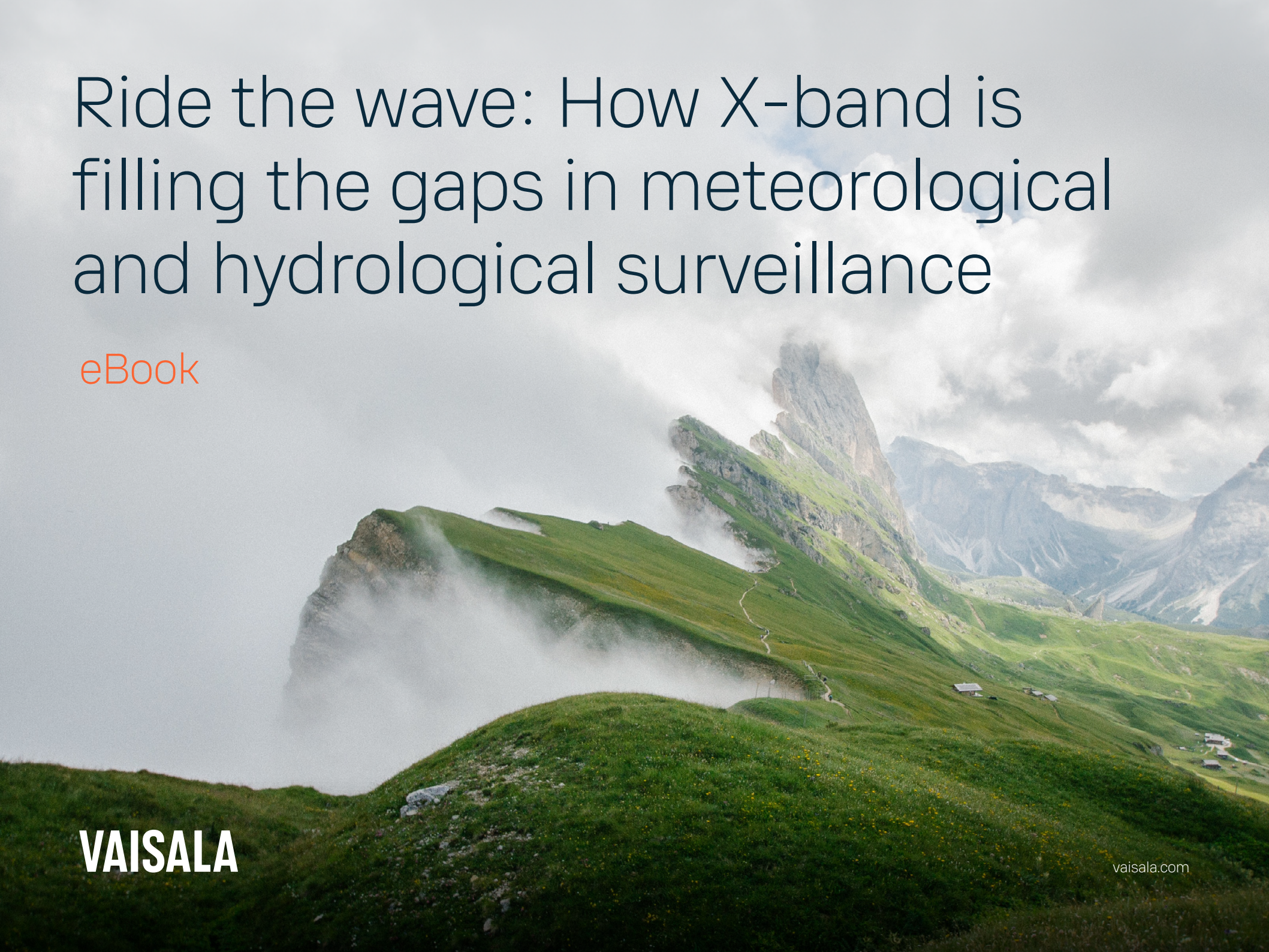
Ride the wave: How X-band is filling the gaps in meteorological and hydrological surveillance

eBook



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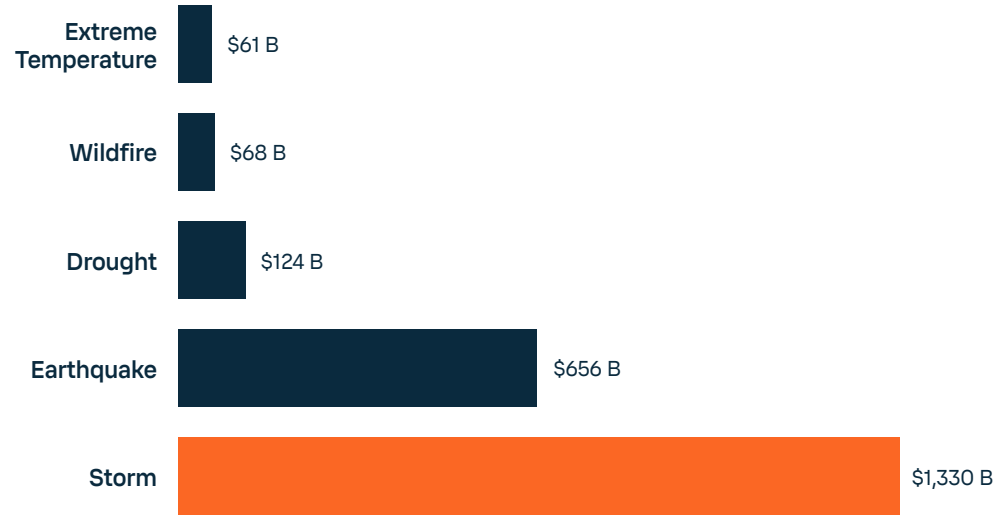
Weather radars and their value to society

Weather radar is critical for helping people prepare for storms, hurricanes and other dangerous weather conditions. These systems exist in all corners of the world — equator to arctic, rainforest to desert, coast lines to mountains.

The value of weather radar is both measurable and immeasurable. They provide high-quality real-time weather information to organizations and individuals.

Severe convective weather, tropical storms, and large-scale weather fronts have a significant societal impact and cause economic loss.

Estimated economic losses produced by different natural disasters, 1998-2017[1]



1. Source: Economic Losses, Poverty & Disasters (1998–2017). UNISDR and CRED (2018)

What makes weather radar extraordinary in monitoring severe weather?

Weather radar plays an essential role in detecting extreme weather events. Through their large coverage areas, high resolution, fast updates and versatility, they provide:

- Outstanding coverage and resolution
- Severe weather analysis
- Improved warnings
- Accurate and quantitative precipitation estimation
- Nowcasting and short-range weather forecasting

Outperforming conventional rain gauge networks, weather radar excels in meteorological applications in both time and space.

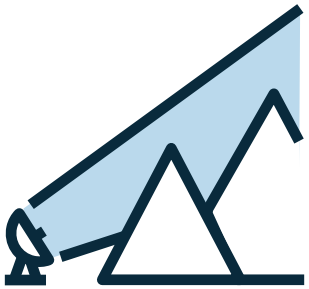
Weather radar categories

X-band	C-band	S-band
• 9.3 – 9.7 GHz • Excellent quality of information within ~100 km range • Smaller cost than C or S band radar systems • Excellent solution in several specific applications	• 5.5 – 5.7 GHz • Extensive coverage for large-scale radar networks • Excellent performance and cost efficiency for long-range meteorological weather monitoring	• 2.7 – 2.9 GHz • Extensive coverage for large-scale radar networks • Large and heavy antenna • Highest life cycle and purchase costs

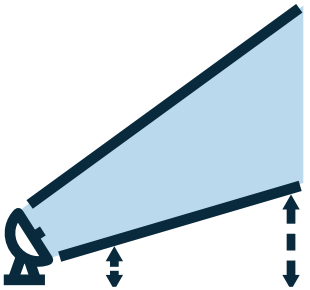
C and S-band radar uses and network challenges

C and S-band radar are the cornerstones of many national radar networks, from small to large applications. For example, the Bahamas Meteorological Department uses 3 Vaisala WRM200 C-band radars and the US NEXRAD network includes more than 150 radars.

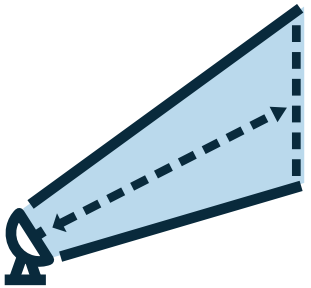
However, these radar networks also have unique challenges:



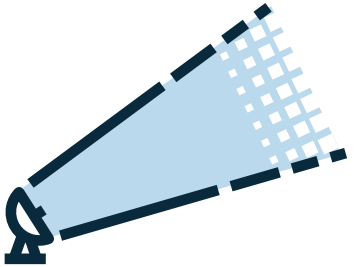
Gaps due to blocking mountains



Increasing beam altitude with distance



Gaps due to limited range



Decreasing quality with distance

Applications of X-band weather radar

Gap filling

One of the main advantages of X-band radar is that it fills the gaps left by traditional C and S-band to form a complete weather radar system that is unparalleled in quality and consistency.

Improved hydrology

Efficient flood forecasting and management planning often depend heavily on the accuracy of hydrological models.

X-band radar provides better input data, inevitably leading to:

- Improved hydrological forecasts and warnings
- Better estimates of rainfall accumulation such as river catchment areas
- Improved rainfall data quality and accuracy when installed close to an area of interest

Urban safety

Because of its hyper-local measuring capabilities, X-band radar is particularly useful for urban areas which are prone to flooding.

Urban application examples:

- City-specific weather nowcasting, monitoring and warnings
- High-resolution urban hydrological modelling
- Data for wastewater treatment plants
- Construction businesses, public events and traffic
- Road maintenance

Vaisala X-band Weather Radar WRS400

The Vaisala X-band Weather Radar WRS400 provides highly accurate measurements for a limited area, filling in a gap in a national radar network or delivering precise information for a specific area.

- Compact design with a modern solid-state transmitter for exceptional performance, reliability and data quality
- Antenna ensures high-resolution radar beam, high sensitivity, and uncompromising dual polarization
- Continuous, real-time calibration for data accuracy and quality plus lower maintenance

Why Vaisala?

As the global leader in weather and environmental measurements, Vaisala provides trusted weather observations for a sustainable future. With over 85 years of experience and customers in 170+ countries, from the North and South Poles to Mars, we help provide the most reliable and accurate weather and climate information for better and safer daily lives.

Our instruments and intelligence are known as the gold standard for precision and reliability. As a sustainability leader we enable meteorology professionals to better understand, forecast and explain climate change. We continue to channel our curiosity into climate action and new ways of enabling a better planet for all.

Ref. B212116EN-B

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