CHAPTER 3

ATMOSPHERIC PHENOMENA

3.1 GENERAL. The instructions given in this chapter together with the "Definitions and Descriptions of Meteors" contained in the Annex of the International Cloud Atlas (pages 55 to 60) shall be used for identifying atmospheric phenomena. Also included are instructions for measuring precipitation, for determining its intensity and character, and for observing miscellaneous phenomena and unusual weather conditions.

3.2 TORNADOES AND WATERSPOUTS. These phenomena are associated with a violently rotating column of air, pendant from a Cumulonimbus cloud. This violent whirlwind is nearly always observable as a cloud column or inverted cloud cone (funnel cloud), and a "Bush" composed of waterdroplets raised from the surface of the sea or of dust, sand, or litter, raised from the ground (see photo on next page).

3.2.1 This phenomenon is called a TORNADO when it occurs over land and a WATERSPOUT when it occurs over water.

3.2.2 The observer shall note the direction of the storm from the station and the direction towards which it is moving. Intensity values are not ascribed to tornadoes or waterspouts. The plain language words TORNADO or WATERSPOUT shall be inserted in the coded weather reports whenever these phenomena are observed.

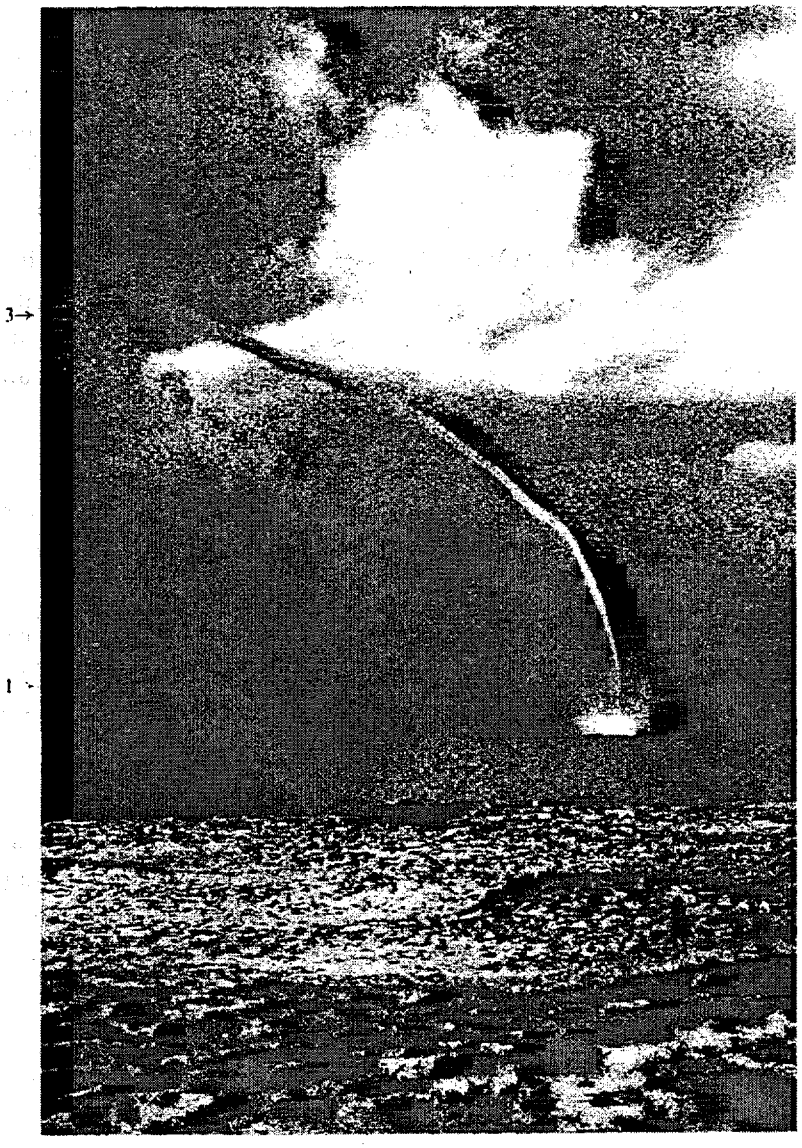
3.2.3 A Tornado (or Waterspout) shall not be reported when the vortex does not reach the ground, or when the observer is not sure that the vortex of the funnel reaches the ground (or water), that is, a "bush" is not observed. In this case "Funnel cloud" and its direction from the station shall be reported.

Waterspout

The photograph was taken looking towards the base of a Cumulonimbus. The heavy rain (1–2) forms a dark background for the lower portion of the spout, which is illuminated by light coming from behind the photographer. The usual tapering of the tuba where it emerges from the base of the Cumulonimbus (3) is hidden by ragged clouds. The lower end of the tuba, which is very narrow, disappears at (4) into a mass of spray (bush), carried up from the sea by the violent whirl of which the tuba is the core.

The spout was 3 km from the shore; it was estimated to be several tens of metres in diameter and several hundreds of metres in height. It moved towards the east (left to right).

A cold front was passing the area in a south–easterly direction.



G. Tsuchida, Masuda (Shimane, Japan),
21 September 1952, 10 h 30 (towards N)

Note: The above photo is a reproduction (Plate No. 68) from the International Cloud Atlas.

3.3 THUNDERSTORM – Definition. A thunderstorm is a local storm produced by a Cumulonimbus cloud, and is always accompanied by lightning and thunder, usually with strong gusts of wind, heavy rain, and sometimes with hail.

3.3.1 Identification. Thunderstorm activity at the station shall be reported when:

(1) thunder is heard within the past 15 minutes, or

(2) overhead lightning is observed within the past 15 minutes and the local noise level is such as might prevent hearing thunder. In this case, hail may also be an indicator of a thunderstorm in progress.

3.3.2 Time of Beginning of Thunderstorm. For record purposes the time of beginning of a thunderstorm shall be the time of the earliest occurrence which indicates thunderstorm activity at the station.

3.3.3 Time of Ending of Thunderstorm. As soon as it is no longer possible to report thunderstorm activity at the station (Para. 3.3.1), the observer shall record the thunderstorm as having ended 15 minutes ago.

3.3.4 Intensity. Heavy thunderstorm shall be recorded when sharp and pronounced thunder and lightning occur almost continuously. (Usually the storm is accompanied by heavy rain and sometimes by hail or snow. Normally there is a rapid drop in temperature and the peak wind preceding or accompanying the storm may reach a speed in excess of 35 knots).

3.3.4.1 Thunderstorm without intensity qualification shall be recorded when the intensity is less than that specified for heavy thunderstorm.

3.4 PRECIPITATION. Any product of the condensation of atmospheric water vapour which is deposited on the earth's surface is a type of precipitation. The types of precipitation which originate aloft are classified in the following sections under Liquid Precipitation, Freezing Precipitation, and Frozen Precipitation.

3.4.1 Liquid Precipitation.

3.4.1.1 Drizzle. Fairly uniform precipitation, composed exclusively of fine drops of water (diameter less than 0.5 mm). Drizzle drops are too small to cause appreciable ripples on the surface of still water. The drops appear almost to float in the air, thus making visible even slight movements of the air.

3.4.1.1.1 Drizzle falls from fairly continuous and dense layers of Stratus, usually low, sometimes even touching the ground (fog).

3.4.1.2 Rain. Precipitation of liquid water particles, either in the form of drops of larger diameter than 0.5 mm, or of smaller widely scattered drops.

3.4.1.2.1 Rain drops are normally larger than drops of drizzle. Nevertheless, drops falling on the edge of a rain zone may be as small as drizzle drops, owing to partial evaporation.

3.4.2 Freezing Precipitation.

3.4.2.1 Freezing Drizzle. Drizzle, the drops of which freeze on impact with the ground or with other objects at or near the earth's surface.*

3.4.2.2 Freezing Rain. Rain, the drops of which freeze on impact with the ground or with other objects at or near the earth's surface.*

3.4.2.3 Freezing Drizzle or Freezing Rain shall be reported when rain or drizzle is freezing on the Ice Accretion Indicator or on other objects at or near the earth's surface.*

3.4.2.4 Ice Accretion Indicator. Two ice accretion indicators are supplied at each station. One or the other of the indicators shall be exposed continuously. The indicator in use is normally attached to the Stevenson Screen, while the other is kept in the screen (free of ice, moisture etc.) to ensure that it will always be at air temperature when it is required as a replacement for the one in use. However, at stations equipped with the AES Dewcel, more convenient locations for exposure and storage may be selected, provided they have been approved locally by the meteorological Inspector.

3.4.2.4.1 Any accumulation of snow on the indicator shall be cleared off after each observation and the metal surface left dry. Ice formed by freezing precipitation shall be removed by melting. Rime Ice or Frost may be wiped from the indicator. During periods of precipitation it will normally be more convenient after each observation, to replace the exposed indicator by the one taken from the screen.

* It is of course assumed that the objects are not artificially heated above or cooled below the temperature of the ambient air.

3.4.2.4.2 When an observation is made during rain or drizzle, the horizontal surface of the ice accretion indicator shall be examined, and if ice has formed on it, freezing precipitation shall be reported. If frost has formed on the indicator, or if ice is detected during fog conditions, appropriate remarks of "Frost on Indicator", "Rime Icing on Indicator" etc., shall be recorded and reported.

3.4.3 Frozen Precipitation.

3.4.3.1 Snow. Precipitation of mainly hexagonal ice crystals, most of which are branched (star–shaped). The branched crystals are sometimes mixed with unbranched crystals. At temperatures higher than about −5 C, the crystals are generally clustered to form snow flakes.

3.4.3.2 Snow Pellets. Precipitation of white and opaque particles of ice. These ice particles are either spherical or conical; their diameter is about 2 − 5 mm.

3.4.3.2.1 Snow pellets are brittle and easily crushed; when they fall on hard ground, they bounce and often break up. Snow pellets always occur in showers and are often accompanied by snow flakes or rain drops, when the surface temperature is around 0°C.

3.4.3.3 Snow Grains. Precipitation of very small white and opaque grains of ice. These grains are fairly flat or elongated; their diameter is generally less than 1 mm. When the grains hit hard ground, they do not bounce or shatter. They usually fall in very small quantities, mostly from Stratus or occasionally from fog, and never in the form of a shower.

3.4.3.4 Ice Pellets. Precipitation of transparent or translucent pellets of ice which are spherical or irregular, rarely conical, having a diameter of 5 mm or less. Ice Pellets are subdivided into two main types:

(a) Frozen raindrops, or snowflakes which have largely melted and then refrozen, the freezing process usually taking place near the ground.

(b) Pellets of snow encased in a thin layer of ice, which has formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets.

3.4.3.4.1 The pellets of ice usually bounce when hitting hard ground and make a sound on impact. Ice pellets type (a) generally fall as continuous precipitation; ice pellets type (b) occur in showers.

3.4.3.5 Hail. Precipitation of small balls or pieces of ice (hailstones) with a diameter ranging from 5 to 50 mm or sometimes more, and which fall either separately or fused into irregular lumps.

3.4.3.5.1 Hailstones are composed almost exclusively of transparent ice, or of a series of transparent layers of ice at least 1 mm in thickness, alternating with translucent layers. Hail is generally observed during heavy thunderstorms.

3.4.3.6 Ice Crystals. A fall of unbranched ice crystals, in the form of needles, columns or plates, often so tiny that they seem to be suspended in the air. These crystals may fall from cloud or from a cloudless sky. (In WMO terminology, Ice Crystals are referred to as Diamond Dust).

3.4.3.6.1 The Crystals are visible mainly when they glitter in the sunshine; they may then produce a luminous pillar or other halo. This hydrometeor, which is frequent in polar regions, occurs only at very low temperatures and in stable air masses.

3.4.4 OTHER HYDROMETEOROLOGICAL DEPOSITS

3.4.4.1 Dew. Dew forms when water is condensed on grass and other objects near the ground. The surface on which the dew forms has been cooled by radiation during the night, to a temperature below the dew point of the surrounding air, but is still above freezing.

3.4.4.2 Hoar Frost. Hoar Frost (commonly called frost), forms when air with a dew point temperature below freezing is brought to saturation by cooling. Hoar Frost is a deposit of interlocking ice crystals formed by direct sublimation on objects, usually of small diameter such as tree branches, plant stems, leaf edges, wires, poles, etc.

3.4.4.3 Rime. Rime is a white or milky and opaque GRANULAR deposit of ice formed by the rapid freezing of super–cooled water drops as they contact an exposed object.

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3.4.4.4 Glaze. Glaze is a coating of ice, generally clear and smooth, formed on exposed objects by the freezing of a film of supercooled water deposited by rain, drizzle, fog or possibly condensed from supercooled water vapour. Glaze is denser, harder and more transparent then either rime or frost.

3.5 OBSTRUCTIONS TO VISION

3.5.1 An "obstruction to vision" is a meteor, other than precipitation, which reduces the horizontal visibility at eye level. Obstructions may be suspended in the atmosphere, e.g., fog or haze, or blown from the earth's surface, e.g., blowing snow or blowing sand.

3.5.2 Fog. A suspension of very small water droplets in the air, reducing the visibility at the earth's surface.

3.5.2.1 When sufficiently illuminated, individual fog droplets are frequently visible to the naked eye; they are then often seen to be moving in a somewhat turbulent manner.

3.5.2.2 This hydrometeor forms a whitish veil which covers the landscape; when mixed with dust or smoke, it may, however, take on a faint coloration, often yellowish. In the later case, it is generally more persistent than when it consists of water droplets only.

3.5.2.3 Fog is rarely observed when the temperature and dew point differ by more than 2°C and fog reduces the visibility to less than 5/8 mile.

3.5.2.4 Fog Patches. Fog patches consist of fog extending to at least two metres above ground level and whose areal extent comprises less than 50% coverage of the ground normally visible from the observing point.

3.5.2.5 Fog Covering Part of Aerodrome. Non–patchy fog (more or less continuous fog) extending to at least two metres above ground level covering part of the aerodrome. The apparent visibility within the area of fog shall be less than 1000 metres (5/8mi.) Fog Covering Part of Aerodrome describes a fog bank or area of fog (or ice fog) which may have small breaks, however within the area of fog at least 50% of the ground must be covered.

3.5.2.6 Freezing Fog Freezing fog is fog consisting mainly of supercooled droplets which usually deposit rime or glaze on objects or surfaces with below freezing temperatures.

3.5.2.7 Mist . The definition of mist is the same as for fog, (see para. 3.5.2 to 3.5.2.3), except that mist reduces visibility to the range 5/8 to 6 miles inclusive.

3.5.3 Ice Fog. A suspension of numerous minute ice particles in the air, reducing visibility at the Earth's surface.

3.5.3.1 Ice fog occurs in clear, calm, stable air. It occurs at temperatures colder than −20°C.

3.5.3.2. The ice crystals in the ice fog may produce phenomena such as small haloes and luminous pillars around lights, the sun or the moon.

3.5.3.3 Ice fog does not produce rime icing or glaze.

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3.5.3.4 Ice Fog. A description of ice fog is given in para. 3.5.3 to 3.5.3.3. In METAR, ice fog is reported as mist when it reduces visibility to the range 5/8 to 6 miles inclusive; it is reported as fog when it reduces visibility to less than 5/8 mile.)

3.5.4 Blowing Snow. Snow particles raised by the wind to sufficient heights above the ground to reduce the horizontal visibility at eye level to 6 miles or less. The concentration of snow particles may sometimes be sufficient to veil the sky and even the sun. The snow particles are nearly always violently stirred up by the wind. The observer should use great caution in reporting a combination of falling snow and blowing snow.

3.5.5 Haze. A suspension of extremely small, dry particles invisible to the naked eye and sufficiently numerous to give the air an opalescent (milky or pearly) appearance.

3.5.5.1 Haze imparts a yellowish or reddish tinge to distant objects or lights seen through it, while dark objects appear bluish. This effect is merely a result of scattering of light by the haze particles. These particles may have a colour of their own which also contributes to the coloration of the landscape.

3.5.6 Dust Haze. A suspension in the air of dust or small sand particles, raised from the ground, prior to the time of observation, by a duststorm or sandstorm.

3.5.6.1 The duststorm or sandstorm may have occurred either at or near the station or far from it.

3.5.7 Dust/Sand Whirls. Dust or sand whirls (commonly known as a dust devil) consist of an ensemble of particles of dust or sand, sometimes accompanied by small litter, raised from the ground by the wind, in the form of a whirling column of varying height with a small diameter and an approximately vertical axis.

3.5.8 Blowing Dust or Blowing Sand. Dust or Sand, raised by the wind to moderate heights above the ground. The visibility at eye level is sensibly reduced.

3.5.9 Duststorm. Dust raised to great heights by a strong turbulent wind. The forward portion of the storm may have the appearance of a wide high wall. The visibility at eye level is reduced to less than 5/8 of a mile.

3.5.10 Sandstorm. Sand raised to great heights by a strong turbulent wind. The forward portion of the storm may have the appearance of a wide high wall. The visibility at eye level is reduced to less than 5/8 of a mile.

3.5.11 Smoke. A suspension in the air of small particles produced by combustion.

3.5.11.1 Viewed through smoke, the sun appears very red at sunrise and sunset; it shows an orange tinge when high in the sky. Smoke from nearby cities may be brown, dark grey or black. Smoke in extensive layers originating from forest fires scatters the sunlight and gives the sky a greenish–yellow hue. Evenly distributed smoke from very distant sources generally has a light greyish or bluish hue. When smoke is present in large quantities, it may be distinguished by its smell.

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3.5.11.2 Smoke which is surface–based is distinguished from layers or clouds of smoke (clouds of smoke from nearby fires or layers resulting from industry) by the diffuse appearance of the former and by the absence of any discernible outlines. Plumes of smoke of local origin are not reported as an atmospheric phenomenon.

3.5.12 Volcanic Ash. Volcanic ash consists of fine particles of rock powder which have been blown out from a volcano. The ash may remain suspended in the atmosphere for long periods, producing red sunsets thousands of kilometres away.

3.6 VISIBILITY REDUCED BELOW EYE LEVEL

3.6.1 Drifting Dust, Drifting Sand and Drifting Snow. When particles of dust, sand or snow are raised by the wind in such quantity that very low objects are veiled or hidden and yet the visibility at eye level is not appreciably restricted, the phenomenon is referred to as Drifting Dust, Dirfting Sand or Drifting Snow respectively.

3.6.2 Shallow Fog. A suspension of very small water droplets in the air, reducing the visibility at the earth's surface, but not appreciably reducing the visibility at eye level (1.8 m above the surface), although the visibility within the fog is less than 5/8 mile.

3.7 MEASUREMENT OF PRECIPITATION AMOUNTS

3.7.1 General. The measurement of precipitation is expressed in terms of vertical depth of water (or water equivalent in the case of solid forms) which reaches the ground during a stated period. Suitable measuring gauges and calibrated graduates are supplied for this measurement.

3.7.2 Unit of Measurement. The millimetre is the unit of measurement of liquid precipitation. The vertical depth of water or water equivalent is normally expressed to the nearest 0.2 mm. (See also para. 3.7.3.1 and 3.7.6.1) Less than 0.2 mm is called a "Trace". Depth of freshly fallen snow is measured to the nearest 0.2 cm. Less then 0.2 cm is called a "Trace".

3.7.3 Rainfall. Liquid catch of the rain gauge shall be measured to determine the amount of rain or drizzle. The catch of the rain gauge shall also be used to measure the amount of freezing rain, freezing drizzle, and hail (para. 3.7.3.1) and the amount of water accumulated from these types of precipitation shall be recorded as "Rainfall."

3.7.3.1 When measuring rainfall, the level of the water in the plastic graduate is correctly taken to be that of the lowest part of its curved surface or meniscus. When this lies between two scale marks, the amount is that of the nearer mark. In the exceptional case where the level is exactly midway between two scale marks, the amount reported is the intermediate (odd) value, e.g., 0.3 mm.

3.7.3.2 Whenever the level of the meniscus is below the .2 scale mark, "trace" will be reported.

Note: Precipitation amounts up to 0.2 mm are exceedingly difficult to measure. Therefore, all observations will be recorded as "trace" or 0.2 mm. The amount 0.1 mm will not be recorded at any time.

3.7.3.3 If the catch of liquid or freezing precipitation has frozen in the funnel or gauge, it shall be melted by adding a measured quantity of warm water. The quantity of water added shall then be subtracted from the contents of the gauge to determine the actual precipitation amount.

Example:

Measurement of total contents of gauge. . . . . .1.4 mm
Added warm water . . . . . 1.0 mm
Actual precipitation. 0.4 mm

3.7.4 Hail. When hail falls, a great deal usually bounces out of the rain gauge. When the fall of hail has been sufficient for a layer to completely cover the ground, the top of the rain gauge shall be removed as soon as possible after the hail storm has ended; invert the top over a horizontal surface and collect the amount of hail contained within the area of the top of the rain gauge. Melt this amount of hail to obtain the water content. Include hail amount in the amount of "Rainfall".

3.7.5 Dew. The amount of dew collected by the rain gauge shall be included in the precipitation amount without comment when other precipitation has also occurred. When the observer is certain that no other precipitation has fallen, the amount of dew shall be measured and recorded and the word "dew" shall be noted in the precipitation record. This is necessary not only for general record purposes, but also because measured precipitation resulting from dew alone shall not be reported in Synoptic messages.

3.7.6 Snowfall. The amount of snow which has fallen in a given period shall be determined by measuring and averaging the depth of new snow in several places using a ruler. As far as possible, the depth of new snow shall be measured in spots where the snow has fallen undisturbed by the wind. When snow has been drifted by the wind, the depth of new snow in the drifts and in exposed areas shall be measured, and the observer shall then estimate the depth of snow that would have accumulated if the fall had been undisturbed by the wind. Due allowance for the relative sizes of the drifts and exposed areas shall be made. During the periods when melting occurs between observations, the amount of snow left at the time of the observation will not be the same as the total depth of the snow which has fallen since the previous observation. Under such conditions the amount reported will be an estimate of what the depth would have been if no melting had occurred.

3.7.6.1 Measurement of Water Equivalent. At stations equipped with a snow gauge, two catchment containers are provided. One of these is exposed in the gauge and the other held as a replacement. At each observation when snow has occurred the observer shall remove the exposed container from the gauge, insert the replacement container, and melt the snow caught in the exposed container. A measured quantity of warm water or a source of low heat, such as a radiator, should be used for melting the snow. The water content of the snow shall be measured in the special graduate provided. During the summer, the catchment container should be brought indoors. When the snow gauge container is in service, it shall be checked and emptied whenever a measurable amount of precipitation is found in the rain gauge. Although water equivalent is normally expressed to the nearest 0.2 mm, in the exceptional case where the meniscus is exactly midway between two scale marks, the amount reported may be the intermediate (odd) value, e.g., 0.9 mm.

3.7.6.1.1 When snow has occurred without rain, and some or all of the snow has melted by the time of observation, the amount of water collected in the snow gauge shall be measured to obtain the water equivalent of the snowfall. The water equivalent shall be multiplied by ten and converted to cm to obtain an estimated value for the amount of snowfall.

3.7.6.1.2 When the observer is reasonably sure that the catch in the snow gauge is due largely to "blowing snow", the water equivalent of the newly fallen snow shall be estimated (para. 3.7.6.2). During and/or after "blowing snow" conditions, when no falling snow has occured, the snow gauge shall be checked and emptied of any accumulated snow, at each scheduled time for measuring precipitation.

3.7.6.2 Estimating the Water Equivalent. At stations not equipped with a snow gauge, it is necessary to estimate the water equivalent of the new snow which has fallen. The depth of the freshly fallen snow shall be divided by ten and converted to mm to obtain the water equivalent. For example, 3.0 cm of newly fallen snow has an estimated water equivalent of 3.0 mm.

3.7.6.2.1 When snow has occurred without rain, and the snow has melted by the time of observation, the amount of water collected in the rain gauge shall be measured to obtain the water equivalent of the snowfall. The water equivalent shall be multiplied by ten and converted to cm to obtain an estimated value for the amount of snowfall. For example: if the raingauge contains 1.4 mm of water (melted snow) the estimated depth of the snow which melted would be 1.4 cm.

3.7.6.3 Snow Pellets, Snow Grains, Ice Pellets and Ice Crystals. The accumulation on the ground is measured as for snowfall, (para. 3.7.6) and shall be included in the amount of snowfall. "Water equivalent" shall be measured (para. 3.7.6.1) or estimated (para. 3.7.6.2) in the same way as for snow.

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3.7.7 Mixed Rain and Snow

3.7.7.1 Stations equipped with snow gauge. When all or part of the snow has melted, the total amount of precipitation shall be obtained from the contents of the snow gauge. The relative amounts of rainfall and snowfall shall be estimated, taking into consideration the amount of snow, if any, which accumulated on the ground previous to melting, and the intensity and length of time during which the snow fell. For example, if the total precipitation measured in the snow gauge was 2.8 mm, and the snowfall was estimated as 1.0 cm (water equivalent of 1.0 mm) then subtracting the water equivalent of the snowfall from the total precipitation (2.8 – 1.0) would give the amount of rainfall as 1.8 mm.

3.7.7.2 Stations not equipped with a snow gauge. The amount of new snow which has not melted shall be measured as instructed in para. 3.7.6. The catch of the rain gauge shall also be measured as instructed in para. 3.7.3, using a measured amount of warm water, if necessary, to melt any snow which accumulated in the rain gauge. The precipitation measured by the rain gauge in this case is the total amount of the actual rainfall plus the water content of the snowfall. The amount of the rainfall may then be determined as shown by the example in para. 3.7.7.1.

3.7.7.2.1 When the snow has melted, the total amount of precipitation shall be obtained from the rain gauge. The relative amounts of rainfall and snowfall shall be estimated as indicated in para. 3.7.7.1.

3.8 DEPTH OF SNOW ON THE GROUND

3.8.1 The total depth of snow on the ground at the time of the observation shall be determined, (in whole centimetres) by making a series of measurements and taking the average. The area selected for the measurement shall be chosen with a view to avoiding drifts. Care shall be taken to ensure that the total depth is measured including the depth of any layers of ice which are present.

3.8.2 A number of snow stakes, painted with rings of alternate colours or other suitable scale, provide a convenient means of measuring the total depth of snow on the ground.

3.8.3 Measurements taken in 3.8.1 shall not be adjusted to agree with the weekly or bi–weekly snow survey (as they are usually at different locations).

3.9 INTENSITY OF PRECIPITATION

3.9.1 The precipitations classified above as Liquid, Freezing and Frozen (with the exception of ice crystals) are always qualified as to intensity, viz., light, moderate or heavy.

3.9.2 The term LIGHT also includes scattered drops, flakes, grains, pellets or stones occurring at a rate which would not wet or cover a surface, regardless of the duration.

3.9.3 The intensities LIGHT, MODERATE and HEAVY are determined by considering either the effect on visibility or the rate of fall.

3.9.4 Intensity by Visibility Criteria.

Snow	LIGHT if visibility 5/8 mile or more
Snow Shower	
Snow Grains	MODERATE if ALONE* and the visibility
Snow Pellets	reduced to 1/2 or 3/8 mile.
Drizzle	
Freezing Drizzle	HEAVY if ALONE* and visibility reduced to 1/4, 1/8 or 0 mile.

*ALONE, i.e., no other precipitation and/or obstruction to vision is present.

3.9.4.1 Mixed Precipitation. When two or more of the above precipitations are occurring together without any "Obstruction to Vision", the intensity of the predominant type shall be determined according to the visibility and the intensity of the less dominant type/s shall be judged, as well as possible on a rate of fall basis.

3.9.4.2 Mixed Precipitation. When one or more of the above precipitations is occurring with any other precipitation and no "Obstruction to Vision" is present, the predominant type from the above group shall have its intensity determined according to the visibility and all other intensities shall be judged, as well as possible, on a rate of fall basis.

3.9.5 Intensity by Rate of Fall Criteria.

Rain	LIGHT if rate of fall is 2.5 mm/h or less
Rain Showers	MODERATE if rate of fall is 2.6 mm to 7.5 mm/h.
Freezing Rain	HEAVY if rate of fall is 7.6 mm/h or more

3.9.5.1 Although the above rates of fall are given in millimetres per hour, the intensity at the actual time of observation shall be determined by the rate of fall using the shortest practical period. For example, if from the chart of the automatic rain gauge, it was determined that 1.0 mm of rain was recorded during the 5 min prior to the observation, the rate of fall would be 12.0 mm/h and the intensity of the rain at time of observation would be classified as Heavy, unless there were obvious reasons to indicate otherwise.

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3.9.5.2 The above "rate–of–fall criteria" may also be used to determine the intensity of frozen precipitation, considering its water equivalent, when the intensity is not directly indicated by the visibility.

3.9.5.3 When a recording rain gauge is not available and when the rate of fall is fairly uniform, the intensity of rain may be determined by exposing a spare rain gauge for a 10–minute period. For example: if the catch is 1.4 mm for 10 minutes, the rate of fall is 8.4 mm/h (6 X 1.4), the intensity is "Heavy". If a spare gauge is not available, two measurements from the standard gauge could be made, to determine the 10–minute catch, taking the necessary precautions to ensure that all the precipitation for the period will be measured at the time of the scheduled observation.

3.9.5.4 When the intensity of rain, rain showers or freezing rain must be determined without the aid of instrument measurements, the following table may be used as a guide:

	Light Rain	Moderate Rain	Heavy Rain
Individual Drops	Easily seen	Not easily seen	Not identifiable (Rain in sheets)
Spray Over Hard Surface	Hardly any	Noticeable	Heavy, to a height of several centimetres
Puddles Form	slowly	Form rapidly	Form very rapidly

3.9.5.5 When the intensity of Hail or Ice Pellets cannot be determined from the measured water equivalent, the following table may be used as a guide:

Ice Pellets	Light	Few stones or pellets, slow
Hail		accumulation on the ground
	Moderate	Rapid accumulation on the ground
	Heavy	Very rapid accumulation on the ground

3.9.5.6 When the intensity of drizzle or freezing drizzle cannot be determined by visibility the following "rate–of–fall" accumulation table may be used as a guide:

	Light	less than 0.2 mm/h
Drizzle		
Freezing Drizzle	Moderate	0.2 mm to 0.4 mm/h
Snow Grains	Heavy	0.5 mm to 1.0 mm/h

Note: When the rate of fall for liquid or freezing precipitation exceeds 1.0 mm/h, the precipitation should be classified as rain or freezing rain rather than drizzle or freezing drizzle.

3.9.5.7 Ice Crystals – No intensity is ascribed to Ice Crystals.

3.10 INTENSITY OF PRECIPITATION WITH AN OBSTRUCTION TO VISION.

3.10.1 When precipitation occurs together with an "Obstruction to Vision", the intensity of the precipitation shall be determined on a "rate of fall" basis, irrespective of whether its intensity is normally defined in terms of visibility. However, "rate of fall" intensities shall be consistent with visibility criteria, for example:

(a) Drizzle occurring with fog shall not be reported as moderate or heavy when the visibility is 5/8 mile or more.

(b) Snow with blowing snow shall not be reported as heavy when the visibility is 3/8 mile or more, etc.

3.11 CHARACTER OF PRECIPITATION

3.11.1 Under the term "character", precipitation can be classified as showery, continuous or intermittent.

3.11.2 Showers. Showery precipitation falls from cumuliform cloud and can be further identified by one or more of the following features:

(a) Showers often (but not always) begin and end abruptly.

(b) Showers usually occur in periods of short duration, perhaps 15 minutes or so, but they may last much longer.

(c) Usually there are rapid fluctuations in the intensity of the precipitation.

(d) There is a noticeable brightening of the sky between showers.

3.11.2.1 Certain types of precipitation, such as Snow Pellets and Hail, always occur as showery precipitation. Rain, Snow and Ice Pellets, can occur either with showery or non–showery characteristics; to indicate a showery character, the terms "Rain showers", "Snow showers" and "Ice pellet showers" are used.

3.11.3 Continuous Precipitation. Precipitation which is not showery is considered to be continuous when:

(a) It continues without a break for at least one hour preceding the time of observation, or

(b) It continues without a break since beginning in the hour preceding the time of observation.

3.11.4 Intermittent Precipitation. Precipitation which is not showery is considered to be intermittent when it has stopped and recommenced at least once during the hour preceding the actual time of observation.

Note: Continuous precipitation may on occasion become showery without the precipitation stopping, and showery precipitation may become continuous without stopping.

3.12 NOTES ON UNUSUAL WEATHER

3.12.1 Notes on unusual weather shall be kept by all stations. Such notes are of considerable value, particularly for climatological purposes, in providing information to hydro electric systems, public carriers, insurance companies and many other users. Notes of unusual weather shall be kept in the designated spaces on Form 63–2322. If no space has been designated for the particular phenomenon observed it shall be entered under a heading of "Notes". Should more space be required, as would be the case when a sketch is involved, the information shall be entered on the back of the form with a notation to this effect on the front. Copies of all such notes, sketches, etc., shall also be made on the station copy of the form, so that the station record will be complete.

3.12.2 In all cases where notes are made regarding unusual weather, the times and dates shall be recorded with the greatest care.

3.12.3 The following are some of the conditions which should be described under "NOTES" on Form 63–2322:

(a) Heavy and killing frosts.

(b) Damage to life or property by high winds, tornadoes or hail. Particulars of the extent and location of the damage should be given.

(c) The thickness of the accumulation of ice on wires, trees or other exposed surfaces during periods of freezing precipitation.

(d) Unusual floods or droughts.

(e) Other unusual occurrences such as frequent dustwhirls, severe lightning, etc.