BACKGROUND PAPER

WMO–ITU Global Seminar: Spectrum use for meteorology: challenges, opportunities and evolving requirements

Radio-frequency spectrum is a fundamental resource for meteorological observations and Earth system monitoring. Both space-based and terrestrial systems rely on spectrum not only for data transmission, but also as an essential part of the measurement process, particularly in passive sensing. Increasing demand for spectrum from other radiocommunication services is placing growing pressure on frequency bands used by meteorological systems, raising concerns regarding their long-term availability and protection. Meteorological observations underpin weather forecasting, climate monitoring and early warning systems. Any degradation in data quality or availability, including due to radio-frequency interference, may have direct consequences for public safety, economic activities and environmental protection. Ensuring reliable and continuous access to spectrum is therefore critical for maintaining the performance of meteorological services worldwide.

The observation ecosystem is rapidly evolving:

- major space programmes and coordinated international systems continue to provide the backbone of global observations;
- industry is advancing sensing technologies, including radars and radiometers;
- commercial operators are introducing additional data sources through small satellite constellations;
- data dissemination and processing increasingly rely on satellite broadcast systems and cloud-based platforms.

These developments create new opportunities, while also increasing the complexity of spectrum use and management.

Spectrum use is governed by the ITU Radio Regulations and supported by ITU-R studies. Ongoing preparations for World Radiocommunication Conferences, including WRC-27 and future work towards WRC-31, involve several agenda items relevant to meteorological services and require careful consideration to ensure adequate protection of essential frequency bands.

This WMO–ITU Global Seminar will:

- review the role of spectrum in meteorological observation systems;
- present user requirements from national meteorological agencies;
- discuss preparation for WRC-27 and WRC-31 on issues relevant to meteorology;
- address regulatory and interference-related challenges;
- highlight technological developments and industry perspectives;
- examine emerging trends, including commercial data and cloud-based processing.

The seminar will also mark the publication of a new joint WMO–ITU Handbook entitled “Use of Radio Spectrum for Meteorology: Weather, Climate, Water and related Environmental Applications”, providing an updated reference on systems, requirements and spectrum considerations.

The seminar is expected to strengthen cooperation between stakeholders, improve understanding of spectrum requirements for meteorology, and contribute to ensuring the sustainable and resilient operation of Earth observation systems.