Suspected Earth Impact Sites database

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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 started off combining information from four databases by Whitehead (2004 – Earth Impact Database), Sharpton (2004 – GISP), Fortes (2000) and Moilanen (2004) plus information that I compiled from literature. The Earth Impact Database and GISP were considered authorities for identification of confirmed impact structures. Fortes' database provided some useful references. Moilanen's extensive list of proposed impact structures together with those 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. For example, all latitude and longitude coordinates were listed with a precision to the nearest minute although many coordinates were clearly converted from data with an order of magnitude lower precision.

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.

Current status and further development

Relatively few structures bear detailed notes currently. Most structures barely show a reference mentioning that structure. 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.

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.

Further development will continue along two lines:

1. Systematic scanning of literature and internet for more structures.
2. Systematic literature compilation for individual structures.

How to contribute

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. Ševětín, Silverpit, Nyika, Mingobar).

Ideally I would like you to submit:

- Data in Excel file
- The reference list in EndNote file
- Pdf files of the referred literature

Please send your contributions to David Rajmon (drajmon@yahoo.com). Contributions will be recognized in the database.

Many thanks to all who provided some feedback so far!

Sources systematically searched for new proposed impacts:

Databases, compilations

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

Abstracts

(Herrick and Pierrazzo, 2003)
(Evans et al., 2005)
LPSC 1999, 2002, 2004
METSOC 2004, 2005

Journals

MAPS 2002-2005 (excluding meeting abstracts)

Other

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

Explanation of data attributes:

Classification

The classification generally follows the guidelines outlined by Koeberl and Anderson (1996) for confirmed, probable and possible impact structures.

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. **Possible** – some structural, geological and/or geophysical evidence exists but the impact origin is still highly uncertain for the lack of data. This includes also somewhat obscure proposals until someone makes an effort to disqualify their impact origin. Less than 50% of these structures are expected to be of impact origin.
4. **Rejected** – non-impact origin has been well documented

Structure name

The most common name is followed by other used names in parentheses. 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 also may be derived by the database contributor from Lat/Lon data as those are considered 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 1σ, 2σ, 95% confidence interval, MSWD, stratigraphic range, etc. For cases of approximate ages without an indication of uncertainty an arbitrary 10% uncertainty has been chosen (to serve the needs in the original project, for which this database was created). Note that 2σ and 95% confidence intervals are not necessarily the same.

Representation of age data in several columns may seem redundant but it is a result of formatting for the original purpose of this database and perhaps may be useful for other people too. 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.

Exposed, Drilled

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

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.**
- 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; multiple paragraphs are not allowed due to formatting issues at this time. 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. The bold items are the most important ones.

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 ☺.

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