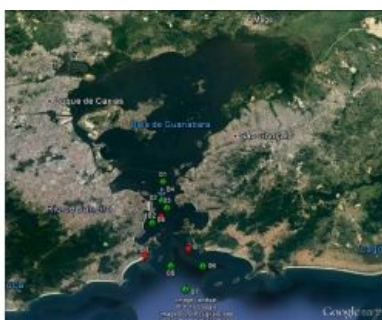


DHN CHOSEN TO AID OLYMPIC WATER SPORTS

DHN's Contribution to Olympic and Paralympic Games in Rio 2016



Hosting the Olympic Games includes supporting water-sports competitions like sailing, swimming marathons and triathlons. The Brazilian Directorate of Hydrography and Navigation (DHN) has been supporting Olympic sailing and other international yachting races since Athens 2004, in addition to being the accredited organisation to provide safety in Brazilian waters and a large portion of the South

Atlantic Ocean. As a result, the Rio 2016 Organizing Committee selected DHN to add expert weather forecasting and to deploy meteocean buoys to collect data to support water sports during the recent Olympic and Paralympic Games.

The Directorate of Hydrography and Navigation (DHN) is accredited in Brazil to run the Hydrographic Service and the Marine Meteorological Service (SMM). The SMM is operated by the DHN's Navy Hydrographic Center (CHM), which is located at Ponta da Armação Naval Complex (CNPA), Niterói, Rio de Janeiro. Following the adoption of the International Convention for the Safety of Life at Sea (SOLAS, 1974), the Brazilian government assigned to SMM the responsibility of issuing daily weather bulletins, and severe weather warnings when appropriate, for the whole maritime area under the

responsibility of Brazil.

SMM in Previous Olympic Games

Besides its duty for the safety at sea, SMM has been developing experience with weather forecasting for the Brazilian sailing teams since Athens 2004. SMM's debut followed an unofficial invitation by the Olympic Sailing Team to assist their strategies with weather forecasting. Navy experts added specific runs to Navy operational numerical weather prediction models to focus on the Eastern Mediterranean region with a denser grid with a 20km resolution. Navy Meteorologists issued weather bulletins and warnings based on those model outputs and all available measurements of winds and currents. They were added to the ensemble of forecasts available for the sailors. Brazilian athletes Torben Grael, Marcelo Ferreira and Robert Scheidt performed so well in 2004 that they won two out of the five Brazilian gold medals that year.

The esteemed 2004 contribution fostered further participation. After aiding a series of international sailing competitions, SMM was officially requested to provide weather forecasts for the XV Pan-American games in 2007 that took place in Rio de Janeiro. Further contributions during the Olympic Games in Beijing 2008 and London 2012 vouched for the request to join the Rio 2016 weather forecasting team.

Preparations for the Olympic Games Rio 2016

Following the selection of Rio de Janeiro in 2009 to host the 2016 Games, the Olympic Public Authority (APO), a public consortium constituted by the Brazilian federal government, sent part of its Board to review the available resources at the DHN facilities in 2012. SMM would be assigned to help monitor weather and tide events in the Guanabara Bay as a result of the Olympic candidature process commitments. To comply with the International Olympic Committee (IOC) requirements, SMM conducted personnel qualifications and specifications of equipment, expected costs and delivery times.

The last two years were challenging. In 2014, SMM weather forecasting started during the first official test event concerning the Olympic Games, the International Sailing Regatta 2014, the largest held in Brazil ever. A Memorandum of Understanding was signed in March 2015 between the Organizing Committee of the Olympic and Paralympic Games Rio 2016 and all the requested institutions for weather forecasting: the Instituto Nacional de Meteorologia (INMET), the Instituto Nacional de Pesquisas Espaciais (INPE), the CHM, the Departamento de Controle de Espaço Aéreo da Força Aérea Brasileira (DECEA), the Sistema de Monitoramento da Costa Brasileira (SiMCosta), the Instituto Estadual de Ambiente (INEA), the Secretaria Municipal de Meio Ambiente (SMAC), and the Sistema Alerta Rio/Fundação Instituto de Geotécnica do Município do Rio de Janeiro (Geo-Rio). The appendix of the agreement was the Matrix of Responsibilities in Meteorological Data and defined what each institution was to deliver. Yet, a final official test was promoted during the International Sailing Regatta 2015.

Let the Games Begin

The effort put into providing accurate and timely forecasts during the Olympic Games was truly great. SMM predicted weather to all offshore sports, and DHN nautical charts and tide tables were available. Sailing was hosted at seven different race areas inside and outside the Guanabara Bay. It involved 380 sailors from 66 countries in 13 competitions. The swimming Marathon was held at the Copacabana beach, which involved a 10km track for 51 swimmers from 29 countries. The triathlon had a much shorter 1.5km water track, but for 110 athletes from 42 countries. Add to that all Paralympic competitions. These are such different scenarios that a team of two Navy Meteorologists was assigned by DHN to work exclusively for the Games, and the other two assigned by CPTEC and CEMADEN, dealt with providing bulletins and warnings, as well as two daily briefings for the event organisation and all delegations that could change races or postpone competitions.

‘Nowcasting’ and Improved Observational Data

Weather forecasting of synoptic scale features such as cold fronts is routine for SMM along the Brazilian coast, but tracks within Guanabara Bay required better spatial and temporal resolutions. Mesoscale features such as breezes and katabatic winds, as well as local scale features such as cumulonimbus clouds that develop sparsely at the end of a warmer day, could mislead forecasts. The best-suited approach was to conduct ‘nowcasting’. This is defined by the World Meteorological Organization (WMO) as the detailed description of the current weather along with forecasts obtained by extrapolation for a period of 0 to 6 hours ahead.

‘Nowcasting’ depends upon observational data, so sensors dedicated to the Olympic Games were needed. Cold and warm fronts, highs and lows, tides, and currents are distinguishable large-scale features in current weather products. However, ‘nowcasting’ relies on observing relevant smaller-scale features. Buoys and weather stations play key roles in acquiring such data. DHN deployed four buoys for collecting environmental data, one under Navy management, and three under SiMCosta management. The buoy under Navy management, a.k.a. Guanabara, is already attached to the National Program of Buoys (PNBOIA) observational network. The PNBOIA is an almost 30-year cooperation between several partners coordinated by the DHN that has already deployed and maintained nine moored buoys and 296 drifting buoys along the Brazilian coast and the South Atlantic region. All buoys were able to measure air pressure, temperature and humidity, wind and ocean currents, water temperature, and wave properties. In addition to the buoys, three new surface weather stations were installed by the CEMADEN. One of them was installed at DHN.

Brazilian Gold Medal at the Last Sailing Competition

DHN contributions to the Olympic and Paralympic Games Rio 2016 demonstrated that Hydrographic and Marine Meteorological Services could perform tasks that are collateral to its regular responsibilities with proper planning and joint efforts with other government institutions and the private sector. The participation of Navy Meteorologists performing ‘nowcasting’, deployment of buoys, and weather station data resulted in remarkable contributions such as was the Skiff 49er class gold medal of the Brazilian sailors and Navy Sergeants Martine Graef and Kahena Kunze. They were sailing at home and had a strategy supported by weather forecasts, but four boats had nearly equal chances up to the last regatta. The winning decision of the girls was to sail away from the beach right before the last leg. It was based on their personal ‘nowcasting’. Competitors were not allowed to receive observational data during the race, but in an interview later, they mentioned that gale wind information was provided by the visual observation of the Brazilian flag movements on the Fort Urca mast. In the end, it seems that the lasting professional experience obtained by the DHN is the most rewarding part of its Olympic legacy.

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More Information

- [Brazilian Navy monitors climatic conditions to competitions at Guanabara Bay.](#)
- Read about the [meteorological system essential for outdoor events.](#)