WMO Research Demonstration Project “Paris 2024 Olympic Games“: An international initiative towards 100m-resolution meteorological and air quality forecasting in urban areas

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The WMO World Weather Research Programme (WWRP) “promotes international and interdisciplinary research for more accurate and reliable forecasts from minutes to seasons, expanding the frontiers of weather science to enhance society's resilience to high-impact weather and the value of weather information for users. In the 2016-2023 WWRP implementation plan, activities focus on 4 challenges: High-Impact Weather, Water, Urbanization, Evolving technologies. Furthermore, the WMO Global Atmosphere Watch Urban Research Meteorology and Environment (GURME) focus on the development of models and associated research activities to enhance the capabilities in providing urban-environmental forecasting and air quality services, illustrating the linkages between meteorology and air quality (https://public.wmo.int/en/programmes).

This talk presents an international Research Demonstration Project (RDP), that will focus on international research on scientific urban issues addressed by both WWRP and GURME. The strategic objective of this RDP is to focus on the Olympic Games of Paris in 2024 in order to advance research on the theme of the “future Meteorological Forecasting systems at 100m (or finer) resolution for urban areas”. Such systems would prefigure the numerical weather prediction...
at the horizon 2030. The focus will be on themes related to extreme weather events in summer which both are influenced by and impacts urbanization: thunderstorms and strong Urban Heat Islands, and their consequences.

There are 5 scientific questions that will be addressed during this Paris RDP:

- Nowcasting & Numerical Weather Prediction in cities at order 100m resolution
- High resolution thunderstorm nowcasting (probabilistic and deterministic) in the urban environment, Urban heat islands, cool areas and air quality
- Nowcasting and forecast in coastal cities (for the Marseilles site)
- How to improve and better use observational networks in urban areas, including (big) non-conventional data
- Conception and Communication of tailored weather, climate, environmental information at infra-urban resolution.

Several High-Impact weather case studies were selected. Storm cases (starting with one the 10th July 2017) will allow to evaluate the role of the urban area on their enhancement. Extreme Heat wave aggravated by a strong Urban Heat Island are also studied (July 2019). Open urban data describing the agglomerations at very high resolution are provided. New innovative methods to produce maps of urban form characteristics (e.g. from street images) and meteorological data (from personal meteorological stations) will be explored.

This talk will describe these scientific questions, as well as the common methodology approach that is being discussed within the partners. A focus will be the international experimental campaign that will take place in 2022 over the Paris agglomeration, with an intensive Observation Period in the summer 2022. Interactions between urban surface and the atmospheric boundary layer, the interactions between air quality and aerosols between city and biogenic plumes, and the local effect of urban trees on micro-climate and chemistry are some of the axes of the campaign. It will provide additional meteorological and air quality observations, to both help to improve the nowcasting and NWP systems at urban scale, and aim to define the required additional instrumentation that should be deployed during the Olympics games themselves.