

Thunderstorm Forecasting and Nowcasting

Competencies

The course will address competencies expected of a severe weather forecaster:

1. Assess thunderstorm and severe thunderstorm potential

- 1 Forecast thunderstorm areas during the forecast period
- 2 Forecast potential severe thunderstorm areas and associated weather
- 3 Formulate policy (and issue forecasts)
- 4 Monitor the evolving environment

2. Identify, assess and forecast thunderstorms and severe thunderstorms

- 1 Analyse detected thunderstorm or developing thunderstorm
- 2 Forecast thunderstorm evolution, movement and weather
- 3 Formulate (and issue) forecasts and warnings

As forecasters, participants are also expected to already have the following **general forecaster competencies**. Although these will not be explicitly taught on the course, the first four will be required to complete the workshops.

- 1 Access, analyse, organise and synthesize a wide range of forecast information (taking into account data limitations) based on requirements of the situation and of clients
- 2 Apply synoptic analysis techniques and conceptual models
- 3 Interpret numerical model output, taking into account strengths and limitations of different models
- 4 Follow policy and procedure and communicate relevant information and ideas to team members
- 5 Communicate forecast information to clients
- 6 Use complex forecast systems and software and identify and solve problems and situations that arise. eg, system or software failures and/or conflicting information.

Background knowledge and skills

Participants will be able to use the following data, taking into account characteristics and limitations, to identify and interpret features relevant to thunderstorm detection and forecasting:

- 1 Satellite imagery (Meoteosat MSG channels, MODIS)
- 2 Satellite derived products (RGB products, GII, RDT, cloud tops, precipitable water, ...)
- 3 Radar imagery (reflectivity, Doppler)
- 4 Radar derived products (mesocyclone, downburst, VIL, ...)
- 5 Lightning data
- 6 Atmospheric soundings (aerological diagram) and wind profiles (hodograph)

Content

The following table shows the content for each competency.

Course content base on competencies

	1. Pre-storm Forecast	2. Storm Nowcast
Storm location	Predict areas and times of storms	Detect new and developing storms
Knowledge and skills	Conceptual models of initiation Ingredients method – instability, moisture, upmotion Composite analysis Climatology	Conceptual models of structure and features Satellite and radar signatures
Tools	Observations, soundings NWP Satellite Radar (convergence lines, winds) Indices (thresholds, limitations) SATREP, SATMANU, ESTOFEX	Observations, including spotters Radar Satellite Lightning detection
Storm type	Predict potential severe storm areas	Classify storm intensity and type
Knowledge and skills	Conceptual models of storm types Favourable environmental conditions	Conceptual models of storm types Storm structure and features
Tools	Soundings Wind profile (hodograph, AMDAR, profiler, radar derived) NWP	Observations, including spotters Radar signatures and algorithms Satellite signatures and algorithms, RGB Lightning detection
Weather	Forecast weather and severe weather potential – damaging winds, hail, heavy rains, tornadoes, turbulence	Identify and predict (severe) weather – damaging winds, hail, heavy rains, tornadoes, turbulence
Knowledge and skills	Conceptual models of storms types and associated weather Environments supporting severe weather phenomena	Conceptual models of storms types and associated weather Radar signatures – mesocyclones, downbursts, squalls, hail (TBS) Thresholds and limitations
Tools	Soundings, wind profiles NWP guidance	Observations Radar
Evolution	Monitor the evolving mesoscale environment	Predict storm movement and evolution
Knowledge and skills	Conceptual models of initiation CAPE, CIN, moisture, boundaries, horizontal convective rolls	Conceptual models of storm types, movement and evolution (life cycle) Steering winds, hodograph
Tools	Observations Satellite Radar	Tracking and prediction tools Radar Observations, satellite
Forecast process	Systematic approach to forecasting all aspects – end-to-end case study workshops	
Issue forecasts and warnings	When and why to warn but not country specific details on how to warn	