

United Arab Emirates

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United Arab Emirates Status of quality management in Rainfall observation

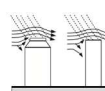
Miss Noora Al Hameli.
Miss Henda AlMandoos.

RAII WIGOS workshop on quality management of observation held in Tokyo, March 2018

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Challenges in rainfall observation.

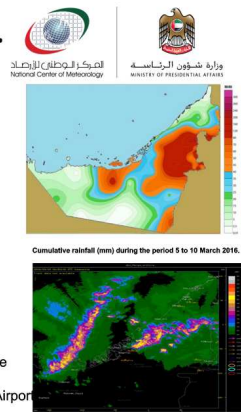
- The most significant influences on the accuracy of precipitation measurement are the environment and wind rather than the performance of the instrument itself.
- The measurement of precipitation is very sensitive to exposure and in particular due to systematic wind field deformation above the gauge orifice which cause the deviation of precipitation particles over the catchment area.
- The loss of water during the tipping action in heavy rain.
- The amount of moisture deposited in the form of dew caused by fog.
- Error due to evaporation from the container.
- Error due to the in and out splashing of water.



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Major Recent rainfall-related disaster.

- March 5-10, 2016 was notable for the passage of deep and active upper trough, sufficient moisture with the upper instability led to a memorable storms with plenty of clouds and frequent outbreaks of heavy thundery rains to many parts of UAE.
- Maximum wind gust reached 130 km/h was reported at Al Bateen (Abu Dhabi Emirate).
- Heaviest rain reported on 9th of March with 287.6 mm was recorded at Al Shiweb.
- Due to unstable weather conditions several accidents exacerbated road congestions and caused a main reason of travel delays for airports, uprooted trees and flooded roads were also reported.
- Public schools were closed two consecutive days.
- Valley runoffs were also witnessed in parts of UAE.
- Early warnings were issued by National Center of Meteorology.
- From climatological perspective there is a second memorable episode of great significance was on 18 March 2002 Maximum wind gust reached 183.3 km/h was reported at Abu Dhabi Airport.



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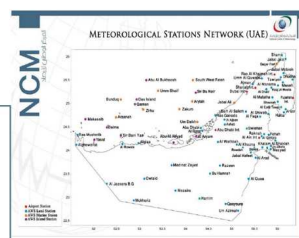
Rain gauge network

- National center of meteorology use two types of automatic rain gauges recorders:
 - The weighing recording type.
 - Tipping-Bucket type
- Statistical data are stored from 2003 for AWS, while data for manned stations are stored from 1977.
- Frequency of data acquisition from AWS is 15 min.



Tipping bucket rain gauge

- A principle of the rain gauge function lies in an utilization of tipping bucket mechanism to get electrical pulses in dependence on precipitation quantity.
- The bucket tips when precipitation of 0.2 mm has been collected, it tips and bring the other one in position.
- Catching area is 200 cm²



Total Rain weighing Sensor

- The weight of a container together with the precipitation accumulated therein, is recorded continuously by a system of balance weights.
- Elimination:
- Wind vibration.
 - Particles.
 - Unreal step change of weight.
 - Evaporation.

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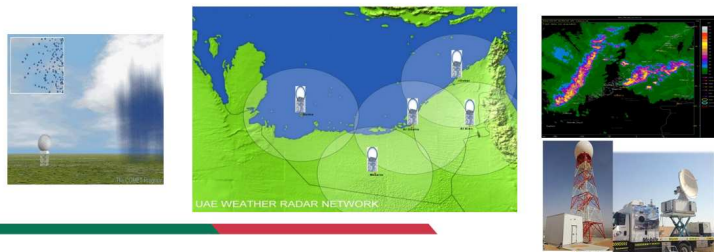
Major Recent rainfall-related disaster. Cont'd



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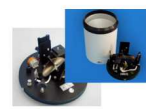
Rain gauge network Cont'd.

- Weather radar has become an increasingly important tool for measuring the spatial distribution of rainfall.
- Radar provides detailed information on the time and space distribution of rain and can be particularly valuable for heavy rainfall.



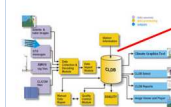
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Applications and users



Automatic rain gauge data are transmitted to NCM every 15 min.

Warnings: Warning/Watch/Advisory for the stakeholder for example: NCM issue warnings concerning the occurrence of expected weather phenomena which may affect the safety of aircraft operations.



National Center of Meteorology

Climate Department in NCM conducts AQC and archiving statistical data.

Monthly rainfall map

Observation data in real time web for NCM.

- Dams.
- Farmers.
- Agricultural operations.
- Water management.

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Quality management.

- Periodic inspection of tipping bucket and weighing type of rain gauges is conducted once a month by maintenance team to ensure quality of measurements.
- Periodic calibration of rain gauges is performed by the manufacturer of rain gauges.
- Periodic training of observers and maintenance team to establish their competence to make observations to the required standards.
- Cleaning and checking is performed periodically to ensure and verify that the tipping bucket tips smoothly.
- Climatological database system CLDB is being designed for validation and removal of erroneous and invalid data, both AQC (automatic quality control) & HQC (Human quality control).
- CLDB (Climatological Database) provide QC flags for erroneous data indicating the reason for the decision to accept or reject a value.



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Expectation for this workshop.

- Good opportunity to share practical experiences on meteorological instruments and quality management with all participants.
- Promote and improve the quality of measurements by using effective and accurate observing technology (Rain gauges) which will enhance the homogeneity of rainfall observations.

