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Early Thunderstorm Detection in the Caucasus Mountains

The Northern Caucasus Mountains are the most active thunderstorm zone in the Russian Federation. Determined to limit the loss of life and property, Russia's High-Mountain Geophysical Institute decided to install a new state-of-the-art thunderstorm detection system across the area.

The Northern Caucasus Mountains region records the most thunderstorm days annually in the whole of the Russian Federation. This is due to its rugged terrain and unique geographical position sandwiched between the Black and Caspian Seas. As warm and moist air from the sea level and surrounding flatlands rises up and meets the cold and dry mountain air, it creates the perfect conditions for thunderstorms and heavy rain.

Located between southwest Russia, Georgia, Armenia and Azer-

baijan, the Caucasus Mountains are considered to form a natural barrier between Asia and Europe. The height of the mountains average 6,000-9,000 feet, but the highest peak, Mount Elbrus, rises up to 18,481 feet.

Early Detection to Reduce Damages

The task of monitoring weather conditions in the Northern Caucasus Mountains is allocated to officials in the High-Mountain Geophysical

Institute (VGI). The institute is part of Roshydromet, the Russian Federal Service for Hydrometeorology and Environmental Monitoring.

To limit risks to human life and to reduce economic damages and losses from adverse weather and climatic events, VGI decided to modernize the thunderstorm information technology used in the area. The main requirement for the new system was to achieve accurate, early detection of thunderstorm activity.

New System from Vaisala

VGI had an existing meteorological system in the area for recording thunderstorms, but due to its age, it had technical limitations that prevented the Institute from taking a more proactive role in weather monitoring and warnings. To make sure the new system would also address their future needs, they were looking



for a modern, automated system that could be easily upgraded.

They opted to go for Vaisala's thunderstorm information technology, which allows for comprehensive coverage of mesoscale meteorology, including precise real-time lightning location as well as time data on lightning strokes in 3-D rendering.

The project began in October 2007 with initial site surveys. After the sites were selected, VGI worked closely together with Vaisala to install the sensors, calibrate the antennas, and set up network connections.

The selected sites were chosen based on their proximity to existing government facilities in order to ensure land ownership, ease of site supervision and an existing technical infrastructure. The new system was fully completed and relaying data to the High-Mountain Geophysical Institute facilities in Nalchik in August 2008.

More Accurate and Effective Warnings

The new system consists of lightning detectors equipped with both low frequency (LF) and very high frequency (VHF) sensors and corresponding central processing capability. The sensor array gives detailed data on individual lightning strokes.

Thanks to the new detection capability, researchers can now determine the potential severity and direction of the storm based on stroke classification, frequency, intensity, position, polarity, current steepness, and signal peak values. The network is currently being upgraded with electric field sensors to provide more detailed analysis yet.

Real-time data rendering enables VGI to issue thunderstorm warnings more effectively and accurately.

"The system has operated failure-free, which – along with the responsiveness of our technical support – has generated very positive feedback from our associates at VGI. In fact, Roshydromet are now looking to expand the system to the Moscow region," Julia Warley, Sales Manager with Vaisala, concludes.

Enhanced Decision-Making Capabilities with Lightning Data and Information Systems

More than 40 national hydro-meteorological agencies worldwide rely on Vaisala lightning detection networks to serve their nowcasting and forecasting needs. Our product portfolio extends from singular lightning detection sensors to complete systems designed to serve total lightning information needs.

In addition to equipment and systems, Vaisala provides real-time data on lightning activity that can be monitored over the internet or with specific Vaisala software. Vaisala Global Lightning Dataset GLD360 reports lightning and convective activity as it happens anywhere in the world, while Vaisala U.S. National Lightning Detection Network® (NLDN) provides highly accurate lightning information across the USA.

Vaisala GLD360 and NLDN data is used for early warning of lightning and thunderstorm threats by meteorologists and people responsible for safety, and/or productivity in electric power distribution, aviation, defence and telecommunications, for example. The data also benefits climatologists, as it provides the possibility to create long observation time series over large areas.

Combining Vaisala Real-Time Lightning Data with Vaisala Thunderstorm Information System helps maximize detection coverage and accuracy. Expanded detection provides operational benefits by enhancing weather nowcasting solutions with complete monitoring of thunderstorm lightning activity.