

Arpa Piemonte weather service for Torino 2006

10 weather forecast offices, 65 ground stations for 869.040 measurements, 75 people and 8 weather venue teams, 370 weather bulletins, 9146 messages for INFO2006: these are the figures provided by Arpa Piemonte to TOROC in order to implement the snow-meteorological assistance system during the Torino 2006 Olympic Winter Games. In matter of weather forecast, the Agency has a wide experience ripened on the occasion of important sport events, such as the World Ski Championship in 1997, the Turin Marathon since 1997 and the Winter Sports Events in 2005. Climate forecasts have a strategic importance both for the weather and snow conditions, which are the only two key variables able to decisively modify in real time the competitions program.

The service: the snow-meteorological assistance

The forecast and monitoring service meets the needs of the event planning, which includes several activities, such as: road network management, artificial snow coverage and dissemination of information to tourists and media. In addition to this, the forecast service also guarantees the whole Olympic area against avalanche danger. The activities have been implemented in two phases.

Preliminary works prior to the Games

This phase involved the development of infrastructures (weather forecast offices, hardware, nets), the installation of monitoring instruments, measurements, staff recruiting, the implementation and testing of procedures as well as of hardware and software systems, which are fundamental for the service.

The operational phase during the Games insures the proper functioning of the forecast system, which consists of the following activities:

- implementation of the products conceived for the venues;
- real time measurements and meteorological data providing to the Competitions Management, the Main Operation Centre, the Sport Coordination Centre, the intranet system INFO2006, the information systems of the Olympic venues, the Olympic family, the official Olympic website and the Arpa website;
- analysis and forecast of the conditions of the snow cover in relation to the competitions and competition tracks, as well as the evaluation of the avalanches danger on road system.

The organization: the weather offices network

An innovative aspect of the Arpa service is the distribution of its activities and products over the competition outdoor venues through a network of coordinated but independent weather offices:

- the **Weather Operation Centre (WOC)** in Torino is responsible for weather forecasting and monitoring on regional scale and for coordinating and supporting the **Main Operation Centre (MOC)** activities. It is the main source of weather information and data distribution for the Intranet system INFO2006;
- the **Weather Local Centre (WLC)** in Sestriere, fully operational since December 2003, is responsible for local weather forecasting and nowcasting. Moreover, it carries out activities related to monitoring, organizing and collecting manual measurements and to local snow forecasting. The forecast dedicated to transports and access road conditions are also produced within the WLC, which guarantees the coordination of the activities in the venues;
- the **Weather Information Centres (WICs)**, located in 8 temporary offices in the outdoor competition venues, allow a close collaboration with the venue and sport management, the teams captains and all staff.

During the Games, the WOC and the WLC will operate **24h a day**, while the WICs will operate 12/13h a day, with on-call staff available 24h a day in order to guarantee any intervention in case of bad weather conditions.

The monitoring system

- 65 automatic stations
- 2 radiosounding systems
- 2 doppler radar
- 1 wind and temperature profiler
- 5 webcams
- 2 three-axis sonic anemometers

Products

- Official Weather Bulletin for the Olympic System
- Last Minute Weather Forecast
- Detailed Weather Forecast
- Long Range Weather Forecast
- Map of the snow surface measured temperature
- Avalanche Bulletin
- Ski-course Bulletin
- Monitoring and forecast of ice formation



Thermal mapping

A ground-breaking new service offered by Arpa is the thermal mapping of the cross-country courses in Pragelato and San Sicario, where the Nordic Combined, Biathlon and Cross-country skiing competitions will be held. The service was tested for the first time by the University of Utah at the Olympics of Salt Lake City in 2002.

What is it? It is a map of the snow surface temperature measured along the whole length of the ski course, to provide athletes, trainers and ski-men with indications about its thermal conditions.

How does it work? An infrared thermometer, connected to GPS technology at few centimetres above the ground, is dragged along the track by a snowmobile at a constant speed of 10 km/h, measuring the snow surface temperature every 3 metres. These georeferenced thermal data are transmitted, via radio, to a computerised station which processes them and produces a topographical map of the course where temperature is represented through a scale of 8 different colours, agreed with the International Federations. This map is an important and real-time aid for the work of the ski-men on waxes. 17 thermal maps of the cross-country course and 16 of the biathlon course will be produced.

Wind Chill

Arpa supplies, furthermore, the Wind Chill temperature: it is the body temperature in case of wind and it is based on the rate of heat loss from exposed skin heat due to the evaporation of the sweat. This indicator, extracted from a formula, describes therefore the temperature perceived, different from the real one recorded by the monitoring stations. It describes the "feeling" of cold of the human body affected on wind chill. The absolute minimum value of wind chill was recorded on 13th February 1994, equal to -26°C , with a wind speed up to 22.3 km/h and a temperature of 15.7°C .

The METEOGIOCHI web-site

From 31 January 2006 the web-site www.meteogiochi.arpa.piemonte.it is on line. It displays real-time weather information during the Olympic Games. The same data are supplied to INFO2006 and to the Olympic teams.

As for the Olympic system, Arpa Piemonte provides the following products:

- **general data observed in each venue** (report of the current situation, temperatures, humidity percentage, wind direction and intensity, rainfalls and snow levels and, for some venues, a webcam);
- **weather bulletin of the Olympic system** with a general weather forecast on the whole Olympic system;
- **snow and avalanches forecast bulletin** to assess avalanches danger;
- **wind maps**;
- **air quality index** for Turin metropolitan area and for olympic mountain area.

For each Olympic venue some detailed data are issued:

- **last minute weather forecast**, daily quantitative weather prediction;
- **detailed weather forecast**, of the next 2 days for each venue;
- **long-range weather forecast**, of the next 4 days for each venue;
- **venue presentation**;
- **climatologic features**.

For each competition Arpa supplies:

- **thermal mapping**;
- **ski-course bulletin**, snow and weather data on tracks.

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