WMO-CIMO Lead Centre on Precipitation Intensity "*Benedetto Castelli*" (Italy)

General Site Information

The WMO-CIMO Lead Centre on Precipitation Intensity (LC-PrIn) dedicated to Benedetto Castelli is a Centre of Excellence for instrument development and testing with the purpose of:

1) providing Members with specific guidance and standard procedures about instrument calibration and their achievable accuracy,
2) performing laboratory and field tests and the intercomparison of instruments, and
3) providing research advances and technical developments about the measurement of precipitation intensity and the related data analysis and interpretation.

The Lead Centre is a joint initiative of the Italian Air Force and the University of Genova (Italy), and operates on three different sites:

- Laboratory for instruments testing and calibration in controlled conditions, located at the University of Genova,
- Field site for rainfall intensity (RI) measurements, characterized by a Mediterranean climate with intense, prolonged rainy periods, located in Vigna di Valle (Rome) at the Technical Centre for Meteorology (CTM) of the Italian Air Force,
- Mountain site, envisaged for solid precipitation measurements, characterized by snowy periods and harsh climate conditions, located on the top of Mont Cimone mountain (2163 m amsl), in the hearth of the northern Apennines, operated by the Air Force Mountain Centre (CAMM).

Lead centre location:	42.08°N, 12.211°E (CTM) and 44.194°N, 10.7°E (CAMM)
Climate type:	CTM: Csa (hot summer continental climate) CAMM: ET (tundra climate)
Contact person:	Dr Maj Emanuele Vuerich
Email:	emanuele.vuerich@aeronautica.difesa.it
Address:	Italian Air Force Technical Centre for Meteorology (CTM) Via R. Giacomelli, 2 00062 Vigna di Valle (Rome), Italy
Tel:	+39 06 99 80 10 13
Fax:	+39 06 99 87 297
Website:	http://www.precipitation-intensity.it/

Main activities and competences

(a) The WMO-CIMO Lead Centre on Precipitation Intensity (LC-PrIn) Benedetto Castelli maintains:

- capability to perform dynamic calibration, metrological confirmation and intercomparison of rain intensity gauges in the laboratory,
- suitable equipment for:
    - laboratory calibration,
    - the traceability of its measurement standards, and
    - measuring instruments,

  therefore providing support for certification of the instruments' performance as a suitable Independent Third Party Organisation.
- set of gauges acting as a working reference for field measurements of rainfall/snow intensity.

(b) LC-PrIn conducts research on:

- suitable equipment and procedures for routine field testing of network precipitation gauges which would be recommended for the standardization of field calibrations of precipitation gauges during operational use,
- suitable devices and technical procedures to improve the testing capabilities following the results of the WMO Field Intercomparison of RI gauges (WMO, 2009),
- the interpretation of the influence of measurement errors on meteo-hydrological applications,
- correction procedure for historic data series, and
- post-processing techniques for automatic correction of the measured rain intensity.

(c) LC-PrIn has the necessary facilities to perform regular field measurement campaigns or international/regional comparisons with the purpose to test:

- performance of different measuring principles for rainfall intensity, and
- effects of laboratory calibrations on the measured intensities.

(d) LC-PrIn collaborates and cooperates with:

- relevant CIMO Expert Teams on developing guidance material, and
- WMO Regional Instrument Centres (RICs) and other international testbeds for the organization and participation in field tests for specific purposes or in international/regional intercomparisons.

(e) LC-PrIn proposes:

- standards on precipitation intensity measurements for consideration to WMO and ISO technical committees,
- reports on all significant tests to the CIMO community, through publication of IOM reports and publications in scientific journals, and
- technical support and vocational training and periodic training courses on general and specific issues related to liquid/solid rainfall intensity measurements.

Infrastructure description

Hydraulic Laboratory "E. Marchi" - University of Genoa

The wide varieties of laboratory equipment and available facilities at the University of Genoa allow:

1) development of both basic and applied research and experimental activities in the field of hydrology and environmental monitoring, and
2) characterization and qualification of instruments and processes relevant to environmental protection. The laboratory is classified as highly qualified according to the Italian Decree by Law 297/99.

In particular,two specialized devices for rain gauge testing are available, together with the basic electronic equipment for analog and digital data acquisition, as well as specific devices to comply with the data output requirements of typical rain gauges.

Two specialized devices for rain gauge testing are:

1) **Automatic device for stationary calibration tests** was developed by the University of Genoa following the WMO requirements for calibration and testing of rain intensity gauges. The automatic device was designed for the calibration of rain intensity measurement instruments by means of a simple reproducible laboratory procedure and is able to provide calibration curves for different types of rain gauges.

2) **Portable device for manual testing of rain gauges in the lab/field** was developed at the University of Genoa with the aim of providing the on-site capability of performing the same kind of tests that are used for the calibration of catching type rain gauges under controlled conditions in the laboratory. The portable device is an ideal and cost effective solution for metrological qualification of rain intensity instruments within the framework of the quality assurance procedures that are now widely adopted by organisations in charge of managing meteorological measurement networks at the regional, national and international levels.

Air Force Centre For Meteorology (CTM) - Vigna di Valle

The Air Force Centre for Meteorology (CTM) at Vigna di Valle is:

- located on the top of a hill at 262 metres above the sea level, close to Bracciano Lake and 12 km far from an isolated mountain chain in north direction (600-900 m amsl), and
- characterized by a wind regime of dominant flows during the year from SW (warm-humid air masses) and from NE (cold-dry air masses).

The most intense rainy period is from October to December, however spring and summer intense events are also possible. The worst weather conditions normally occur when perturbations meet a strong lake humidity condition (beginning of autumn, early spring, hottest summer days). This strong precipitation variation offers a good meteorological background for instrument testing and intercomparison on liquid precipitation measurement.

Air Force Mountain Centre (CAMM) - Monte Cimone

CAMM centre is located in the heart of the Apennines, with its operative base on the top of Monte Cimone (2165 m amsl), and logistic base in Sestola (1020 m amsl), at about 65 km far from Modena and 87 km from Bologna. Monte Cimone is the highest peak of the northern Apennines, with a field of view free of any obstacles for all 360°. The geographic location and the high altitude make Monte Cimone a strategic and particular representative site for telecommunications and for meteorological observations and research.

CAMM has three main duties:

- Telecommunications, with radio link and a telecommunication laboratory,
- Synoptic and aeronautical weather observations, and
- Environmental GAW observations.

In particular, CAMM deals with traditional meteorology (aeronautic and synoptic) for air navigation assistance and for weather forecast service, and with GAW observations for climate and atmospheric change monitoring.

The centre is composed of a gathering and processing data service, a meteorological station and a special observations unit.

CAMM has got various data series (both meteorological and GAW) among the most ancient in Europe. In particular, the time series of the measurement of carbon dioxide concentration, starting from 1979, is the longest in Europe.

Monte Cimone is characterized by a very particular climate with many extreme weather conditions due to strong wind for a large portion of the year (up to 216 km/h); rapid ice formation with flags which grow up even to 40 cm in 3 hours, from October to March; very low temperatures (-22 °C absolute minimum temperature measured in January 1981). The observatory is inside the clouds for 15-20 days per month. During the summertime this value decrease up to 10-12 days, but the frequency of high intensity thunderstorms increases with high number of lightning. From the snow precipitation point of view, during the wintertime in the last 20 years, the annual snow fall is about 1.70 m on average, with a maximum value of 3.12 m in 2008 and minimum of 0.62 m in 2002. The average number of days with snow is 37 per year, with maximum value of 60 days in 2008 and minimum of 23 days in 2006. The daily maximum amount of snow fall was 59 cm, on 11 December 1990.

Publication list

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