

# What's the Weather Like?

## Vaisala Weather Radars for Optimized Dual Polarization Performance

Weather radars measure precipitation by emitting and receiving radio frequency signals. The radar transmits signal pulses that are propagated through the atmosphere and scatter back from hydrometeors and other atmospheric scatterers. The radar's receiver picks up the echo, and data processing techniques are used to analyze it.

Vaisala's weather radar product family consists of a complete offering of Doppler C-band weather radars, signal and radar control processing technology, and related software and services. The heart of the product family is the dual polarization capability, for which the whole line was originally developed and optimized.

Dual polarization technology ensures more detailed information on precipitation, distinguishing between variations in precipitation type and providing more accurate rainfall estimates. Weather radars are used to gather cumulative rainfall measurements that aid authorities in everything from weather forecasts and severe weather warnings to aviation safety and hydropower optimization.

### Superior Data Quality Thanks to Thoroughly Optimized System

The success of hydrometeor classification is dependent on data quality. Vaisala's whole weather radar product family has been designed specifically for dual polarization measurement,

which means that all hardware and software have been optimized to work as an integrated system to provide the best possible data quality.

Dual polarization measurement improves data quality significantly compared to single polarization technology. The accuracy of cumulative rainfall estimates is improved as the precipitation rate measurement is based on differential phase between horizontal and vertical channels instead of reflectivity. Unlike reflectivity, differential phase is directly proportional to the precipitation rate, independent of the radar calibration and unbiased by intervening clutter of partial beam blockage, making it very robust in measuring moderate and heavy rain.

Thanks to its ability to measure parameters needed in analyzing the shape of targets, dual polarization also enables eliminating non-meteorological targets from the radar data.

### Attenuation Correction for Highly Accurate Precipitation Estimates

Data quality is also affected by the choice of radar frequency, i.e. the wavelength of the measurement signal. Shorter X-band and C-band wavelengths are more sensitive for identifying the atmospheric targets, but on the other hand, they experience a higher degree of attenuation (i.e. the loss of sensitivity) by intervening heavy precipitation along the

*Vaisala's weather radar product family offers optimized dual polarization performance for professional meteorology.*



signal path than the longer S-band, which is less attenuated.

Therefore, the choice of radar frequency has been a compromise between optimizing the sensitivity of the radar and limiting the degree of attenuation. This has been a problem especially for those regions of the world where heavy precipitation is commonplace, as the strength of attenuation grows proportionally to the rainfall intensity, often resulting in a complete loss of the X-band signal in intense rain.

Vaisala's radars operate on the shorter, more sensitive C-band wavelength, but with the advent of dual polarization technology, Vaisala has also been able to successfully correct for the attenuation in the radar echoes, resulting in quantitative precipitation estimates that are on par with S-band radars in accuracy.

### IRIS™ – Control and Monitor a Complete Weather Radar System

The core of Vaisala's weather radar systems is the Vaisala Sigmet Inter-

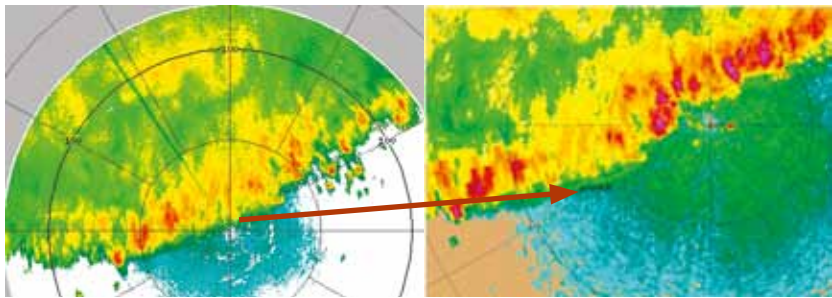
active Radar Information System (IRIS™), a comprehensive software system designed to provide full control and monitoring of a complete weather radar system from data processing to managing the network. The system architecture is fully scalable and works just as well with a single radar as a network or radars.

IRIS™ has been designed as user-friendly as possible with automatic data acquisition and display, network communication and remote control and monitoring possibilities. At each step, concise interactive menus are available for monitoring and managing the process, which makes it easy to trace data all the way from the radar receiver to the end user. The logical user interface simplifies even complex scanning requirements, and scanning and data acquisition are adjusted automatically in response to changing weather.

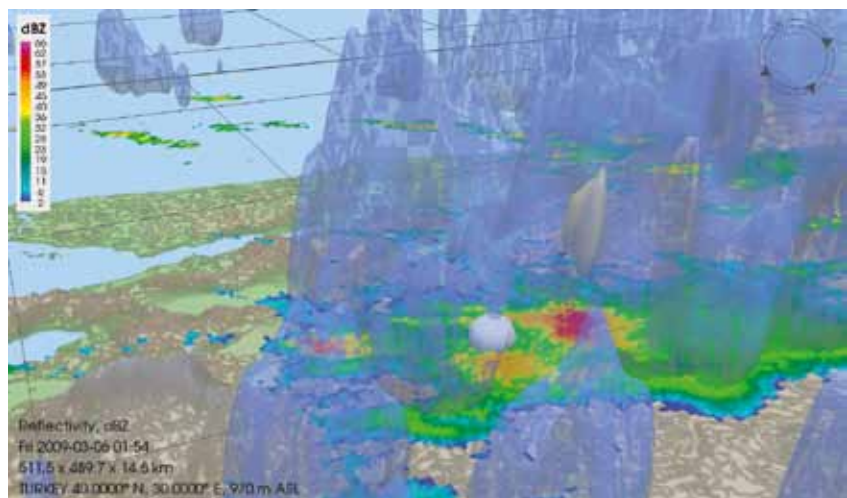
Recently updated features include new and improved display applications for 3D rendering of data and a web interface for accessing the data via a browser.

**Further information:**

[www.vaisala.com/en/meteorology/products/weatherradars](http://www.vaisala.com/en/meteorology/products/weatherradars)



Attenuation correction illustrated. Left panel, corrected reflectivity fields at C-band, and right panel, S-band measurement at the same time. The arrow points to the C-band radar location versus S-band radar location.



Weather radars generally collect data using volume scan strategies, which provide information on the angle, distance, and height from the radar site to a target. Vaisala has developed a new IRIS™ 3D View application for viewing and interacting with the volumetric data in three dimensions.

## Vaisala Weather Radar

Vaisala's weather radar product family consists of a complete offering of Doppler C-band weather radars, signal and radar control processing technology, and related software and services:

- Vaisala Weather Radar WRM200 – dual polarization Doppler radar equipped with magnetron transmitter technology
- Vaisala Weather Radar WRK200 – dual polarization Doppler radar equipped with klystron transmitter technology
- Vaisala Weather Radar WRM 100 and Vaisala Weather Radar WRK100 – single polarization Doppler radars with upgrade possibility to dual polarization
- Vaisala Sigmet Digital Receiver and Signal Processor RVP900™ – comprehensive digital IF and signal processing functions on an open Linux PC platform
- Vaisala Sigmet Radar and Antenna Control Processor RCP8™ – Sigmet's third generation radar and antenna control processor on a Linux PC platform
- IRIS™ – suite of software tools for configuring, calibrating and operating a complete weather radar system
- HydroClass™ – real-time hydrometeor classification software
- Radar upgrades – modernizing an existing radar with new signal and radar control processors, receivers, transmitters and software can give a whole new lease on life for older radar technology