German Aerospace Center

DLR Special Prize Winners Developing GNSS Seismology Procedure

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In October 2010, the VADASE project – submitted by a team from the Sapienza University of Rome – took home the ESNC special prize of the German Aerospace Center (DLR). This prize included a voucher for DLR technical services to aid the team to continue the development and systematic implementation of their idea. The project has since produced an innovative procedure for analysing tectonic movements in a fast, flexible, easy-to-implement fashion.

For further development of their idea, which won the special prize awarded from DLR Technology Marketing, Mattia Crespi, Gabriele Colosimo, and Augusto Mazzoni received support from the DLR Institute of Communications and Navigation in Oberpfaffenhofen, Germany. In addition to its expertise, the institute has been providing the team with a broad range of infrastructure for simulations, lab tests, and measurement activities. All the team's hard work recently culminated in the joint project's completion. "It was an unbelievable experience; I never would have thought we could take VADASE so far," reports a pleased Mattia Crespi, who hails from the Department of Civil, Constructional, and Environmental Engineering at Sapienza.

Relative, not absolute

VADASE (**V**ariometric **A**pproach for **D**isplacement **A**nalysis **S**tandalone **E**ngine) enables users to observe areas at risk of earthquakes and tsunamis, as well as monitor individual bridges and buildings, based on the integration of novel software and a market-standard, single-frequency GNSS sensor. For real-time analysis, VADASE utilises phase changes in the GNSS signals it receives to ascertain seismic movements. Since this method is relative (hence "variometric"), it can be deployed in any location; a complex network of sensors for absolute positioning is not required.

Successful collaboration

While the basic procedure used to access only GPS data, VADASE's algorithms have since been extended to take advantage of Europe's satellite navigation system, Galileo. It is also possible to integrate GLONASS navigation signals, which enables VADASE to process signals from multisystem constellations and provide higher levels of accuracy, availability, and reliability. In addition, the Italian team was able to perform more detailed examinations on and eliminate some of the ramifications of certain disruptive effects. The real-time performance of the new procedure was also confirmed during the project, which led to VADASE's incorporation into EVnet – DLR's experimentation and verification network for assessing the performance of global satellite navigation systems.

Right now, the developers are in discussions with a manufacturer about integrating the VADASE approach directly into firmware for a receiver. Equipped with this new technology, independent, portable devices could soon be available to provide tsunami warnings in real time.

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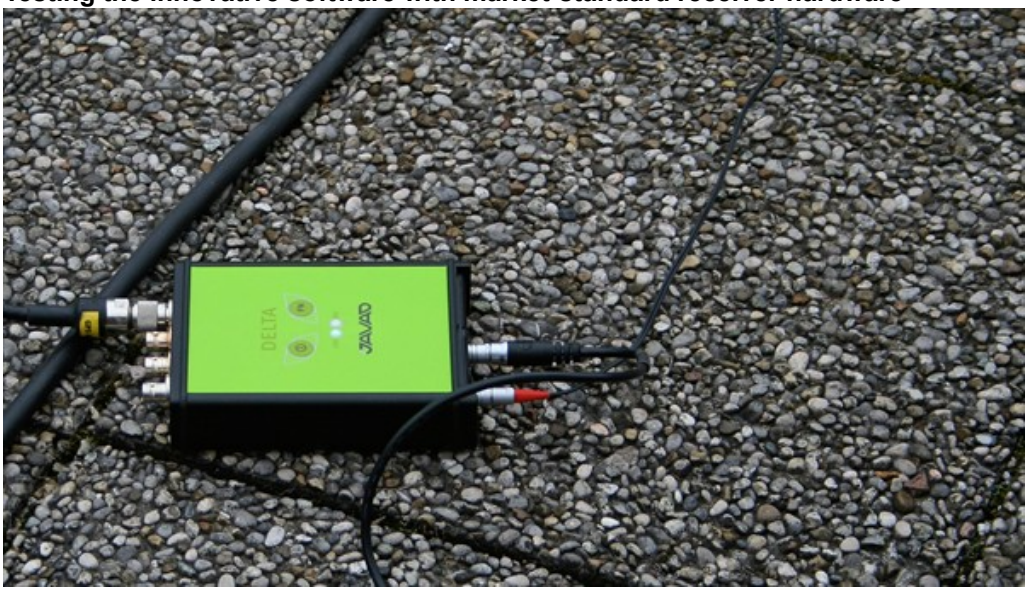
Winners of the ESNC DLR Special Prize 2010

The VADASE team (from left): Augusto Mazzoni, Mattia Crespi, and Gabriele Colosimo.

Credit: La Sapienza/VADASE.

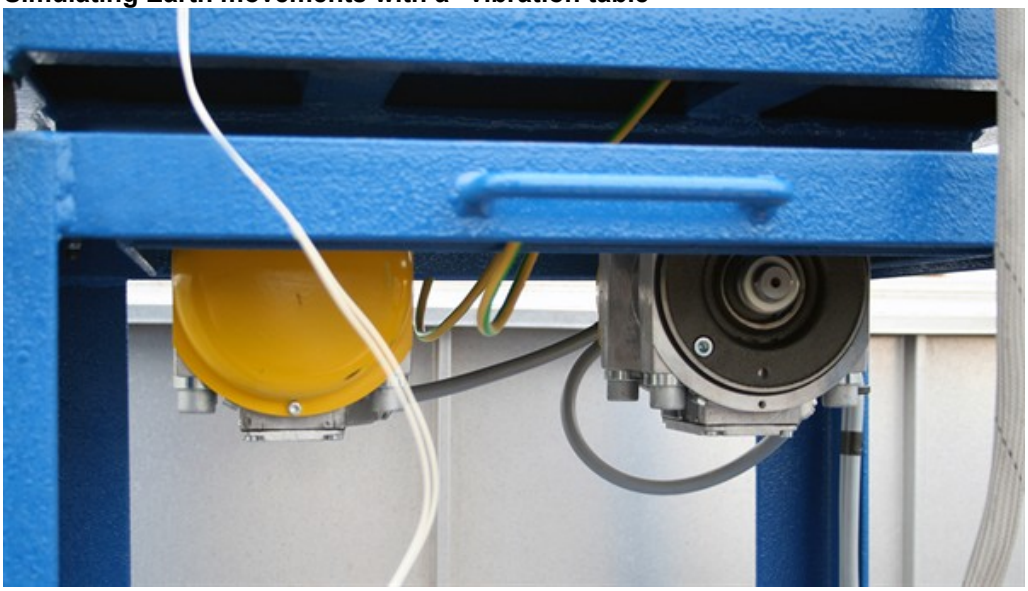
Testing the innovative software with market-standard receiver hardware



The concept behind VADASE (Variometric Approach for Displacement Analysis Standalone Engine) is based on the integration of novel software and a marketstandard, single-frequency GNSS sensor. For real-time analysis, VADASE utilises phase changes in the GNSS signals it receives to ascertain seismic movements. Since this method is relative (hence "variometric"), it can be deployed in any location.

Credit: La Sapienza/VADASE.

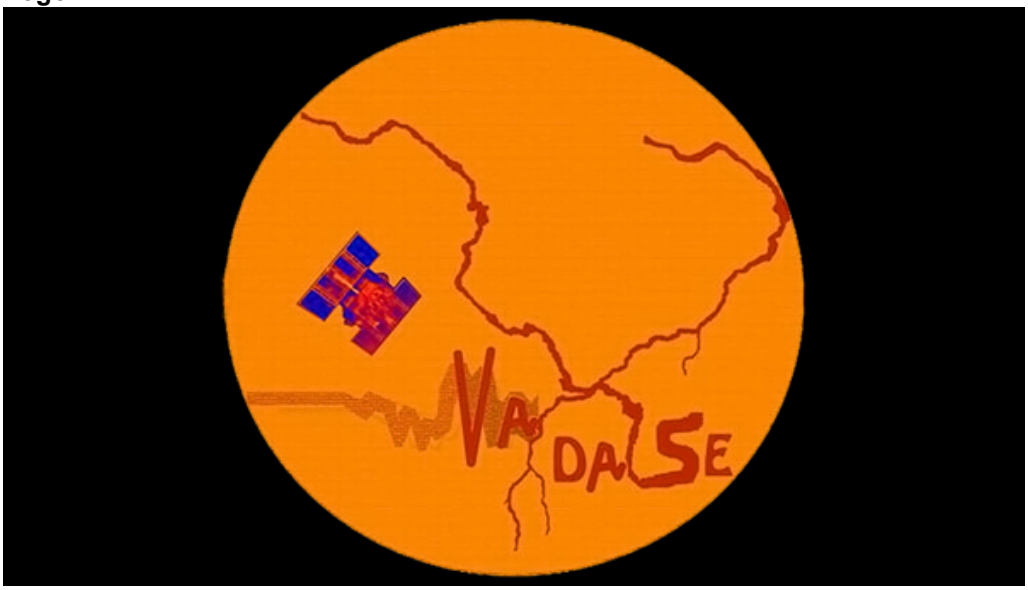
Simulating Earth movements with a "vibration table"



The VADASE team carried out various tests and simulations on Earth movements along with scientists from the DLR Institute of Communications and Navigation. With the help of a "vibration table", they purposely set a GPS receiver antenna to oscillating in order to evaluate the results of VADASE's algorithms.

Credit: La Sapienza/VADASE.

Logo



VADASE stands for Variometric Approach for Displacement Analysis Standalone Engine.

Credit: VADASE.

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