Vaisala Weather Radar.

You will see more.

Your next weather radar.

New breakthrough in remote sensing technology.

For over 70 years, Vaisala has been developing, manufacturing, installing and maintaining meteorological instruments. The C-band family of weather radar with Sigmet processing represents a breakthrough in precipitation identification. Developed in collaboration with leading universities in the U.S. and Finland, the new radar family compliments our full offering of remote and in situ sensing products. C-band weather radar clearly distinguishes between variations in type of precipitation, showing results on an intuitive graphical display.

Weather radar is nothing new. In the last couple of decades, however, emphasis has shifted from qualitative rainfall estimation to quantitative measurement. Potential areas of application have also increased due to today's outstanding spatial resolution. Vaisala supplies a number of hardware and software options for specialty uses, including dual polarization features and the innovative HydroClass™ particle-type mapping software package.

Your next weather radar.

Vaisala C-band weather radar is a fully integrated system providing superior data quality and high availability for applications such as:

- Weather surveillance
- Severe weather monitoring
- Hydrometeorological applications, such as flood forecasting
- Airport wind shear detection
- Hurricane/Typhoon/Cyclone tracking
- Hail detection
- Weather modification
- Meteorological research
- Launch support systems

Integrated options:

- Weather radar networking
- Vaisala rain gauge network
- Vaisala lightning detection network
- Weather satellite images composites
- Vaisala automatic weather stations
- Low Level Wind Shear Alert Integration (LLWSAS)

Expanding your senses.

Unrivalled data through innovation.

Although dual polarization weather radar data has been available since the late 1980s, it has mainly been used for research purposes. Technology has matured in meteorological applications, enhancing signal processing power and producing more sophisticated algorithms. Vaisala is implementing these features in our new family of weather radar systems. This allows us to produce superior data quality for dual polarization applications through more accurate measurements.

- HydroClass™ is the world's first automatic operational hydrometeor classification software package in dual polarization radars.
- Antenna and feed are designed for dual polarization, providing better data quality.
- Pedestal is lightweight and designed for easy maintenance and to maximize radar data availability.
- Intelligent software powers pedestal belt-driven azimuth and elevation movements. This provides quick acceleration and deceleration in order to pinpoint antenna position.

High data availability, low cost.

Vaisala meteorological systems and sensors have always met the operational requirements of the most severe weather conditions in the world. The new Vaisala C-band Doppler Weather Radar continues this heritage.

The Vaisala Weather Radar system is a cost-effective solution for most weather applications. High radar data availability is achieved through active online remote monitoring and control, and through the use of sophisticated data processing algorithms.

The user-friendly IRIS™ software package was specially designed for weather radar applications. Vaisala continues to develop IRIS™ applications, signal processing algorithms, and new user interface features and upgrades. These new features and upgrades can be downloaded from the Internet as they become available.

Vaisala Weather Radar systems can be accessed from anywhere in the world, reducing the number of site trips and lowering Mean Time To Repair (MTTR). Single-seat network administration, testing, upgrade and maintenance means less need for site visits.

Quality components and integrated compact mechanical system design are crucial to achieving high Mean Time Between Failures (MTBF). Our antenna, pedestal transmitter and other suppliers are proven and strategic partners who bring decades of experience and know-how.

Better data quality through precision design.

> "The Vaisala radar antenna is a very well designed and built unit. The horizontal and vertical polarization main beams are extremely well matched. The co-polar sidelobes on 45 degree diagonals are down about 27 dB and the ICPR (and LDR limit) is calculated to be better (less) than -35 dB. These are exceptionally good characteristics of a dual polarization weather radar antenna."

Dr. R. Jeffrey Keeler
rJK Consulting, LLC
Boulder, Colorado USA
June 2006

Optimized performance antenna.

The antenna plays a vital role in determining the overall quality of radar data. For this reason, the radar antenna dish shape and structure have been carefully designed to optimize the performance for operation at both single and dual polarization. The reflector is manufactured to a tolerance of 1 mm. This precision, combined with a slightly larger than normal dish with less than one degree of beam and a tapered feed pattern, provides excellent side lobe performance. Integrated cross-polarization isolation is better than -35 dB making it the best in the industry.

Fail-safe operation.

The Vaisala Radar Antenna Controller provides complete fail-safe operation to protect the antenna/pedestal from operating outside of its limits, including an acceleration limit, slew rate limit, over speed check and elevation soft and hardware limits. In addition, a dynamic antenna model is run continuously to compare real-time antenna performance and to detect errors. All these operational parameters significantly reduce maintenance costs.

Simplified maintenance.

In addition to mechanical support structures, the antenna pedestal holds motors and drivers, gears, belt drives, shelters for control modules and wave guide structures. Convenient hatches provide easy access for maintenance of motors and bearings.

Sigmet inside.
First-rate data quality, guaranteed.

The new family of weather radar provides comprehensive digital receiver and signal processing functions on an open-system PC platform for flexibility and ease of use. And 'Sigmet inside' brings you the most sophisticated application software and signal processing in the world. Features include:
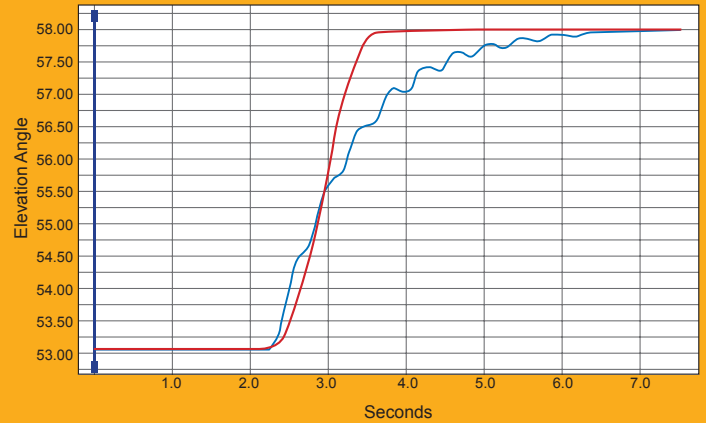
- High reliability
- Extraordinary degree of accuracy
- Easy identification of precipitation phenomena
- Wide dynamic range
- Flexible pulse width selection
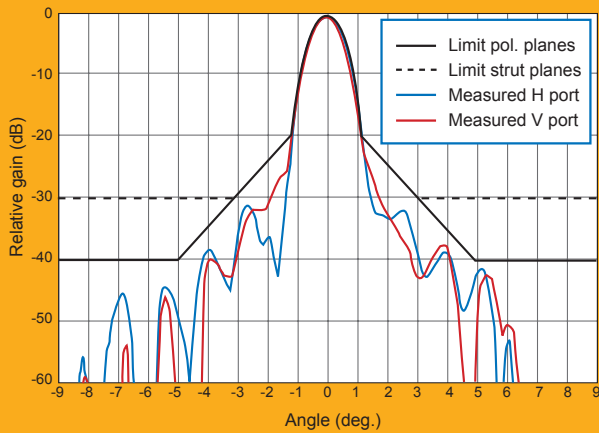
**Antenna radiation pattern:
low side lobes and narrow beam**
*Vaisala Weather Radar Antenna radiation pattern limits and
typical measured performance in the main polarization planes.*

Quick response to elevation change
*Red line shows Vaisala antenna elevation change of five (5) degrees
within a second. Blue line shows set-up time of traditional servo
controlled antenna exeeding five (5) seconds.*

Vaisala IRIS™ software provides full control and
monitoring of the system. Features of IRIS™ include:

- Scalable architecture facilitates use within a network
  of radars
- Allows for a comprehensive suite of output products
- Open software and fully documented data formats
  and source code templates
- Stable Linux platform
- Local and remote control with automatic fault alerts
- Standard TCP/IP networking means no custom
  communication protocols
- Web-based customer support

HydroClass™– Superior hydrometeor classification through fuzzy logic.

Vaisala HydroClass™ software makes use of radar
observations made in both horizontal and vertical
polarization. Dual polarization measurements are
formatted as polarization parameters, adding to
standard radar events. Combining this information
allows easy identification of the types of scatterers
present in the atmosphere, such as rain, hail, snow, sleet
and even non-meteorological targets such as clutter, sea
clutter, insects and chaff.

HydroClass™ identifies weather events in real-time,
exploring the full radar range on a sweep-by-sweep
basis every 10-15 seconds. This is an advantage over
conventional methods which analyze vertical structures
of reflectivity (such as vertical integrated liquid), and
have latency of up to 15 minutes between full volume
scans.

Classification results are presented by labeling each
bin with the hydrometeor class that is most compatible
with the observations – i.e. by choosing the class of
highest rule strength. A threshold parameter is used
to specify bins for which the class is ambiguous; for
example, non-meteorological targets.

Supreme precipitation estimation.

Like in Figure 1. on the next page, in the reflectivity
measurement of a conventional single polarization
weather radar there is usually only a high intensity
of reflectivity indicating possible hail or high rainfall
rates. On the other hand, a low intensity of reflectivity
from birds, insects and interference also indicates
rain, if reflectivity thresholds are not established.
This information is crucial for accurate Quantitative
Precipitation Estimates (QPE) and in the worst case
could lead to erroneous flood warnings without any
more accurate information.

In Figure 1. conventional reflectivity image and in Figure 2. HydroClass™ hydrometeor classification result in the same severe weather event. On Figure 2. hail and graupel are shown in red and yellow respectively. Rain, wet snow and snow are shown in blue, dark blue and light blue. Eye-witness report of the location of hail and graupel is indicated by the red arrow. (Vaisala)

In HydroClass™ software image as shown in the Figure 2., the ability to identify and map types of scatterers greatly enhances the power of a dual-polarization radar to see more. In addition to indication of rain, snow and sleet the locations of hail and graupel are clearly indicated with red and yellow, respectively. Also the reflectivities from the non-meteorological targets are perfectly classified and easy to filter out from the precipitation data. This is revolutionary improvement in QPE achieved with dual-polarization radar and very important for applications such as:

- Hail detection
- Lightning hazard potential forecasting
- Highway snow removal
- Airport terminal operations
- Rain/snow line demarcation
- Melting height detection
- Weather modification for hail mitigation
- Insurance industry claims verification
- Military detection of chaff
- Data quality improvement by elimination of non-meteorological targets
- Improved precipitation forecasting
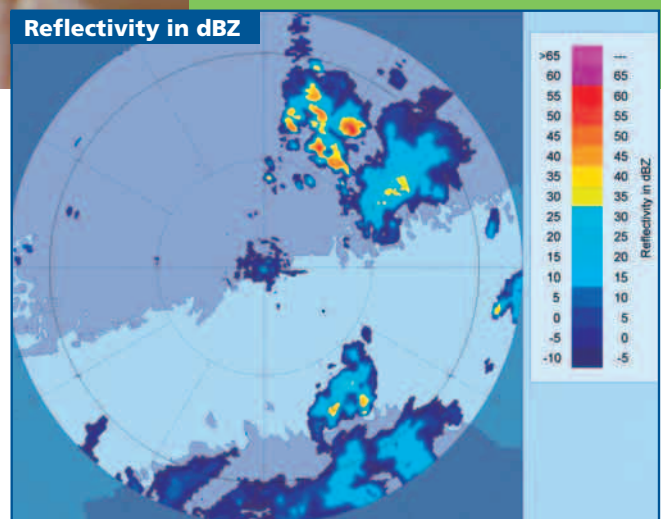- Hydrological modeling
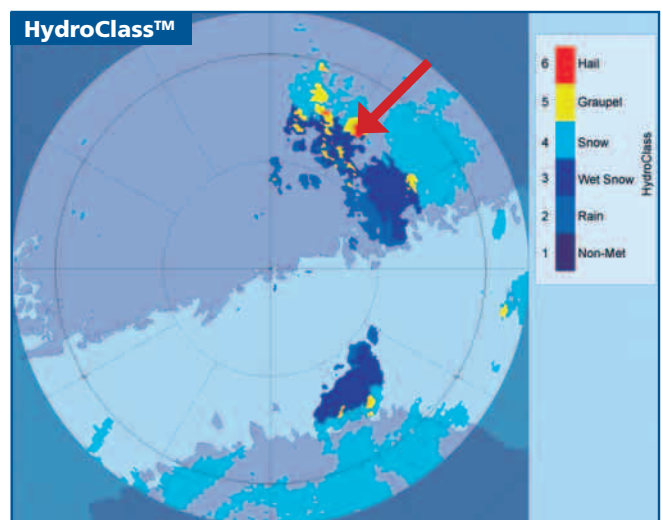

Reflectivity in dBZ

Figure 1.

HydroClass™

Figure 2.

Vaisala professional services.

Worldwide support.

Vaisala's professional services and support programs are key to customer satisfaction. Comprehensive service contracts are built to suit your particular needs. Our customer support plans are built on a well-established, professional support infrastructure that keeps Vaisala products around the world operating optimally.

Vaisala service contract options may include:

- Support contract (see details below)
- Knowledgeable technical support available 24/7
- Telephone support
- Remote monitoring and diagnosis
- Depot spares shipped from Helsinki or Westford the next business day
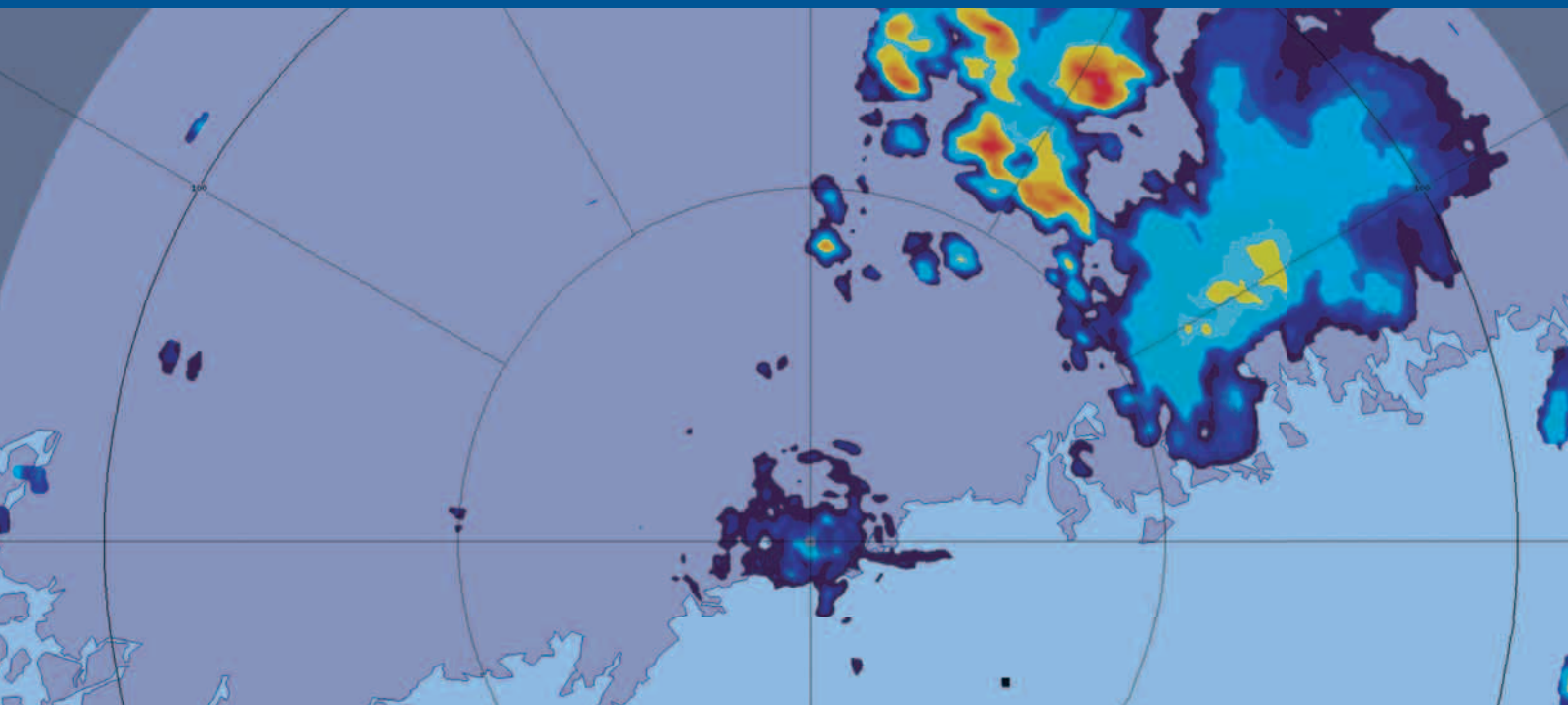- Guaranteed on-site response

Software support contracts include:

- Downloadable software upgrades from www.vaisala.com/sigmet
- Telephone support
- Computer failure recovery assistance, including emergency temporary licenses for replacement hardware

- The right to switch IRIS™ licenses to new platforms for the same Operating System
- Patch installation assistance
- Email alert notification of critical bugs and patches, with direct links to the software patches on our website

Remote monitoring: peace of mind

Remote monitoring gives you peace of mind. Vaisala's newest service contract option gives you the reassurance of Vaisala headquarters monitoring for fault detection. With this optional feature, a piece of software called "agent" is installed on the IRIS™/Radar workstation, and monitors the message log for new entries. When a critical or major fault is reported in the log, the message is transmitted to our remote monitoring site at Vaisala headquarters via a secure network. Our support staff then informs the customer to take appropriate action.

Customers who have not purchased this option may use built-in remote monitoring IRIS™ features such as IRIS™ Net, the Radar Status Menu, and pop-up fault messages.

www.vaisala.com/weatherradar