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Interactive name index of old virtual globes

Keywords: gazetteer, virtual globes, toponyms, gazetteer, name index

Abstract: The Virtual Globes Museum (VGM) is a globe digitising project running since 2007 at the Institute of Cartography and Geoinformatics, ELTE Eötvös Loránd University. More than 170 terrestrial and celestial globes are available on its website, (<http://vgm.elte.hu>) making it one of the largest online globe collections worldwide.

This paper introduces an interactive gazetteer on a subset of the collection. 30 terrestrial globes, representing the past 180 years of Hungarian globe production (starting from 1840), were selected, and their toponyms had been organized into a geodatabase. A search engine combined with a Cesium.JS powered virtual globe helps browsing the data. Users can search the database in seven name categories: oceans and seas, capes, rivers, lakes, ocean currents, waterfalls and settlements. Gazetteer entries include the original name (appearing on the globe), the recent Hungarian and English name of the object, its location and the globe the name appears on. The virtual globe on the interface lets users to overlay feature class layers upon the digitised globe surface, facilitating to examine the differences of these globes as well as the changes of a name through time. The largest and most recently added category, settlement names, are also combined with the CShapes dataset (created at ETH Zürich) containing contemporary country borders, therefore not only the settlement but also its country in the respective time period is highlighted. The gazetteer can be found at <http://terkeptar.elte.hu/vgm/gazetteer>.

Introduction

The Virtual Globes Museum was born more than 15 years ago at Eötvös Loránd University, Institute (earlier Department) of Cartography and Geoinformatics. This collection with its more than 170 virtual items comprises Hungarian globe's history. The most valuable globes date back to 19th century or earlier. These globes are mirroring well the contemporary geographic knowledge, the toponyms, the spelling habits and rules and their changes. If users want to compare globes including geographic environment and the toponyms as well, it is not an easy challenge to manage technically the comparison among several raster layers. Therefore, Professor Mátyás Márton had an idea in 2010, to collect the names of several globes in a dataset. An initial work was made by a Hungarian student Virág Szabó (2010) as her thesis. She selected thirty globes from the Museum, whose cover most parts of 19th and the whole 20th century. During the selection, it was an important criteria to represent all the important globe maker companies and their globes. The diameter of globes are also

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varying from 5.8 to 51 cm. The collected names were arranged in several Excel tables, in three categories: ocean and sea names, cape names, and sea current names. The disadvantage of Excel tables is that no geographic visualization possible, furthermore it is not easy to handle them. But this pre-processed dataset became a very good basis for further works and database.

A few years later between 2017 and 2022, with the supervision of Zsuzsanna Ungvári, four BSc students in cartography and geoinformatics used this dataset and created the present website. The evolution of the project is presented in the next chapter.

Development of the gazetteer

Arthur Beszkid, a former BSc student created the first version of the website (Figure 1), and since then the basic structure had not been changed (Beszkid 2017). He visualized the first name category of the old Excel tables – the ocean and sea name changes – in a virtual globe. The technical background of the work looks as follows: Excel tables (made individually for each globe) were cleaned and imported in a MySQL database. In the database, there are two tables for each name categories: in the first one, all old names were collected from globes, while in the second one, the recent name (Hungarian and English) pairs were listed. The old names and their recent pairs are linked with each other. Beside this, a key field for the globes is stored as well in the old name tables. The description of globes (e.g. diameter, publishing data and globe’s texture) is saved in “globes” table. The queries from the database are served by PHP scripts, and the results are displayed on the website in tabular format. In the first version of website, the only searching option was in the name field: all names containing the text typed in the box were listed in publishing date order. In the result table, users can read the recent name variant, the globe main data. Users can browse among the texture of the result globes, and then zoom into the name on the globe surface.

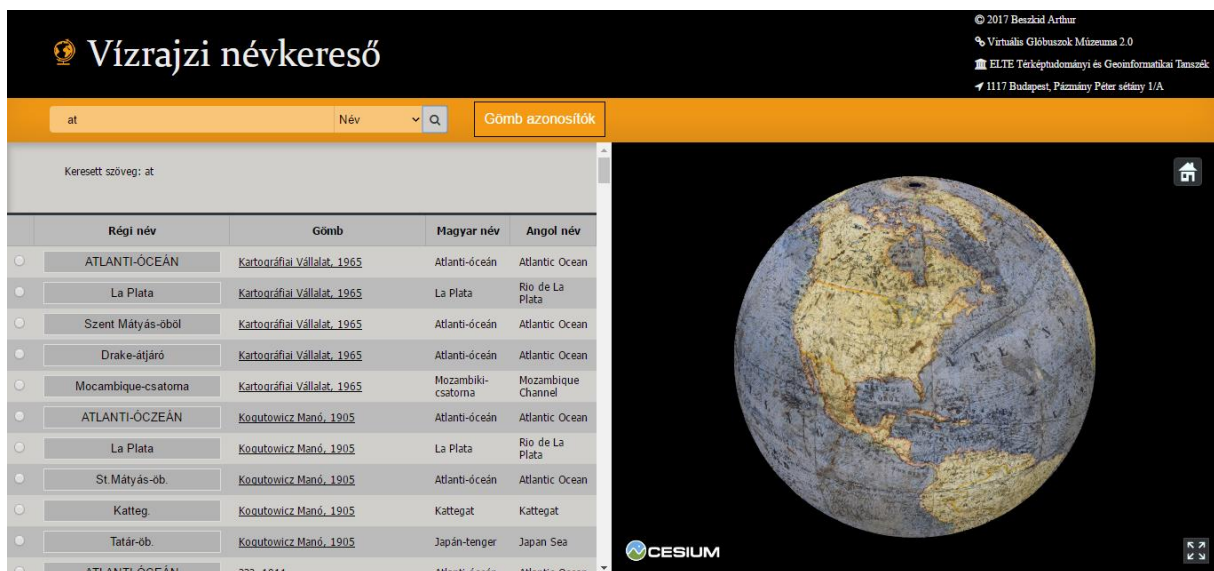


Figure 1: First version of Interactive Name Index of Ocean and Sea Names

The website also provides 3D visualization of the globes. The geographic names are on globes originally, therefore it was obvious to visualize them on a virtual globe. We used the Cesium JS Library (CesiumJS, 2023). The textures of the virtual globes come from the VGM. There are two model formats in VGM: X3D and KMZ (Gede, Márton, 2010, Gede et al. 2013), the latter one is used in this project.

Not only the raster layers can be seen on the virtual globe: a vector polygon layer of ocean and seas also can be loaded. This was needed in order to give geographic extent to names. The largest challenge was to create the ocean and sea area layer: the original data came from the website marineregions.org (Flanders Marine Institute, 2023) – it is freely download – but this dataset was too detailed, its size too big, therefore loading the original layer was slow. We decided to simplify the geometry of this layer with MapShaper.org (MapShaper, 2021). The basic idea was to use only free tools in every step of our work (in 2017 less free tools were available then nowadays). After several attempts, the Visvalingam–Whyatt simplification algorithm (Visvalingam, Whyatt 1992) gave the best result.

Some polygons like Pacific Ocean or Bering Sea extend across the International Date Line. In our case, these objects consist of parts because of the projection of the initial dataset. Therefore, a little modification was necessary, because these seas should be one polygon, not two. KML files allows us to use 180° or bigger (or -180° or smaller) coordinates, therefore the polygons crossed by the International Date Line won't be divided.

In respect to the number of features, the Marine Regions dataset is unnecessarily detailed sometimes. A good example is the Northern and Southern Atlantic Ocean: Hundred years ago and also nowadays the Atlantic Ocean is one object on globes (and even on small scale maps). Dividing it into Northern and Southern Atlantic Ocean is rather a scientific division than a real/everyday life one. A couple of other similar features that were modified or merged: the Seas of the West Coast of Scotland was attached to Atlantic Ocean, or The Coastal Waters of Southeast Alaska and British Columbia was attached to Pacific Ocean.

The names of oceans and seas were translated to Hungarian according to *Világlasz* (Atlas of the World) published by Cartographia (2019) and the *A Világtenger kartográfus szemmel* (Seas and Oceans with the Eyes of a Cartographer) written by Mátyás Márton (2012). Finally, the dataset was exported into a KML file. The polygons from this KML can be loaded onto the Cesium virtual globe with lightblue color and partial opacity, therefore the underlying raster layer also can be read.

During the next academic year, Klaudia Rapsán worked on the previously collected ocean currents and cape names. She created two tables per name category (old and recent names), and the KML vector layers of features. The ocean currents are lines, the capes are points (placemark objects). The website got its new design in this part of the work (Figure 2).

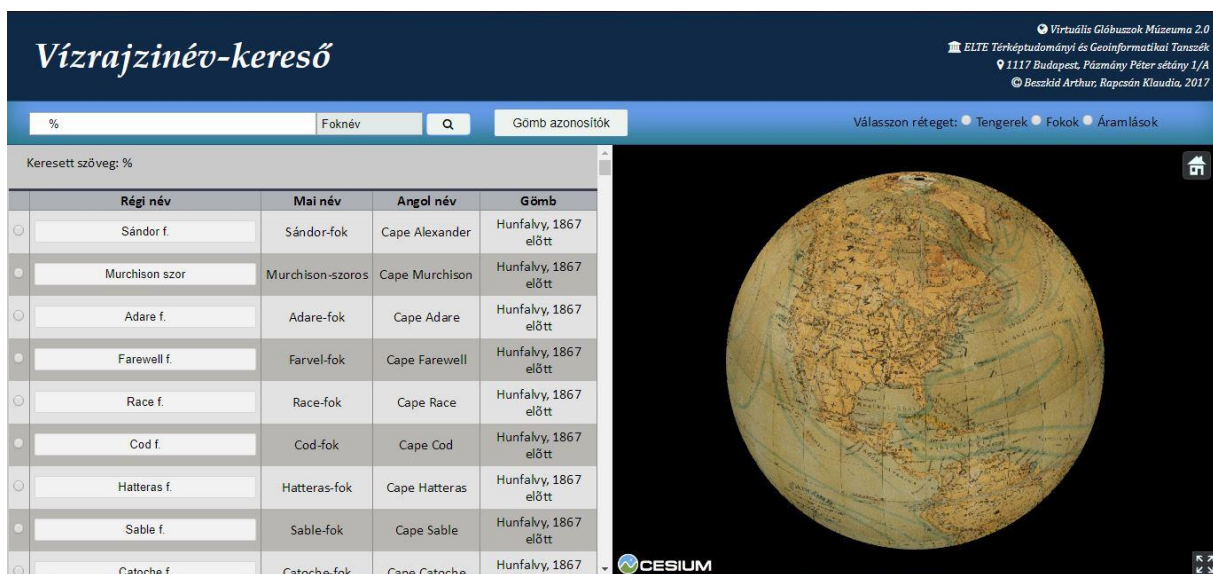


Figure 2. The final design of the website.

In the next phase, Zoltán Kuris carried on the work with the lake, river and waterfall objects (Kuris 2021). First, he collected and uploaded the new names into the database. River geometries were taken from the 1 : 10 million Natural Earth dataset, completed by OpenStreetMap data. As the target scale was much lower, a generalization step had to be included in order to prevent visualization from lagging. After several attempts, the Cartographic Line Generalization plugin in QGIS was used with the Simplification and Smoothing algorithm (Tutić, Lapaine, 2009). This algorithm works with the scale of the target map as an input parameter. According to our earlier experiences, the denominator in the algorithm is a bigger number than the desired result scale (1:200 000 000). The shapes of the lines were good, but this method sometimes have not kept the river mouths (it is not topology safe simplification), therefore manual correction was needed. (The glitches appeared where the path of the main stream was changed, and a smaller river confluenced into the main stream). Another problem was that some rivers were represented as multilinestrings. This geometry type is falling into separate linestrings during visualisation in Cesium, therefore highlighting them on mouse hover did not work properly. This issue was solved by merging connecting multipart linestrings with matching name into one object.

In the case of lakes, point markers were used instead of polygons, because almost all of these lakes would have been tiny object due to the small scale of globes.

Not only the database, but also the querying functions were extended in this phase of work. New comparing options were introduced, which help to follow the changes of the names. These options are the follows:

- The first dropdown menu contains the list of globes, and another one the name categories (lakes, rivers, sea names etc.). As a result, we get the full list of names in the selected name category from a globe (Figure 3a).
- With the comparative function, it's possible to examine the various older forms of names among globes. We have to select a name category first, then we choose a name: as a result, we get the list of the old forms of the selected recent names from the globes (Figure 3b).

ID 46, Gönczy Pál, 11.8 cm Load globe texture

Old Hungarian name	Recent Hungarian name	English name
Aral-öb	Aral-tó	Aral Sea
Balkhas tó	Balhas-tó	Lake Balkhash
Caspi-teng	Kaszpi-tenger	Caspian Sea
Kuku noor	Kuku-Nór (Csinghaj-tó)	Qinghai Lake
Ngami	Ngami-tó	Lake Ngami
Nyassa	Nyassa-tó (Malawi-tó)	Lake Malawi
Tangayika v. Ujji t.	Tanganyika-tó	Lake Tanganyika
Tsad-tó	Csád-tó	Lake Chad

Figure 3a. The list of names on a globe from the Felkl's Company. Hungarian translation by Pál Gönczy in 19th century (around 1884).

Old forms of Csád-tó / Lake Chad		
Old name	Globe	Change layer
Tschád tó	Nagy Károly, Batthány Kázmér, 1840, 31.65 cm	<input type="radio"/>
Tsad t.	Hunfalvy, 1867 előtt, 15.8 cm	<input type="radio"/>
Tsad tö	Hunfalvy, 1867–1870, 21.7 cm	<input type="radio"/>
Tsad tó	Gönczy Pál, 1868–1870, 15.8 cm	<input type="radio"/>
Tsad t.	Hunfalvy János, 1875–1884 között, 15.8 cm	<input type="radio"/>
Tsad t.	Hunfalvy, 1875–1884 között, 15.8 cm	<input type="radio"/>

Figure 3b. Name variants of Lake Chad on various globes.

With this work the hydrographic network name database was completed. The last expansion of the database was completed by Helga Krizsán (2022). She collected names of the biggest name category – settlement names. The majority of recent names were acquired from the Natural Earth 1:10 million dataset. As 400 names missed from this dataset (altogether 2171 settlement names were processed), these were taken from the OpenStreetMap database. The capital cities are represented uppercase letters on most globes what she kept the same way in the database.

She extended the searching functions as well to improve the comparison possibilities between globes. The settlement name category was added. Because of the large number of names in this class, they can be grouped by continents.

The novel expansions

Not every name categories were processed: countries or states were still missing. To consider them, we selected another method, because we do not have any more capacity to digitalize them. Department of Humanities, Social and Political Sciences and Center for Comparative and International Studies at ETH Zürich developed a dataset called CShapes, which contains the polygons of countries from 1886 to 2017 (Schvitz et al. 2022). It is freely downloadable in various file formats. The data was imported into MySQL database. When the user selects a settlement, the system can determine which country it belonged to in the specific time period. The countries can also be displayed on the surface of the virtual globe. This query uses the MySQL Spatial functions (Figure 4). Finally, the English version of the website was created.

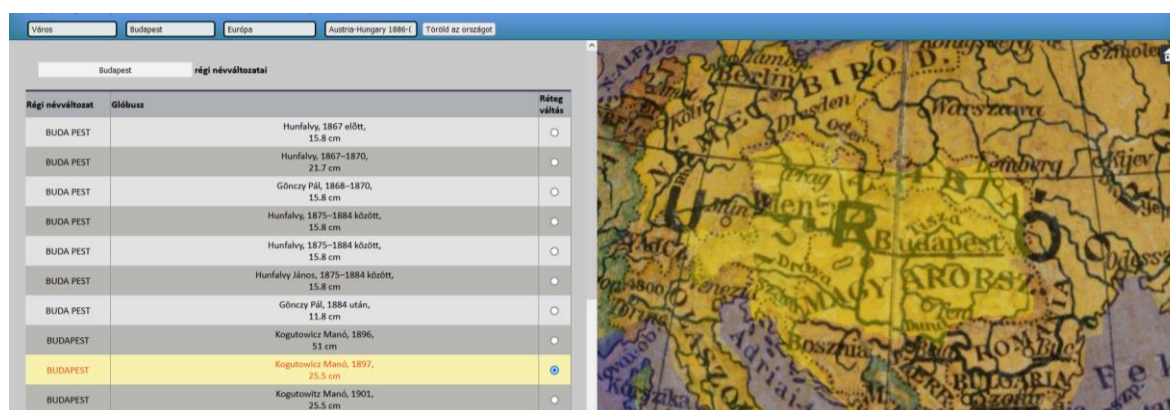


Figure 4: The strong yellow area shows the territory of Austro-Hungarian Monarchy between 1886 (opening date of CShapes dataset) and 1908. If we compare with a globe texture from 1897 you can observe the matches.

About the selected globes

As it has been earlier mentioned, not all globes from VGM were processed. We used 30 globes to follow the name changes. During the selection, we considered the following issues:

- various authors and publishers have to cover the 19th and 20th century,
- publishing method: printed globes,
- language: Hungarian,
- various diameter.

The earliest globe of the selection was printed in 1840. This 31.65 cm diameter globe was the first printed globe in Hungarian language, published by Károly Nagy and Kázmér Batthyány in Vienna, Austria (VGM ID 29 and 89). The names were written by Károly Nagy (astronomer, mathematician), József Bajza (Hungarian poet and critic), Pál Bugát (professor, doctor and participant of the Hungarian Language Reform) and Mihály Vörösmarty (poet, participant of the Hungarian Language Reform). The names of this globe reflect the results of the Hungarian Language Reform (“Language Renewal” between 1790 and 1820), but sometimes these are very different from the recent forms of the geographic names. Therefore, the identification of names on this globe was the hardest work. Unfortunately, river and settlement names of this globe had not been processed yet. Despite the medium size of this globe (made for desktop use), the name density is very dense.

In release time order, the next globes connect to Felkl company (Jan Felkl and co. and Jan Felkl and Son co.) with headquarters in Prag, later Rožtok. These globes were translated into Hungarian by János Hunfalvy (one of the pioneers of the Hungarian scientific geography), and Pál Gönczy (teacher, politician, secretary of state, member of Hungarian Academy of Sciences).

The globes from Felkl were already outdated at the beginning of 20th century, therefore a decree excluded them from the education in 1908. The globe publishing market was dominated by the Hungarian Geographic Institute Company (in Hungarian: Magyar Földrajzi Intézet) afterwards with the leadership of Manó Kogutowicz (cartographer) and later his son, Károly Kogutowicz (geographer professor) before and after the World War I. The diameter of these globes are 25.5 and 51 cm. A new started in the Hungarian globe production after the World War II. Due to the technical development, the new plastic globes allowed cheap mass production. From 1965 to 1990 there are nine globes in the list, including political and physical globes. The production was led by the Cartographia Co. (in Hungarian: Kartográfiai Vállalat) sometimes in cooperation with the VEB Rätgloben Verlag (Leipzig).

Interesting details discovered during the work

The goal of the creation of this database was to allow the researchers to easily reach the names on globes, to make comparison easier, to help following the changes of geographic names. While the names were recorded in the database, several interesting issues had been found.

In the case of sea names, the name *Sulu-tenger* (Sulu Sea) was misplaced on some globes translated by Hunfalvy and Gönczy (Hungarian Felkl globes) (Figure 5). On these globes, the real Sulu Sea was called *Mindorói-tenger* (Mindoro Sea). But *Szulu-tenger* (Sulu Sea with different spelling) is appearing within *Celebesz-tenger* (Celebes Sea).

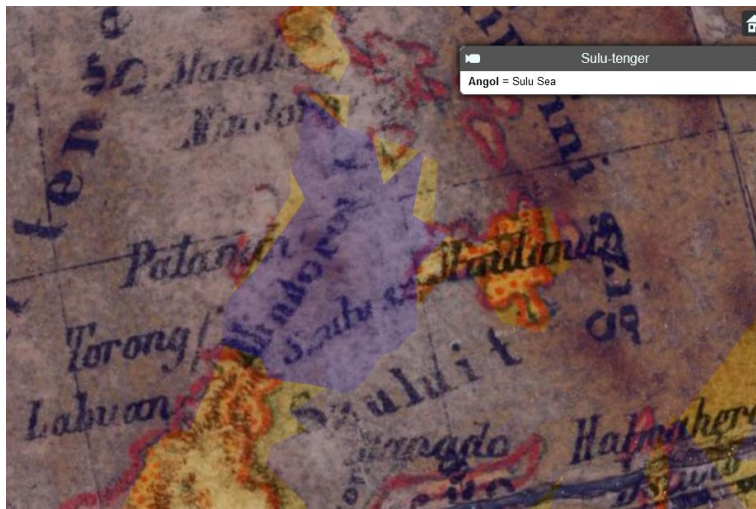


Figure 5. The misplaced name of Sulu Sea, and the nowadays' Sulu Sea was called Mindoro Sea.

In the case of smaller geographic features like lakes and rivers, some identification problems can be spotted mainly at the globe by Károly Nagy, e.g. *Maniba tó* (Lake Maniba) or *Negro tó* (Lake Negro) in Amazonas Basin or *Zamba tó* (Lake Zamba) in Kongo Basin.

Rum tó (Lake Rum) maybe refers to Point Lake in Canada, but the missing sources obstruct the precise identification. In the category of rivers the identification was almost complete with the exception of one river in South America: it is called *Ipaminare*, and probably refers to the Inirida or the Isana river.

Several spelling mistakes can be found on the Felkl globes. Figure 3b shows Lake Chad (today: *Csád-tó* in Hungarian) old forms. The Hungarian translation of lake is "tó", but you can read "tő" sometimes. The lettering of the globe is in contemporary Hungarian orthography, but the lithographer was not Hungarian. The usage of accent letters are often incorrect. The translators (Hunfalvy or Gönczy) probably wrote a list of the names occurring on the globe, and the lithographer used this list. The short forms are also incorrect sometimes (Márton 2010a, Márton 2010b).

Maybe the most interesting name is Lake Parime (or Parima) which appears on seven globes. This lake was mentioned in the 17th century first, and according to the legends it can be found in Guyana, deeply hidden in the jungle between the Amazonas and Orinoco rivers. The legendary city El Dorado or Manoa laid on the bank of this lake. The legend of the lake had lived until the 19th century, when explorers finally confirmed its inexistence. Despite of this, even in the late 19th century the name Parime can be still found on Felkl globes (Figure 6-7).

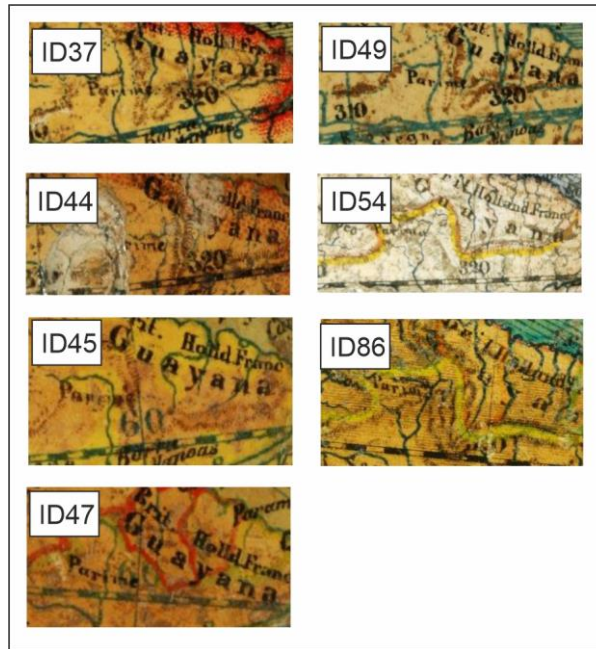


Figure 6: The occurrences of name Parime on globes. (Globes are marked by their ID in VGM).



Figure 7: Lake Parime in Caribbean language Kalina means „Great Lake”, and El Dorado laid on its northwestern bank. This South America map was created from 1656 by N. Sanson with the way to El Dorado. (Wikipedia 2023)

The changes of settlement names were also registered. The main cause of their disappearance is depopulation. But other reasons also came up: *Tamsagbulag* in Mongolia was an air force basis but today only ruins can be found in its place. *Nannine* in Australia is a depopulated mine city. *Koroszkó* was an important place, resting points of caravans along the Nile, near Wadi Halfa until 1890. But when the first Aswan Dam was built, it was flooded by River Nile.

A handful of smaller settlements (38) cannot be matched with any recent places; these can be mostly found in South America and Africa.

Some globes contain a map legend, which mainly shows the classification of cities by their population. These legends use 3-5 classes, and sometimes they also distinguish capital cities and research stations in Antarctica.

Summary

This database and website contains globes and their names from the last 180 years. Table 1 shows the number of names processed altogether in each categories. The website allows users to compare the names from different globes. The searching and listing functions can help following the changes of names.

Name category	Old names	Recent names
Oceans, seas and bays	2,649	88
Ocean currents	257	25
Capes	1,420	290
Rivers	2,844	281
Lakes	917	171
Cities	13,890	2,171
Altogether	21,977	3,026

Table 1. Summarizing the name classes

References

- Beszkid, A (2017): Webes összehasonlító névrajzi kereső kialakítása glóbuszokhoz (Online gazetteer of old globes). *BSc Thesis, Eötvös Loránd University, Budapest, 2017.* http://lazarus.elte.hu/hun/digkonyv/szakdolg/2017-bsc/beszkid_arthur.pdf
- Cartographia, (2019): Földrajzi világtlasz (Atlas of the World). *Cartographia Kiadó, Budapest, 2019.*
- CesiumJS, (2023): <https://cesium.com/platform/cesiumjs/>
- Flanders Marine Institute (2018): *IHO Sea Areas, version 3.* Available online <https://www.marineregions.org/> <https://doi.org/10.14284/323>
- Gede, M, Márton M (2010): Globes on the Web: Technical Background and First Items of the Virtual Globes Museum. In: *Gartner, G; Ortog, F (ed.) Cartography in Central and Eastern Europe: Lecture Notes in Geoinformation and Cartography. Berlin, Germany, Heidelberg, Germany: Springer-Verlag 2010.* 570 p. pp. 279-290. 12 p.
- Gede, M, Ungvári, Zs, Zentai, L (2013): Virtual Globes Museum 2.0 – Adding the Power of Community. In: *Buchroithner, M F (ed.) Proceedings of the 26th International Cartographic Conference. Dresden, Germany: International Cartographic Association (ICA) 2013.* pp. 1-7. Paper: 356, 7 p.
- Krizsán, H (2022): Településnevek adatbázisa összehasonlító névrajzi keresőhöz (Expanding the online gazetteer of old globes with city names). *BSc Thesis, Eötvös Loránd University, Budapest, 2022.* http://lazarus.elte.hu/hun/digkonyv/szakdolg/2022-bsc/krizsan_helga.pdf
- Kuris, Z (2021): Webes összehasonlító névrajzi kereső fejlesztése glóbuszokhoz (Expanding the online gazetteer of old globes). *BSc Thesis, Eötvös Loránd University. Budapest, 2021.* http://lazarus.elte.hu/hun/digkonyv/szakdolg/2021-bsc/kuris_zoltan.pdf
- MapShaper.org, (2021): <https://mapshaper.org/>

Márton, M (2010a): Hunfalvy János és eddig ismeretlen glóbuszai (I. rész). *Geodézia és Kartográfia*, 62. évf., 2010/5, pp: 22–29

Márton, M (2010b): Hunfalvy János és eddig ismeretlen glóbuszai (II. rész). *Geodézia és Kartográfia*, 62. évf., 2010/6, pp: 12–16

Márton, M (2012): A Világtenger kartográfus szemmel (Seas and Oceans with the eyes of a Cartographer). *Eötvös Loránd University Faculty of Informatics, Budapest, Magyarország, 2012.* 358 p. ISBN: 9789632842745

Schvitz, G, Rügger, S, Girardin, L, Cederman, L-E, Weidmann, N, Gleditsch, KS. (2022): Mapping The International System, 1886-2017: The CShapes 2.0 Dataset. *Journal of Conflict Resolution* 66(1): 144–61. DOI: 10.1177/00220027211013563. <https://icr.ethz.ch/publications/cshapes-2/>

Szabó, V (2010): Tengeri területek térképi magyar névanyagának fejlődéstörténeti vizsgálata XIX. És XX. századi földgömbök alapján (Examining the development of names in sea areas using globes as sources from the 19th and 20th century). *MSc Thesis, Eötvös Loránd University. Budapest, 2010.*

Tutić, D., Lapaine, M. (2009): Area Preserving Cartographic Line Generalization. *In: Cartography and Geoinformation, Vol. 8, No. 11*, 84-100, http://www.kartografija.hr/kig/upload/clanci/kig11_Tutic2.pdf

Visvalingam, M, Whyatt J. D. (1992): Line generalisation by repeated elimination of the smallest area. *Cartographic Information Systems Research Group, University of Hull. 1992.*

Wikipedia (2023): Lake Parime. https://en.wikipedia.org/wiki/Lake_Parime

Last visiting of weblinks: 18.04.2023.