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October 28, 2022

The Honorable Maria Cantwell
Chair
Committee on Commerce, Science and Transportation
United States Senate
Washington, DC 20510

The Honorable Roger Wicker
Ranking Member
Committee on Commerce, Science and Transportation
United States Senate
Washington, DC 20510

Dear Chair Cantwell and Ranking Member Wicker,

Environmental satellites, paired with numerous weather, flood and coastal ground sensors, were critical tools in the prediction of Hurricane Ian as it made a historically damaging landfall in southwest Florida in late September. The timely and accurate information from these technologies were crucial to inform numerous local decisions to keep people safe in this dangerous storm. These technologies rely on radio frequency spectrum to operate -- from the tidal and flood gages that rely on NOAA geostationary satellites to relay their data in the L-band to the weather models that rely on cloud and weather observations captured by polar-orbiting satellites using atmospheric emissions in the passive microwave bands.

The signatories of this letter – the American Geophysical Union (AGU), the American Meteorological Society (AMS), the National Weather Association (NWA) and the University Corporation for Atmospheric Research (UCAR) - and their membership from across the Earth science and meteorology communities in academia, public and private sectors, are committed to providing and informing lifesaving forecasts and supporting research that the nation relies on every day, especially as storms like Hurricane Ian approach. **To prepare for a greater frequency of intense storms in the future, we call on you to protect critical passive spectrum for weather models between 50 and 58 GHz from auction in the next five years and to recommend the FCC vacate its efforts to proceed with a final rulemaking to share the 1675-1680 MHz radio spectrum.**

The Advanced Technology Microwave Sounder (ATMS) on NOAA's Joint Polar Satellite System (JPSS) collects passive measurements of atmospheric temperature by listening to the quiet emissions of oxygen molecules between 50 and 58 GHz, and atmospheric water vapor at other spectral areas such as 23-24 GHz. The measurements of these emissions by ATMS, paired with satellites from

NASA and DoD, as well as Europe and Japan, provide input into weather simulation models that are critical to predict storm track and rainfall totals. Hurricane track and landfall forecasts are reliant on these microwave-based passive measurements of the atmosphere. The uncertainty in numerical forecast models could increase if passive microwave measurements collected with ATMS and other similar instruments are discarded due to contamination from nearby terrestrial spectrum usage.

The impacts could be particularly acute if observations that contained undetected contamination were used in those weather models. The best models require the best global uncontaminated data set of measurements to allow hurricane experts to accurately forecast these significant threats to life and property.

Another example of a spectrum dependent technology is the Data Collection System (DCS) on NOAA's Geostationary Operational Environmental Satellite (GOES), which includes the Data Collection Platform Relay (DCPR). This system is an important means for critical flood, tidal and stream gage data to reach the forecaster, often when timely forecasts matter most. For example, the U. S. Geological Survey (USGS) has more than a dozen water gages in southwest Florida tracked through its National Water Information System that rely on DCPRs operating between 1679.7 and 1680.1 MHz. These sensors were crucial for monitoring the historic storm surge and flood inundation associated with Hurricane Ian.

An additional spectrum dependent technology that was important for monitoring Hurricane Ian was the GOES Rebroadcast (GRB) system, which is the primary relay of full-resolution, near-real-time direct broadcast of satellite information to critical forecasting partners across the weather enterprise, including the National Hurricane Center, the rest of NOAA and other federal agencies, the private sector weather industry and academic partners. Operating between 1681 and 1692 MHz, GRB is robust in transmitting crucial forecasting information in the most severe weather situations, while not being impacted by power and internet outages that are frequent in emergencies when information matters most to saving lives and property, especially during hurricanes. As recommended and commended by the National Academies,[1][2] fostering an ever stronger "weather ready nation" requires cross-sector coordination of the weather enterprise between the public, private and academic sectors, which is enabled and empowered by GRB transmissions.

Additional information about the DCS and GRB systems and the proposed sharing of 1675-1680 MHz was recently published in an independent study funded under the Spectrum Pipeline Act and conducted by NOAA titled "Spectrum Pipeline Reallocation 1675–1680 MHz Engineering Study" (SPRES).[3]

Some examples of how hazard forecast accuracy and timeliness in future storms (like Hurricane Ian) could be impacted by radio frequency interference include:

- Water level information from river, stream and coastal gages via DCS when floods are imminent is critical to forecasters. Indications of when rivers rise and recede are determined from these irreplaceable gage measurements. Storm surge that endangers coastal lives and property is

[1] National Research Council. 2012. *Weather Services for the Nation: Becoming Second to None*. Washington, DC: The National Academies Press. https://doi.org/10.17226/13429.

[2] National Research Council. 2003. *Fair Weather: Effective Partnership in Weather and Climate Services*. Washington, DC: The National Academies Press. https://doi.org/10.17226/10610.

[3] Available in FCC WT Docket No. 19-116. SPRES report can also be downloaded here: https://bit.ly/3sbeSiL.

measured by such devices. But an outage at these moments due to shared band interference (as proposed by Ligado) would mean these measurements are gone for the current forecast and for historical records used for future models.
- The near-real-time information transmitted via GRB to the public-private-academic weather enterprise is a crucial tool that works for these partners regardless of internet or electrical outages in storm conditions. But if GRB faces interference from terrestrial operations from 1675-1680 MHz (as proposed by Ligado), that crucial weather enterprise linkage would be hampered, negatively impacting forecasts and harming state and local officials' ability to make the best decisions for their citizens.

The weather and broader Earth science communities recognize that radio frequency spectrum is a limited commodity and that how it is used or shared must maximize the benefit to the people of the U.S. Our communities were key partners in developing a plan for the use of 1695-1710 MHz in support of the AWS-3 auction in 2014, agreeing to reduce spectrum usage in that band by future environmental satellites and other technologies, while working to develop interference mitigations in those areas.

However, passive sensors like ATMS rely on the physical characteristics of molecules in the atmosphere to make these measurements, and those allocations must be fixed and protected. In addition, both the passive sensors and communications relay systems are reliant on on-orbit technologies that represent major government investments that will not be replaced until the 2030s or later.

These examples highlight the importance of this diverse information for the forecasting of Hurricane Ian and many other major natural hazards and the threat of interference to these forecasts. We call on you to provide leadership in the following areas as you consider future spectrum-related legislation:
- Protect critical passive spectrum for weather models between 50 and 58 GHz from auction in the next five years and invest in technological innovation by authorizing funding for ongoing passive coexistence research that accounts for interference concerns from the weather modeling community.
- Recommend the FCC vacate its efforts to proceed with the final rulemaking to share the 1675-1680 MHz radio spectrum (as proposed by Ligado), which would follow the specific recommendation contained within the SPRES report, which recommends against the use of that band segment for shared cell tower to user (e.g., downlink) usage.

The best defense against natural disasters is accurate, reliable, and tailored weather predictions and observations that enable Americans to take actions to save the lives and protect the property of their families, neighbors, and themselves.[4] Access to spectrum for critical environmental technologies without harmful interference is crucial to our nation as natural disasters become more prevalent.

[4] Gerth, Jordan. As Hurricane Ian threatens Florida, the National Weather Service shines. The Hill (Washington, DC). 27 Sept 2022. https://bit.ly/3eQDev0

Sincerely,

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cc
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