Impact of Potential Loss of Microwave and Radio Occultation Observations in Operational Numerical Weather Prediction

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Abstract

As the current U.S. polar-orbiting satellites in the early afternoon orbit reach the end of their life, there may be a loss or gap in the afternoon microwave (MW) soundings in operational weather forecasting.

There may also be a gap in radio occultation (RO) observations. The mainstay of the global RO system since its launch in 2006, the COSMIC constellation of six satellites is already past the end of its nominal lifetime and only four satellites are now operating. A replacement of RO soundings in the tropics is expected with the launch of COSMIC-2 satellites into Equatorial orbit in 2016. However, the polar constellation of COSMIC-2 will not be launched until 2018 or 2019, and complete funding for this constellation is not assured.

This paper investigates how much degradation in the skill of numerical weather prediction will occur as a result of these possible data gaps. Using the NCEP operational global forecast system as of March and April 2013, two-month experimental forecasts are carried out in which various combinations of MW and RO soundings are removed. The main results are that the forecasts are degraded only slightly in the Northern Hemisphere, even with all of these observations removed. The decrease in accuracy is considerably greater in the Southern Hemisphere, where the greatest forecast degradation occurs when the RO observations are removed.

Overall, these results indicate that the possible gap in RO observations is more significant than the possible gap in the early afternoon orbit MW data.