

SYNOP Data Format (FM-12)

Surface Synoptic Observations

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Syntax

IIiii or IIIII YYGGi 99LLL QLLLL
ihVV Nddff 00fff 1sTTT 2sTTT 3PPPP 4PPPP 5appp 6RRRt 7wwwW 8NCCC 9GGgg
222Dv 0sTTT 1PPHH 2PPHH 3dddd 4PPHH 5PPHH 6IEER 70HHH 8aTTT
333 0.... 1sTTT 2sTTT 3Ejjj 4Esss 5jjjj_jjjjj 6RRRt 7RRRR 8Nchh 9SSss

000 Group - Identification and Location

- **IIiii** The WMO number of the station.
Ship or Buoy Observations:
- **IIIII** The ship or buoy identifier
- **YYGGi**
 - YY** -- The day of the month
 - GG** -- The hour of the observation (UTC)
 - i_w** -- Wind type indicator
 - 0 -- m/s (estimated)
 - 1 -- m/s (from anemometer)
 - 2 -- knots (estimated)
 - 3 -- knots (from anemometer)
- **99LLL QLLLL**
 - LLL** -- Latitude of observation to .1 degrees
 - Q** -- Quadrant of observation
 - 1 -- North east
 - 3 -- South east
 - 5 -- South west
 - 7 -- North west
- LLLL** -- Longitude of observation to .1 degrees

111 Group - Land Observations

- **iihVV**

i_R -- Precipitation indicator

- 0 -- Precipitation in groups 1 and 3
- 1 -- Precipitation reported in group 1 only
- 2 -- Precipitation reported in group 3 only
- 3 -- Precipitation omitted, no precipitation
- 4 -- Precipitation omitted, no observation

i_x -- Station type and present and past weather indicator

- 1 -- manned station -- weather group included
- 2 -- manned station -- omitted, no significant weather
- 3 -- manned station -- omitted, no weather observation
- 4 -- automated station -- weather group included (see automated weather codes 4677 and 4561)
- 5 -- automated station -- omitted, no significant weather
- 6 -- automated station -- omitted, no weather observation
- 7 -- automated station -- weather group included (see automated weather codes 4680 and 4531)

h -- Cloud base of lowest cloud seen (meters above ground)

- 0 -- 0 to 50 m
- 1 -- 50 to 100 m
- 2 -- 100 to 200 m
- 3 -- 200 to 300 m
- 4 -- 300 to 600 m
- 5 -- 600 to 1000 m
- 6 -- 1000 to 1500 m
- 7 -- 1500 to 2000 m
- 8 -- 2000 to 2500 m
- 9 -- above 2500 m
- / -- unknown

VV -- Visibility

- 00 -- less than 0.1 km
- 01 -- 0.1 km
- 02 -- 0.2 km
- ...
- 50 -- 5.0 km
- 56 -- 6 km
- 57 -- 7 km
- ...
- 80 -- 30 km
- 81 -- 35 km
- 82 -- 40 km
- 83 -- 45 km
- 84 -- 50 km

85 -- 55 km
 86 -- 60 km
 87 -- 65 km
 88 -- 70 km
 89 -- greater than 70 km
 90 -- less than 0.05 km
 91 -- 0.05 km
 92 -- 0.2 km
 93 -- 0.5 km
 94 -- 1 km
 95 -- 2 km
 96 -- 4 km
 97 -- 10 km
 98 -- 20 km
 99 -- greater than 50 km
 // -- missing

- **Nddff**

N -- Total cloud cover

0 -- 0 eighths (clear)
 1 -- 1/8th
 2 -- 2/8ths
 3 -- 3/8ths
 4 -- 4/8ths
 5 -- 5/8ths
 6 -- 6/8ths
 7 -- 7/8ths
 8 -- 8/8ths (overcast)
 9 -- sky obscured
 / -- no observation

dd -- wind direction in 10s of degrees

ff -- wind speed in units determined by wind type indicator (see above)

- **00fff** (optional)

fff -- wind speed if value greater than 100

- **1sTTT** -- Temperature

s -- sign of temperature (0=positive, 1=negative)

TTT -- Temperature in .1 C

- **2sTTT** -- Dewpoint

s -- sign of temperature (0=positive, 1=negative, 9 = RH)

TTT -- Dewpoint temperature in .1 C (if sign is 9, TTT is relative humidity)

- **3PPPP** -- Station pressure in 0.1 mb (thousandths digit omitted, last digit can be slash, then pressure in full mb)

- **4PPPP** -- Sea level pressure in 0.1 mb (thousandths digit omitted, last digit can be slash, then pressure in full mb)

4ahhh -- Geopotential of nearest mandatory pressure level (use for high altitude stations where sea level pressure reduction is not accurate)

a₃ -- mandatory pressure level

1 -- 1000 mb
 2 -- 925 mb
 5 -- 500 mb
 7 -- 700 mb
 8 -- 850 mb

hhh -- geopotential height omitting thousandths digit

- **5appp** -- Pressure tendency over 3 hours
a -- characteristics of pressure tendency

0 -- Increasing, then decreasing -- resultant pressure same or higher
 1 -- Increasing, then steady -- resultant pressure higher
 2 -- Increasing steadily -- resultant pressure higher
 3 -- Decreasing or steady, then increasing -- resultant pressure higher
 4 -- Steady -- resultant pressure same
 5 -- Decreasing, then increasing -- resultant pressure lower
 6 -- Decreasing, then steady -- resultant pressure lower
 7 -- Decreasing steadily -- resultant pressure lower
 8 -- Increasing or steady, then decreasing -- resultant pressure lower

ppp -- 3 hour pressure change in 0.1 mb

- **6RRRt** -- Liquid precipitation
RRR -- Precipitation amount in mm

001 -- 1 mm
 002 -- 2 mm
 ...
 988 -- 988 mm
 989 -- 989 or more mm
 990 -- Trace
 991 -- 0.1 mm
 992 -- 0.2 mm
 ...
 999 -- 0.9 mm

t -- Duration over which precipitation amount measured

1 -- 6 hours
 2 -- 12 hours
 3 -- 18 hours
 4 -- 24 hours
 5 -- 1 hour
 6 -- 2 hours
 7 -- 3 hours
 8 -- 9 hours
 9 -- 15 hours
 / -- 24 hours

- **7wwww** -- Present and past weather
ww -- Present weather

- 00 -- clear skies
- 01 -- clouds dissolving
- 02 -- state of sky unchanged
- 03 -- clouds developing
- Haze, smoke, dust or sand**
- 04 -- visibility reduced by smoke
- 05 -- haze
- 06 -- widespread dust in suspension not raised by wind
- 07 -- dust or sand raised by wind
- 08 -- well developed dust or sand whirls
- 09 -- dust or sand storm within sight but not at station
- Non-precipitation events**
- 10 -- mist
- 11 -- patches of shallow fog
- 12 -- continuous shallow fog
- 13 -- lightning visible, no thunder heard
- 14 -- precipitation within sight but not hitting ground
- 15 -- distant precipitation but not falling at station
- 16 -- nearby precipitation but not falling at station
- 17 -- thunderstorm but no precipitation falling at station
- 18 -- squalls within sight but no precipitation falling at station
- 19 -- funnel clouds within sight
- Precipitation within past hour but not at observation time**
- 20 -- drizzle
- 21 -- rain
- 22 -- snow
- 23 -- rain and snow
- 24 -- freezing rain
- 25 -- rain showers
- 26 -- snow showers
- 27 -- hail showers
- 28 -- fog
- 29 -- thunderstorms
- Duststorm, sandstorm, drifting or blowing snow**
- 30 -- slight to moderate duststorm, decreasing in intensity
- 31 -- slight to moderate duststorm, no change
- 32 -- slight to moderate duststorm, increasing in intensity
- 33 -- severe duststorm, decreasing in intensity
- 34 -- severe duststorm, no change
- 35 -- severe duststorm, increasing in intensity
- 36 -- slight to moderate drifting snow, below eye level
- 37 -- heavy drifting snow, below eye level
- 38 -- slight to moderate drifting snow, above eye level
- 39 -- heavy drifting snow, above eye level
- Fog or ice fog**
- 40 -- Fog at a distance
- 41 -- patches of fog
- 42 -- fog, sky visible, thinning
- 43 -- fog, sky not visible, thinning
- 44 -- fog, sky visible, no change
- 45 -- fog, sky not visible, no change
- 46 -- fog, sky visible, becoming thicker

47 -- fog, sky not visible, becoming thicker

48 -- fog, depositing rime, sky visible

49 -- fog, depositing rime, sky not visible

Drizzle

50 -- intermittent light drizzle

51 -- continuous light drizzle

52 -- intermittent moderate drizzle

53 -- continuous moderate drizzle

54 -- intermittent heavy drizzle

55 -- continuous heavy drizzle

56 -- light freezing drizzle

57 -- moderate to heavy freezing drizzle

58 -- light drizzle and rain

59 -- moderate to heavy drizzle and rain

Rain

60 -- intermittent light rain

61 -- continuous light rain

62 -- intermittent moderate rain

63 -- continuous moderate rain

64 -- intermittent heavy rain

65 -- continuous heavy rain

66 -- light freezing rain

67 -- moderate to heavy freezing rain

68 -- light rain and snow

69 -- moderate to heavy rain and snow

Snow

70 -- intermittent light snow

71 -- continuous light snow

72 -- intermittent moderate snow

73 -- continuous moderate snow

74 -- intermittent heavy snow

75 -- continuous heavy snow

76 -- diamond dust

77 -- snow grains

78 -- snow crystals

79 -- ice pellets

Showers

80 -- light rain showers

81 -- moderate to heavy rain showers

82 -- violent rain showers

83 -- light rain and snow showers

84 -- moderate to heavy rain and snow showers

85 -- light snow showers

86 -- moderate to heavy snow showers

87 -- light snow/ice pellet showers

88 -- moderate to heavy snow/ice pellet showers

89 -- light hail showers

90 -- moderate to heavy hail showers

Thunderstorms

91 -- thunderstorm in past hour, currently only light rain

92 -- thunderstorm in past hour, currently only moderate to heavy rain

93 -- thunderstorm in past hour, currently only light snow or rain/snow mix

- 94 -- thunderstorm in past hour, currently only moderate to heavy snow or rain/snow mix
- 95 -- light to moderate thunderstorm
- 96 -- light to moderate thunderstorm with hail
- 97 -- heavy thunderstorm
- 98 -- heavy thunderstorm with duststorm
- 99 -- heavy thunderstorm with hail

W₁ -- Past weather (type 1)

W₂ -- Past weather (type 2)

- 0 -- cloud covering less than half of sky
- 1 -- cloud covering more than half of sky during part of period and more than half during part of period
- 2 -- cloud covering more than half of sky
- 3 -- sandstorm, duststorm or blowing snow
- 4 -- fog, or thick haze
- 5 -- drizzle
- 6 -- rain
- 7 -- snow or mixed rain and snow
- 8 -- showers
- 9 -- thunderstorms

• **8NCCC** -- Cloud type information

N -- Amount of low clouds covering sky, if no low clouds, the amount of the middle clouds

C_L -- Low cloud type

- 0 -- no low clouds
- 1 -- cumulus humilis or fractus (no vertical development)
- 2 -- cumulus mediocris or congestus (moderate vertical development)
- 3 -- cumulonimbus calvus (no outlines nor anvil)
- 4 -- stratocumulus cumulogenitus (formed by spreading of cumulus)
- 5 -- stratocumulus
- 6 -- stratus nebulosus (continuous sheet)
- 7 -- stratus or cumulus fractus (bad weather)
- 8 -- cumulus and stratocumulus (multilevel)
- 9 -- cumulonimbus with anvil
- / -- low clouds unobserved due to darkness or obscuration

C_M -- Middle cloud type

- 0 -- no middle clouds
- 1 -- altostratus translucidus (mostly transparent)
- 2 -- altostratus opacus or nimbostratus
- 3 -- altocumulus translucidus (mostly transparent)
- 4 -- patches of altocumulus (irregular, lenticular)
- 5 -- bands of altocumulus
- 6 -- altocumulus cumulogenitus (formed by spreading of cumulus)
- 7 -- altocumulus (multilayers)
- 8 -- altocumulus castellanus (having cumuliform tufts)
- 9 -- altocumulus of a chaotic sky
- / -- middle clouds unobserved due to darkness or obscuration

C_H -- High cloud type

- 0 -- no high clouds
- 1 -- cirrus fibratus (wispy)
- 2 -- cirrus spissatus (dense in patches)
- 3 -- cirrus spissatus cumulogenitus (formed out of anvil)
- 4 -- cirrus unicus or fibratus (progressively invading sky)
- 5 -- bands of cirrus or cirrostratus invading sky (less than 45 degree above horizon)
- 6 -- bands of cirrus or cirrostratus invading sky (more than 45 degree above horizon)
- 7 -- cirrostratus covering whole sky
- 8 -- cirrostratus not covering sky but not invading
- 9 -- cirrocumulus
- / -- high clouds unobserved due to darkness or obscuration

- **9GGg** -- Time of observation in hours and minutes

222 Group - Sea Surface Observations

- **222Dv**

D -- direction of ship movement

- 0 -- calm
- 1 -- NE
- 2 -- E
- 3 -- SE
- 4 -- S
- 5 -- SW
- 6 -- W
- 7 -- NW
- 8 -- N
- 9 -- unknown

- **v** -- ship's average speed

- 0 -- 0 knots
- 1 -- 1 to 5 knots
- 2 -- 6 to 10 knots
- 3 -- 11 to 15 knots
- 4 -- 16 to 20 knots
- 5 -- 21 to 25 knots
- 6 -- 26 to 30 knots
- 7 -- 31 to 35 knots
- 8 -- 36 to 40 knots
- 9 -- over 40 knots

- **θsTTT** -- Sea surface temperature
 - s** -- sign of temperature (0=positive, 1=negative)
 - TTT** -- Temperature in .1 C
- **1PPHH** -- Wave heights in 0.5 m increments
 - PP** -- Period of waves in seconds
 - HH** -- Height of waves in 0.5 m increments

- **2PPHH** -- Wave period and heights (instrumented)
- **3dddd** -- Direction of swells (up to 2 swells)
- **4PPHH** -- Period and direction of first set of swells
- **5PPHH** -- Period and direction of second set of swells
- **6IEER** -- Ice accretion on ships
- **70HHH** -- Wave heights to 0.1 m (instrumented)
- **8aTTT** -- Wet bulb temperature

333 Group - Special / Climatological Data

- **0....** -- Regionally developed data
- **1sTTT** -- Maximum temperature over previous 24 hours
s -- sign of temperature (0=positive, 1=negative)
TTT -- Temperature in .1 C
- **2sTTT** -- Minimum temperature over previous 24 hours
s -- sign of temperature (0=positive, 1=negative)
TTT -- Temperature in .1 C
- **3Ejjj** -- Regionally developed data
- **4Esss** -- Snow depth
E -- State of ground with snow cover
 - 0 -- predominantly covered with ice
 - 1 -- compact or wet snow covering less than half of ground
 - 2 -- compact or wet snow covering more than half of ground but not completely covered
 - 3 -- even layer of compact or wet snow covering entire ground
 - 4 -- uneven layer of compact or wet snow covering entire ground
 - 5 -- loose dry snow covering less than half of ground
 - 6 -- loose dry snow covering more than half of ground but not completely covered
 - 7 -- even layer of loose dry snow covering entire ground
 - 8 -- uneven layer of loose dry snow covering entire ground
 - 9 -- snow covering ground completely with deep drifts
- sss** -- snow depth in cm
- **5jjjj jjjjj** -- Additional information (can be multiple groups)
- **6RRRt** -- Liquid precipitation
RRR -- Precipitation amount in mm
 - 001 -- 1 mm
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 - ...
 - 988 -- 988 mm
 - 989 -- 989 or more mm
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- **t** -- Duration over which precipitation amount measured

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 / -- 24 hours

- **7RRRR** -- 24 hour precipitation in mm
- **8NChh** -- Cloud layer data
N -- cloud coverage of layer
C -- genus of cloud

0 -- cirrus (Ci)
 1 -- cirrocumulus (Cc)
 2 -- cirrostratus (Cs)
 3 -- altocumulus (Ac)
 4 -- altostratus (As)
 5 -- nimbostratus (Ns)
 6 -- stratocumulus (Sc)
 7 -- stratus (St)
 8 -- cumulus (Cu)
 9 -- cumulonimbus (Cb)
 / -- cloud not visible

- **hh** -- height of cloud base

00 -- less than 30 m
 01 -- 30 m (100 ft)
 02 -- 60 m (200 ft)
 03 -- 90 m (300 ft)
 ...
 50 -- 1500 m (5000 ft)
 56 -- 1800 m (6000 ft)
 57 -- 2100 m (7000 ft)
 ...
 80 -- 9000 m (30000 ft)
 81 -- 10500 m
 82 -- 12000 m
 ...
 88 -- 21000 m
 89 -- greater than 21000 m
 90 -- 0 to 50 m
 91 -- 50 to 100 m
 92 -- 100 to 200 m
 93 -- 200 to 300 m
 94 -- 300 to 600 m
 95 -- 600 to 1000 m
 96 -- 1000 to 1500 m

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SYNOPSIS format (FM-12)

97 -- 1500 to 2000 m
98 -- 2000 to 2500 m
99 -- above 2500 m

- **9SSss** -- Supplementary information