miserable," he says. The researchers worried that they wouldn't receive proper recognition for their work. That didn't turn out to be the case. Ramakrishnan's and Yonath's teams are both credited with working out the ribosome-subunit structure — and the scientists each shared one-third of the 2009 Nobel chemistry prize. Ramakrishnan's paper has roughly twice as many citations as the one that scooped it. "In the long run, it didn't matter," he says.

1. Schluenzen, F. *et al. Cell* **102**, 615–623 (2000).
2. Wimberly, B. T. *et al. Nature* **407**, 327–339 (2000).

GLOBAL 5G WIRELESS DEAL THREATENS WEATHER FORECASTS

Meteorologists say lax international standards could degrade crucial satellite measurements.

By Alexandra Witze

The international agency that regulates global telecommunications agreed to new radio-frequency standards on 21 November. Meteorologists say the long-awaited decision threatens the future of weather forecasting worldwide by allowing transmissions from mobile-phone networks to degrade the quality of Earth observations from space.

Wireless companies are beginning to roll out their next-generation networks, known as 5G, around the world. The new agreement is meant to designate the radio frequencies over which 5G equipment can transmit. But some of the frequencies come perilously close to those used by satellites to gather crucial weather and climate data. To keep the signals from interfering with one another, researchers have proposed turning down the amount of noise allowed to leak from 5G transmissions.

Negotiators at a meeting of the International Telecommunication Union in Sharm El-Sheikh, Egypt, agreed to introduce two stages of protection for frequencies near 24 gigahertz — a range close to those that weather satellites use to detect the amount of water in the atmosphere. Companies that operate 5G networks will have a relatively loose standard from now until 2027. After that, the regulation will get stricter. The idea is to let 5G companies start building networks now, and then to add more protection for Earth observations as 5G transmissions become denser.

But having eight years with relatively lax regulation is "of grave concern" to weather forecasters, says Eric Allaix, a meteorologist at Météo-France in Toulouse who heads a World Meteorological Organization (WMO) group on radio-frequency coordination. The WMO is so upset that it included a statement of concern in the meeting minutes, he says.

"The race for 5G is going to go fast," says Renée Leduc, a consultant with Narayan Strategy in Washington DC who works on spectrum-sharing issues. "In the early-to-mid-2020s we're going to see a very quick uptick." Although more protections for Earth observations will take effect in 2027, "I'm still really concerned about the time period between now and then", she says.

The 5G transmissions will involve many frequencies, but the key one under discussion is 23.8 gigahertz. Water vapour in the atmosphere naturally produces a weak signal at this frequency, which satellites use to measure humidity. Those data feed into weather forecasts. But if a 5G station is transmitting a signal near the 23.8-gigahertz frequency, a weather satellite might pick it up and mistakenly interpret it as water vapour.

Meteorologists say that the problem is manageable, but only if there is enough of a noise buffer between 5G transmissions and the water-vapour signal. The buffer, measured in decibel watts, is akin to a gauge of how much you might turn down the volume of your stereo so as not to bother your neighbours.

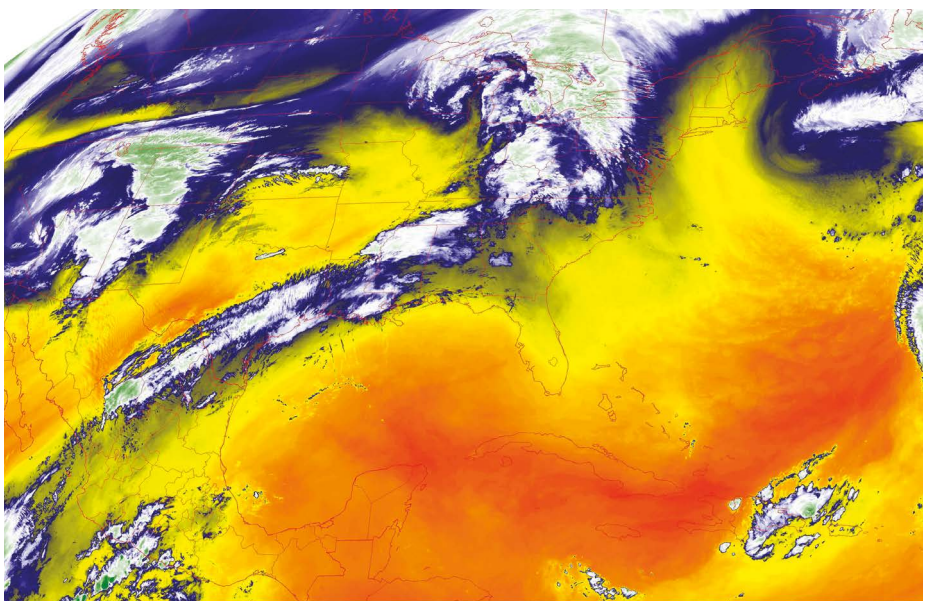
In the run-up to the Egypt conference, the WMO had been pushing for a buffer of −55 decibel watts. European regulators had settled on a less-stringent recommendation of −42 decibel watts for 5G base stations. The US Federal Communications Commission had advocated just −20 decibel watts.

The new standard hews closest to the European proposal: it is −33 decibel watts until September 2027, and −39 decibel watts after that.

"These two values were set by long negotiations between the member states," said David Botha, a counsellor with the International Telecommunication Union, at a 22 November media briefing. "These values were considered to be adequate, in the sense that they would provide protection to the weather satellite systems, to Earth-exploration satellite systems. We have nevertheless noted that there were concerns that were issued."

Even the stricter level is not enough to avoid interfering with water-vapour measurements, says Leduc. A US government study found that 5G base stations needed to transmit with a noise buffer of −52.4 decibel watts to protect the water-vapour observations.

Weather forecasters will have to gauge how to mitigate the impacts on satellite observations — perhaps by working with the wireless industry to research ways to shut down or redirect 5G transmissions when a satellite is making its measurements. Botha said that the agreement requires a "continued monitoring" of how 5G networks affect weather observations, but he provided no details on what that would involve.



NOAA/GOES

Water vapour over the Americas is shown in this US government satellite image.

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