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Radio Frequency Allocations for Meteorological Operations and Research

A Policy Statement of the American Meteorological Society

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The AMS expresses concern over increasing pressure on weather-related radio frequency bands and stresses the need for adequate protection and mitigation efforts against the loss and shared use of this spectrum. The AMS addresses its concern to policy makers, to national radio-frequency administration agencies, and to the meteorological community. Protection of traditional weather-related radio frequencies is critical to the continued function and improvement of weather sensing, monitoring, forecasting, and warning, and is therefore in the best interests of public safety and security. The meteorological community increasingly relies on remote-sensing technologies for both routine and experimental observations of weather and climate. These activities require global access to radio frequency spectrum by radars, wind profilers, microwave radiometers, and telemetry systems, as well as satellite-based passive and active sensors. The impressive progress in meteorological predictions made in recent years is largely attributable to these technologies.

Weather prediction models and localized operational forecasts increasingly depend on national networks of ground-based Doppler radars for severe weather warnings such as tornadoes, flash flooding, land-falling hurricanes, precipitation (rain, snow, hail) forecasts, aircraft icing and air traffic/weather avoidance. Worldwide, Doppler radar networks are now contending with increasing pressures on shared spectrum usage with unlicensed broadband wireless applications. As already experienced, for example in Europe, the impacts of radio-frequency interference by wireless communications can render radars blind in particular directions or even over large portions of their coverage. The situation is exacerbated by the ubiquitous and unlicensed nature of these wireless applications that could lead to a total loss of the related spectrum for weather radars.

Wind-profiling radar systems provide otherwise unavailable details of atmospheric wind flow features, and they provide input to numerical weather prediction models. Operationally, they enable forecasters to identify wind shifts indicative of weather changes and wind shears that pose both an aviation hazard and potentially life-threatening tornadic activity. Because different radio frequencies provide coverage of different altitudes in the atmosphere, each of the current wind-profiling frequencies is needed to obtain a complete vertical profile, and none could be eliminated without serious loss to atmospheric research and forecasting.

The effects of short- and long-term climatological changes, such as El Niño and global warming, can only be assessed through global observations made primarily by optical and passive microwave space-based sensors. Extending weather forecasts to timescales of a week or more for improving prediction and warnings or for economic benefits also requires such global-scale observations. These satellite sensors also track hurricanes and monitor sea ice, sea surface temperature, and soil moisture, all of which play important roles in short and medium range weather prediction.

Most passive microwave techniques require an uncontaminated background free of radio interference, and some are centered on particular frequencies that uniquely correspond to resonances of important

atmospheric molecules. Such is the case for technologies that measure water and water vapor in the atmosphere, whose measurement is essential to improve models of the storage and transfer of heat, an important aspect of weather and climate change. Specifically, these measurements have been recently threatened by the development and deployment of automotive radar systems for collision avoidance. The frequencies associated with such naturally occurring resonance phenomena cannot be changed – they are an inherent property of radio propagation through the atmosphere. Therefore maintaining clear allocation of these important portions of the radio frequency spectrum is critical.

Development of new environmental sensing technologies is of growing importance. Current and planned satellite radar systems measure clouds and precipitation important for weather forecasting and global climate change research and assessment. A variety of other space-based and ground-based radio technologies are currently in experimental use and may require future radio spectrum allocations. Finally, radio telemetry of weather data is essential to the meteorological community and, ultimately, the public at large. It is the means of transferring measurements from weather balloons and satellites to the ground and from remote sites to data analysis centers. Because of the large investment in radio telemetry systems and the generally limited resources for changing radio equipment, commercialization of the frequency bands in which this communication takes place should be approached with great caution.

Burgeoning communications applications make the radio frequency spectrum an extremely valuable commodity, and so the frequency bands used for operational meteorology and research are in increasing jeopardy. The AMS and the meteorological community rely on and support their mandated national radio-frequency agencies to continue to protect or to share appropriately these radio frequencies. The AMS encourages national radio-frequency agencies to develop a clear definition of interference, permissible or otherwise, and a remedial process or solution if shared use becomes a problem. The AMS will pro-actively encourage and support these agencies' efforts to protect meteorological uses of the radio frequency spectrum. The AMS encourages all meteorological users of the radio frequency spectrum to notify the appropriate agencies of their use and to cooperatively advocate for their protection when necessary. Interference should be reported to the appropriate national radio-frequency agency. Vigilance is necessary, as degradations of meteorological data due to intrusions or shared usages will evolve over time. Cooperation with national radio-frequency agencies, the telecommunications industry, and with other spectrum users is encouraged both to advocate support for critically important meteorological use of radio spectrum and to mitigate potential problems.

It is in all nations' best interests to protect these radio frequencies essential for meteorological activities critical to accurate forecasting of adverse weather and climate-change assessment. Global solutions are sought and should be advocated and the AMS will consistently lead such actions and will participate in national frequency management activities as well as in the World Meteorological Organization and other international agencies to encourage their involvement and development.