

# Suspected Earth Impact Sites database

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Last update: *see web*

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## ***Current structure count***

|   |     |
|---|-----|
| <i>Confirmed (Earth Impact Database):</i> | 174 |
| Confirmed (SEIS):                         | 4   |
| Probable:                                 | 114 |
| Possible:                                 | 450 |
| Improbable                                | 18  |
| Rejected:                                 | 73  |

## ***Purpose***

The aim for this database is to:

- Provide ever-evolving list helping to steer research on suspected impact structures.
- Provide basic data for each structure presented with a meaningful precision.
- Provide brief and specific information about data sources and quality, incl. literature references, methods used to measure the data, clarification of conflicting information from various literature sources etc.
- Sort out non-impact structures by consciously rejecting them instead of just forgetting them and allowing unreasonable proposals to keep coming back.

## ***Historical background***

The development of this database started in October 2004 for a brief reconnaissance project at Shell and was released for public development in June 2005. It was designed complementary to Earth Impact Database (EID, 2006 –), which has been widely regarded as a reference work for confirmed impact structures. Extensive list of proposed impact structures from Moilanen (2004) together with those structures that I independently compiled from literature formed the basis of the new database. Moilanen's database provided references and valuable additional information for some of the structures, but for most of the structures, references were not available, which prevented an assessment of the quality and vintage of the data.

## ***Current status and further development***

Further data development continues along three lines:

1. Systematic scanning of literature and the internet for more structures.
2. Systematic literature compilation for individual structures.
3. Geologic screening study utilizing satellite data accessible on internet.

Relatively few structures bear detailed notes currently but about half of the structures are now supported by a reference to original work. The structures printed in CAPITALS have been merely grabbed from Moilanen's database and I did not have a chance to review them yet; all the notes for these structures come from Moilanen's database unless mentioned otherwise. Recently discovered paper by (Classen, 1977) appears to be the source of many of Moilanen's data. Classen's data will therefore provide original references for most of the other half of the structures; probably during this year.

### ***How to contribute***

Compilation of all necessary information is a huge task for one person but can be achieved if the impact community joins forces and many people contribute a little. Any information is appreciated, however, presentation in the database format is strongly preferred as it saves me a lot of work. Please refer to the explanation of data attributes below and to some more complete examples of the structures in the database (e.g. Sirente, Ševětín, Silverpit, Alamo).

Ideally I would like you to submit:

- Data in Excel file
- electronic files of the referred literature

Please send your contributions to David Rajmon ([drajmon@yahoo.com](mailto:drajmon@yahoo.com)).

Many thanks to all who provided some feedback so far!

### ***Names and Credits***

The database follows a standard naming and referencing style common in scientific literature. Names of the structures are derived from nearby geographic features. Personal names will not be accepted.

Whoever contributes to data entry will be named in the database. I decide the order of the names and who will be listed based on the amount of contribution. Consequently, if the notes for a particular structure are completely rewritten the previous contributors may be dropped of the list.

The notes contain standard references to published literature and personal communication. References to peer-reviewed work are strongly preferred over personal communication and other non-peer-reviewed sources and will replace them eventually.

### ***Sources systematically searched for new proposed impacts:***

#### **Databases, compilations**

(von Engelhardt, 1972; Grieve et al., 1988; Henkel and Pesonen, 1992; Hodge, 1994; Koeberl, 1994; Glikson, 1996; Koeberl and Anderson, 1996; Fortes, 2000; Master and Reimold, 2000; Abels et al., 2002; Glikson and Haines, 2004; Moilanen, 2004; Sharpton, 2004 November; Evans et al., 2005; Glikson and Haines, 2005; EID, 2006)

## **Abstracts**

(Herrick and Pierrazzo, 2003)  
(Evans et al., 2005)  
(Ormö and Bergman, 2006)  
LPSC 1999, 2002, 2004, 2006, 2007  
METSOC 2004, 2005, 2006  
GSA 2006  
ESLAB 2006  
Microsymposium 38

## **Journals**

Meteoritics vol. 2-6 (excluding meeting abstracts)  
MAPS 2002-2006 (excluding meeting abstracts)

## **Other**

(Johnson and Campbell, 1997; Dressler and Sharpton, 1999; Dypvik et al., 2004)

## ***Explanation of data attributes:***

### **Classification**

1. **Confirmed** – impact site with documented shock features and/or meteoritic material and/or observed fall but not included in the Earth Impact Database (EID) because the structure does not pass the EID size restriction or lacks a typical structure due to the nature of the particular impact event (airblast, deep water...).
2. **Probable** – structural, geological and geophysical studies established reasonable evidence, possibly with unconfirmed reports of shock features in abstracts, but the definite shock features and/or meteoritic material is not well documented yet. Includes Moilanen's "probable" structures and also some of the Moilanen's "nearly proven structures" if I or person who I trust did not review the evidence. More than 50% of these structures are expected to be of impact origin.
3. **Proposed/Possible** – some structural, geological and/or geophysical evidence exists but the impact origin is still highly uncertain for the lack of data. Any structures supported by work that has not been published. This includes some poorly supported proposals until they get reviewed and reclassified. Less than 50% of these structures are expected to be of impact origin.
4. **Improbable** – observations of the structure and/or geological context suggest non-impact origin but alternative interpretation has not been well established.
5. **Rejected** – non-impact origin has been well documented

### **Structure name**

The most common name. Other used names appear in the notes. For structures in countries using Latin alphabet, spelling in respective language is adopted. Diacritics (a mark added to a letter to indicate a special pronunciation) can be destroyed when saving as .txt file - WATCH OUT.

## **Crater field**

Indication of whether the structure is a part of a crater field.

## **Region, Country**

Mostly taken from the referenced literature source, but not always. This may also be derived by the database contributor from Lat/Lon data as those are considered the primary way of the structure location.

## **Latitude/Longitude**

Shown in decimal degrees format, where N and E are positive, and S and W are negative. Number of shown digits depends on precision of available data and circumstances. For example, showing a center of a 1-km structure with 1-minute precision is inadequate as the location may end up outside of the structure. Precision of 1 second for an 80-km structure is clearly irrelevant. Beware that underlying number may show many more digits; this is a result of a deg/min/sec conversion to decimal degrees and does not reflect actual precision. When saving in different format or copying and pasting the numbers the formatting may be lost, i.e. zeros at the end will be omitted effectively decreasing precision and irrelevant digits will be shown increasing precision unreasonably.

## **Diameter**

Original rim-to-rim diameter is preferred. If not available, diameter of observed feature is used. In any case, the diameter should be explained in “Notes”. Please refer to Turtle et al. (2005).

## **Age**

The age should be recorded in original format and with a range of uncertainty. The stratigraphic names are translated in number in the columns “Minimum age”, “Best age”, and “Maximum age” and the note should explain how the age was calibrated. For ages indicated with a range, e.g. 100-300 Ma, the “Best age” should be left blank as it would be meaningless. “Age uncertainty” is filled in only if explicitly indicated in original data. “Age uncertainty type” shows whether the uncertainty represents 1 $\sigma$ , 2 $\sigma$ , 95% confidence interval, MSWD, stratigraphic range, etc. For cases of approximate ages without an indication of uncertainty an arbitrary 10% uncertainty has been chosen. Note that 2 $\sigma$  and 95% confidence intervals are not necessarily the same.

Representation of age data in several columns allows searching and ranking. Initially, stratigraphic ages were converted to numerical ages for some structures and the original format does not appear in the database. This practice has been later abandoned with a realization that the numerical ages will change according to evolving stratigraphic charts.

## **Overburden**

The thickness of the rocks (in meters) covering the structure.

## **Present water depth**

The thickness of water layer (in meters) covering the entire structure. Lakes filling the structures do not count.

## **Drilled**

This information can be provided with certainty if the answer is “yes”. As one cannot be sure about the negative answer for drilling of many of the structures, “No” should be entered with care.

## **Target**

Indication of the target rocks assuming impact origin of the structures. Target types: W – water, M – metamorphic, I – igneous, S – sedimentary with indexes s – siliciclastic, c – carbonate, e – evaporite. The rock types tend to be presented in the order decreasing volume in the target.

## **Target water depth**

Indication of the target water depth presented assuming impact origin of the structures.

## **Impactor**

Indication of the projectile type presented assuming impact origin of the structures. Really applies only to the (nearly) confirmed structures.

## **Notes**

The notes should:

- **Accurately capture literature sources for each individual data entry**
- **Describe the basis of impact origin proposal, particular attention should be paid to reports of shock features and meteoritic material.**
- Explain methods used to obtain the data (e.g., step-heating Ar/Ar on K-feldspar separates) and uncertainties. Sometimes a brief discussion of other conflicting data is useful (e.g., older ages with different methods).
- Describe competing hypotheses, at least by referring to who advocated what.
- Provide at least a list of other references not discussed any further.
- Pay attention to information about drilling (where, who, location of cores ...)

The notes should be kept brief but clear and specific. Complete notes according to these guidelines are presently not available for almost any structure but we should push for making them as complete as possible.

Moilanen (2004) is the only reference for structures with names in CAPITALS. These structures have not been reviewed and any notes present come from that source.

## **Compiled by**

Recognition is given to those persons who contributed information to a particular structure in “ready format”. Throwing an abstract at me does not count towards your recognition.

## References

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