Review of the manuscript by Galina Kopylova
Title: MUDA: dynamic geophysical and geochemical MUltiparametric DAtabase
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General comments

The manuscript describes a new dynamic geophysical and geochemical MUltiparametric DAtabase (MUDA), created at the National Institute of Geophysics and Volcanology (INGV) and published online in December 2023.

MUDA is based on a MySQL relational database with a web interface developed in PHP. In addition, the authors use additional processing programs written in PITON.

The purpose of MUDA is the automated collection, storage, archiving of multi-parameter data collected by multidisciplinary monitoring networks in Italy, and providing interactive user access to information about observation stations and to the received data via the Internet (https://muda.mi.ingv.it/index.php?lang=en).

The specified link provides access to DAtabase (MUDA), which allows you to familiarize yourself with the details of the creation of the project, with an interactive map of stations, data on all stations. This made it possible to obtain a full understanding of the capabilities of MUDA and compare them with the text of the manuscript.

Data on stations includes information on the geological and geomorphological conditions of their location, coordinates, and a brief description of wells and equipment. It is possible to view data for the entire observation period and at the latest time intervals of 1 day, week, month. It is possible to download data in cvc format and in the form of time graphs.

Of greatest interest to me was assessing the possibility of studying correlations between the behavior of hydrogeochemical data (level/pressure, temperature and electrical conductivity of groundwater in wells, concentrations of radon and carbon dioxide in the air) with endogenous and exogenous factors.

By endogenous factors, the authors apparently mean seismic signals recorded at a network of seismic stations and earthquake catalogs. Exogenous factors apparently refer to data from meteorological stations measuring atmospheric pressure, air temperature and precipitation.

Unfortunately, many shortcomings of MUDA for solving this stated problem have been revealed.

Specific comments

1. An analysis of the possibility of using MUDA to study the correlation between hydrogeochemical data, seismicity and meteorological parameters revealed the following disadvantages that do not allow us to effectively solve this problem:

- the text lacks a general description of the well network, in particular, there is no data on the range of depths of observation wells, temperature, salinity and chemical composition of water;
- time series of observations at wells are predominantly short and limited to the first years (what is the reason?);
- there is no information about the technogenic influence on the behavior of hydrogeochemical parameters, although the factor of technogenic influence in urbanized areas is known to have a significant impact, especially on groundwater in shallow aquifers;
- there is no information on the quality of observation data on groundwater parameters in wells: from the overview graphs of observational data for all time, it follows that the database contains both registration data and data representing technical defects; analysis of data quality for the entire observation period for individual wells is missing and, apparently, was not provided for;

- there is no information about logs of visits to individual wells and equipment maintenance work.

The authors of MUDA carried out additional processing of the original seismic records with a frequency of 100 and 200 Hz in order to ensure their loading and viewing in MUDA. In my opinion, this is an unnecessary procedure that does not have a scientific basis for solving problem No. 1. Data from earthquake catalogs would be sufficient to solve it.

2. Similar remarks arise when solving the problem of searching for correlations between the behavior of geochemical parameters - radon and carbon dioxide with seismicity and meteorological parameters. The results of this analysis also showed that there are very few geochemical observation stations and corresponding data. This should also be written about in the text.

3. The presentation of graphical material in the manuscript and in MUDA is mostly unsatisfactory:

- small, unclear font makes it difficult to see dates;
- on the Time scale, years are not indicated;
- there are errors in the signatures (Fig. 4, 5 – “Idrogeochemical???”;
- the dates of inspection of well bores are not indicated.

Graphs are presented rotated 180 degrees.

It is generally very difficult to work with a manuscript, since the text, illustrations and captions are located in different places.

Conclusion

Despite all these shortcomings, MUDA works and shows an example of creating an automated system of multiparametric data, with the help of which current scientific problems can be solved in the future, including the study of correlations between seismic phenomena, changes in groundwater parameters in wells, taking into account meteorological data.

MUDA currently publishes daily data updated from the previous day and offers the ability to view and download multi-parameter time series selected for different time periods.

The use of MUDA in scientific research at the current stage of its development is problematic due to the lack of a critical analysis of the quality of data in the database.

2. I support the development of MUDA for future multi-parameter monitoring to identify possible short-term precursors of earthquakes. However, for this, the authors need to pay more attention to the features of the observation network and the conduct of observations in wells, as well as to the patterns of behavior of hydrogeochemical parameters and to issues of technogenic influence.

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