments and storms.

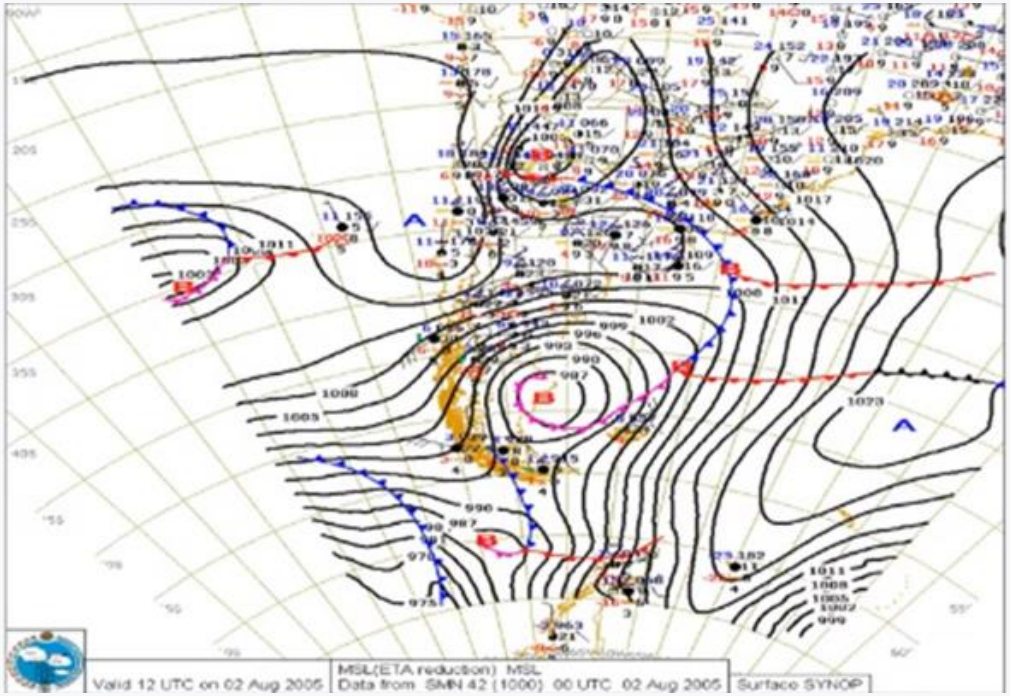
FOGS OR STRATUS IN FRONT OF A WARM FRONT

Often, fog and very low cloud ceilings form in the cold air wedge below and next to the boundary of a warm front as warm air is forced to rise above the cold wedge. These conditions are particularly conducive to fog and stratus formation if precipitation passes through cold air. The combination of evaporative cooling and advection of moisture into the layer allows the underlying cold air to be saturated. In these situations, it is common to observe precipitation associated with very low cloud ceilings or fog. Visibility may be reduced below the minimum requirements, especially if the underlying surface is very wet and cold, such as when there is a blanket of snow.



FOGS OR STRATUS IN FRONT OF A WARM AND/OR STATIONARY FRONT

FOGS OR STRATUS IN FRONT OF A WARM FRONT



EVAPORATION MIST

FRONTAL FOGS

It is clear that the great lakes and oceans represent a source of humidity capable of greatly increasing the frequency of foggy episodes. In addition, due to the low caloric coefficient of water, its surface temperature often contrasts considerably with that of the adjacent soil. The combination of these two ingredients (humidity and temperature contrast) is the main factor influencing fog episodes. Marine features do not only affect immediate coastal areas, but in some cases their influence can be felt hundreds of kilometers inland. In this section we will examine the following scenarios related to marine influences:

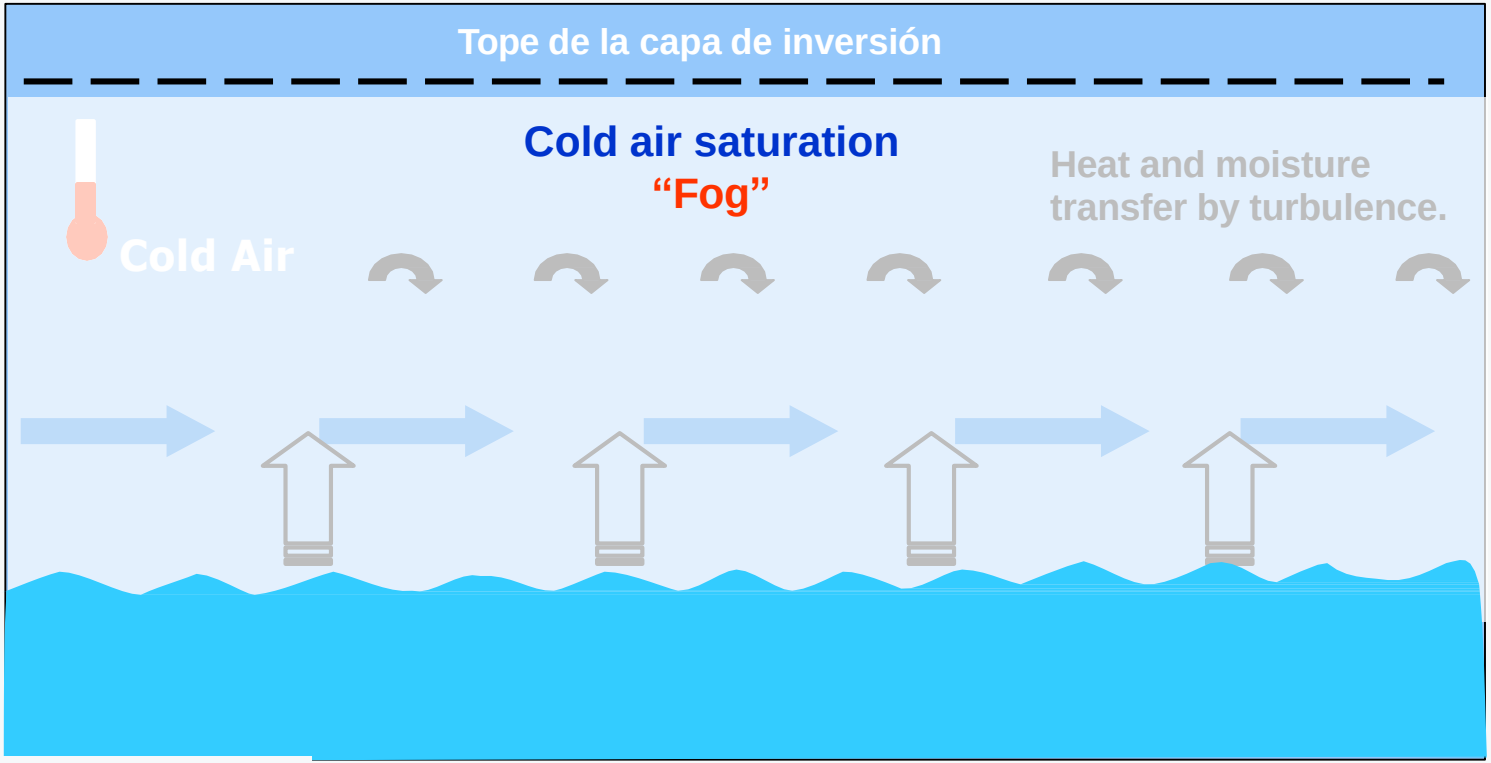
1. Cold Advection Over Warm Water
2. Warm advection over cold water
3. Effects of internal water bodies (lakes, lagoons, rivers)

COLD AIR ADVECTION OVER WARM WATER

FOGS: MARITIME EVENTS

These mists form when dry, cold air passes rapidly over the surface of warmer waters and absorbs heat and moisture from the surface of the water by radiation and heat transfer by turbulence. The moisture then condenses as the air that is in contact with the surface of the water mixes with the cooler air above. Fog forms in vertical columns or dashed zones due to the considerable convective turbulence produced by the underlying warm and moist surface. These mists can become very extensive and very dense, especially if the mixing layer is completely saturated and is below a thermal inversion.

EVAPORATION MIST



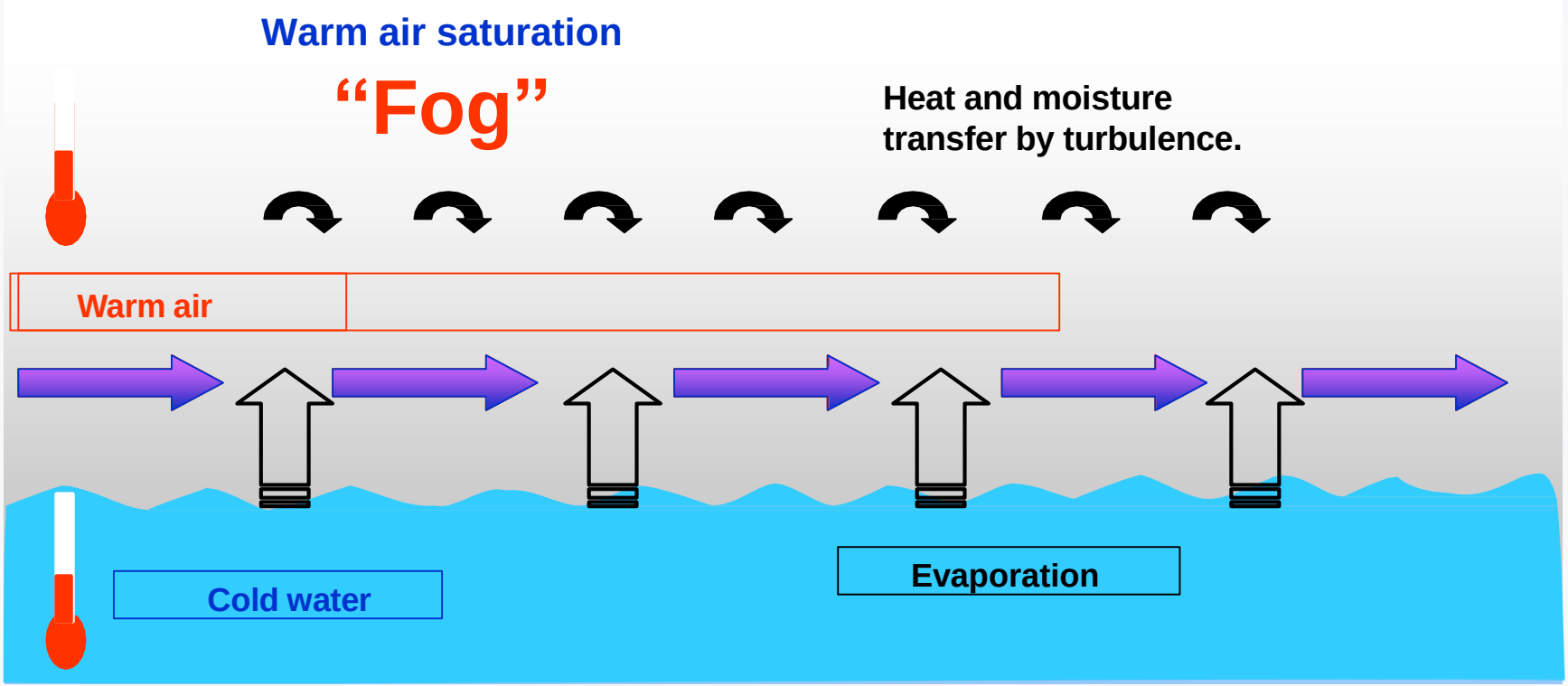
WARM AIR ADVECTION OVER COLD WATER

EVAPORATION MISTS

One of the essential ingredients for fog formation along coastal regions and in the marine environment is an appreciable temperature difference between the surface of the water and the lower layers of the atmosphere. The formation of fog or strata is favored in those areas where there are greater temperature contrasts between the sea surface and the air above it. Key ingredients include:

- The Advection of a warm air mass over colder waters
- The presence of ocean currents or cold lake surfaces

Inversion layer stop

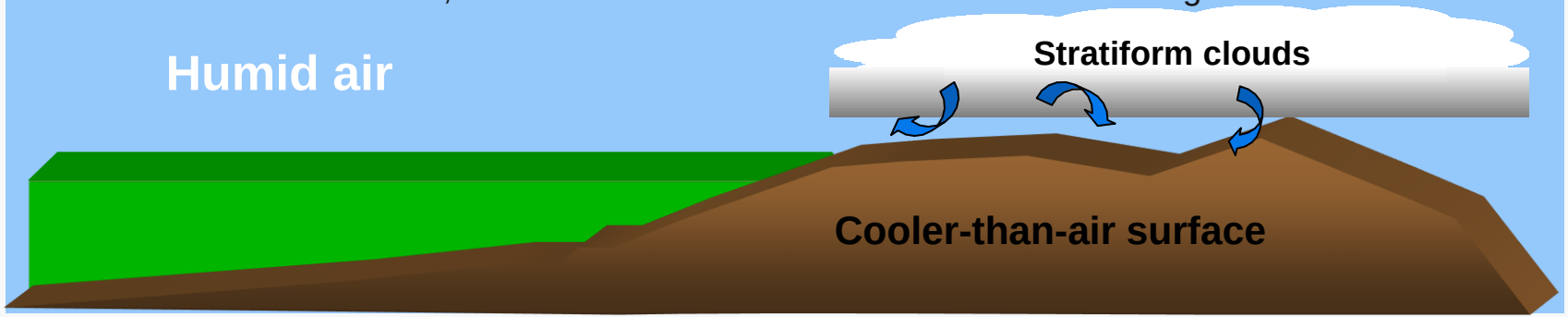


CONTACT WITH COLDER SURFACES. MOISTURE ADVECTION

ADVECTION MISTS

The advection of humid air on colder surfaces favors the heat exchange between the air and the surface, cooling the air until it is saturated and subsequently condensed.

The intensity of the turbulent mixture, in relation to the wind speed and the topographical characteristics of the terrain, will determine whether it is low cloud cover or fog



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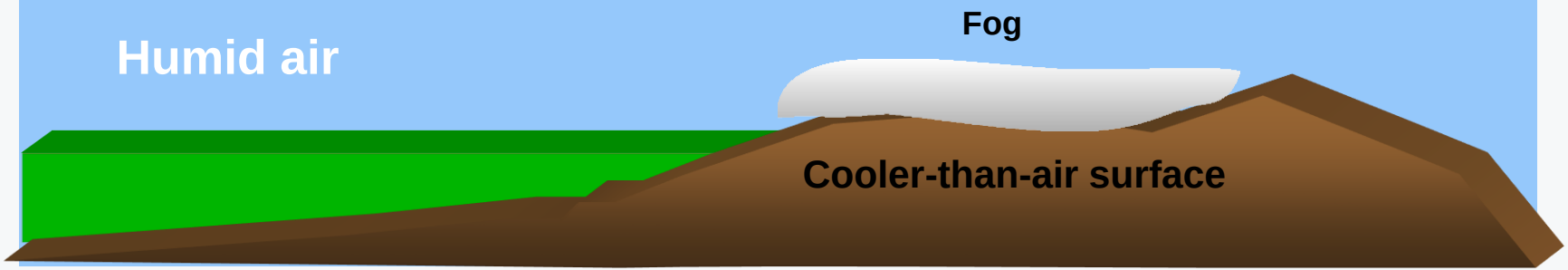

QUESTION TIME!

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