



## **ZMAP7, a refreshed software package to analyze seismicity**

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Earthquake catalogs are one of the fundamental products of seismology. Modern seismograph networks locate upwards of hundreds of thousands of earthquakes annually, while laboratory experiments are capable of generating similarly large datasets over several seconds. ZMAP is a set of tools driven by a graphical user interface (GUI), designed to help seismologists analyze catalog data. ZMAP is primarily a research tool suited to the evaluation of catalog quality and to addressing specific hypotheses; however, it can also be useful in routine network operations.

ZMAP was first published in 1994, with the last major release in 2001. Approximately 10 years ago, the MapSeis project attempted to reinvent ZMAP with some limited success. Surprisingly, the original ZMAP paper continues to be cited, while a constant trickle of emails demonstrate that a continued interest in the ZMAP product exists. In the interim, MATLAB's capabilities and interface have changed significantly, causing ZMAP 6.0 and MapSeis to no longer fully function.

The ZMAP7 project, which started as a "simple" graphical retrofit, has evolved to leverage modern MATLAB's new graphics system, improved object-oriented capabilities, updated toolboxes, and more. The ongoing renovation process has resulted in a version of ZMAP that provides vastly improved usability, speed, and reliability. Nearly every aspect of the ZMAP has been modified and is now compatible with MATLAB R2018a and later. The user interfaces have been modified to provide consistency and a high degree of interactivity. Scripts have been converted to functions and classes, providing robustness as well as improving the readability and maintainability of the code. Classes allow user-extensible capabilities that are automatically endowed with rich functionality. Furthermore, data can now be retrieved in a flexible manner from FDSN-compliant web services, with other near-real time data access and display under consideration.

Since this is an early-release version, many areas are still under construction. However, the basic functionality is in place and provides a foundation that can already help with the exploration of seismology data.

More information about Zmap7 can be accessed from the main SED page: <http://www.seismo.ethz.ch/en/research-and-teaching/products-software/software/ZMAP/>. The source code is hosted on GitHub, where the community is welcome to keep up with the latest developments. We look forward to your feedback and ideas for what additional functionality should be included or reimplemented.