

# The German Heat Flow Database 2022

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## 2. Citation

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## 3. Data Description

The data publication contains all heat-flow data of onshore Germany. The data release contains data generated between 1959 and 2020 and constitutes a substantial update and extension compared to the last compilation provided by the Geothermal Atlas from Hurter & Haenel (2002). The data set comprises new heat-flow determinations published after 2002 as well as data from before 2002, which were not included in the Hurter & Haenel atlas (2002). The resulting updated database contains 836

determinations of heat-flow at 595 locations from 42 publications. 85% of the reported heat-flow values are determined in boreholes, 5% in mines and further 9 % are from onshore lake measurements using marine probe sensing techniques.

### 3.1. Data processing

The reporting and storing of the database is following the structure of the IHFC Global Heat Flow Database (Fuchs et al., 2021). A comprehensive description, including field classifications and examples of associated data, is documented there. The IHFC database concept introduces parent elements (providing site-specific information), child elements (i.e. heat-flow values determined at the site and associated meta-data) and further fields providing additional information for the evaluation of heat-flow quality. Thus, it provides a detailed collection of data and meta-data information, exceeding the sparse information on coordinates, name and heat-flow value provided in Hurter & Haenel (2002). In our release of the German heat-flow values, we have added fields about the applied quality scoring, the reasoning for inclusion or exclusion of data due to quality, and a descriptive field of the regional tectonic or geological units. For details of this procedure see Fuchs et al. (2022).

## 4. File description

### 4.1. Description of data tables

The short name of the columns used in the heat flow database and their description are provided in Table 1.

Table 1: Description of the column headers in 2022-015\_Fuchs-et-al.\_GermanHeatFlowDB-2022.xlsx

Column header	Unit	Short description	Level	Scheme	Class	Field
q	mW/m <sup>2</sup>	Terrestrial surface heat-flow (hf) value after all corrections for instrumental and environmental effects	P	BS	M	1
q_unc	mW/m <sup>2</sup>	Uncertainty standard deviation (SD) of q	P	BS	R	2
name	-	Name of the related hf site	P	BS	M	9
lat	°	N-S coordinate	P	BS	M	10
lng	°	E-W coordinate	P	BS	M	11
elevation	m	Height above or below mean sea level	P	BS	R	12
Ref_1	-	Literature reference	P	BS	M	14
q_acq	-	Year of hf data acquisition	P	BS	O	16
env	-	General geographical setting of site	P	BS	M	17
method	-	Digestion method for hf measurement	P	B	R	19
expl	-	Main purpose of original excavation	P	B	R	20
corr_HP_flag	-	Heat production considered for q?	P	BS	R	23
wat_temp	°C	Seafloor temperature	P	S	R	33
q_comment	-	Any further comments	P	BS	O	34
qc	mW/m <sup>2</sup>	Any kind of heat-flow value (qc)	C	BS	M	1
qc_unc	mW/m <sup>2</sup>	Uncertainty SD of qc	C	BS	R	2
q_method	-	Method of hf calculation	C	BS	M	3
q_top	m	Depth of top hf interval	C	BS	M	4
t_bot	m	Depth of bottom hf interval	C	B	M	5

hf_pen	m	Penetration depth of marine probe	C	S	R	6
hf_probe	m	Type of hf probe	C	S	R	7
hf_probel	m	Length of hf probe	C	S	R	8
q_tf_mech	-	Specification of predominant heat transfer mechanism	C	BS	R	13
Ref_2	-	Supporting literature references	C	BS	O	15
qc_acq	-	Year of qc data acquisition	C	BS	O	16
childcomp	-	Child qc used for q calculation?	C	BS	M	18
corr_IS_flag	-	Conductivity under in-situ pT conditions?	C	BS	R	21
corr_T_flag	-	T data corrected?	C	BS	R	22
corr_S_flag	-	Sedimentation/subsidence effects corrected?	C	BS	R	24
corr_E_flag	-	Erosion effects corrected?	C	BS	R	25
corr_TOPO_flag	-	Topographic effects corrected?	C	BS	R	26
corr_PAL_flag	-	Transient climatic effects corrected?	C	BS	R	27
corr_CONV_flag	-	Convection effect corrected?	C	BS	R	28
corr_BWT_flag	-	Transient bottom-water temperature effects corrected?	C	S	R	29
corr_HR_flag	-	Refraction due to conductivity contrasts corrected?	C	BS	R	30
geo_lith	-	Dominant rock type for hf interval	C	BS	O	31
geo_strat	-	Stratigraphic age of hf interval	C	BS	O	32
T_grad_mean_meas	K/km	Measured T gradient	C	BS	M	35
T_grad_unc_meas	K/km	Uncertainty standard deviation of gradT	C	BS	R	36
T_grad_mean_cor	K/km	Corrected T gradient	C	BS	O	37
T_grad_unc_cor	K/km	Uncertainty SD of corrected gradT	C	BS	O	38
T_method_top	-	Method used for temperature determination at the top	C	B	M	39
T_method_bot	-	Method used for temperature determination at the bottom	C	B	M	40
T_shutin_top	hr	Time after end of drilling/end of mud circulation at the top	C	B	R	41
T_shutin_bot	hr	Time after end of drilling/end of mud circulation at the bottom	C	B	R	42
T_corr_top	-	Correction method applied at the top	C	B	R	43
T_corr_bot	-	Correction method applied at the bottom	C	B	R	44
T_number	-	Number of discrete temperature points	C	BS	R	45
T_tilt	-	Tilt of the marine hf probe	C	S	R	46
tc_mean	W/(mK)	Mean conductivity in vertical direction	C	BS	M	47
tc_unc	W/(mK)	Uncertainty SD of TC mean	C	BS	R	48
tc_source	-	Nature of the samples	C	BS	M	49
tc_method	-	Method used for TC determination	C	BS	R	50
tc_satur	-	Saturation state of the rock sample	C	BS	M	51
tc_pTcond	-	pT conditions of TC determination	C	BS	M	52
tc_pTfunc	-	Technique or approach used to consider pT conditions	C	BS	R	53
tc_numb	-	Number of discrete TC determinations	C	BS	R	54
tc_strategy	-	Strategy to estimate the TC over the vertical hf interval	C	BS	R	55

Ref_ISGN	-	International Generic Sample Numbers	C	BS	O	56
A_reg	-	Region	P	BS	-	-
A_year	-	Year of publication	C	BS	-	-
A_compl	-	Completeness of data on HF/gradT/TC	-	BS	-	-
A_qualEx	-	Quality in-/exclusion	-	BS	-	-
A_scoreTC	-	Methodological quality score for TC	-	BS	-	-
A_scoreGradT	-	Methodological quality score for gradT	-	BS	-	-
A_scoreSum	-	Quality score sum values	-	BS	-	-
A_QualScore	-	Quality category	-	BS	-	-
A_ExclReason	-	Reason for data exclusion	-	BS	-	-

**Abbreviations** – Level: Parent level (P), child level (C); Scheme: Applicable for borehole and mine data (B), applicable for probe sensing data in lakes (S), relevant for all (BS); Classification – Class: Mandatory (M), Recommended (R), Optional (O); Field: Field number in Fuchs et al. (2021)

## 5. Database

The database was developed starting with the last heat-flow compilation of Hurter & Haenel (2002) and extended based on all published data, allowing also to identify misplaced or forgotten data. Compared to the 2002 compilation (549 HF data points and locations), 836 HF data from 595 publications are considered in the current database.

### Considered publications:

*Schoessler\_Schwarzlose\_1959, Creutzburg\_1964, Hueckel\_Kappelmeyer\_1965, Haenel\_etal\_1983, Meincke\_etal\_1967, Becher\_Meincke\_1968, Haenel\_1969a, Haenel\_1969d, Haenel\_1969b, Haenel\_1970a, Haenel\_1970b, Haenel\_1971a, Haenel\_1971b, Haenel\_1969c, Haenel\_Zoth\_1971a, Haenel\_Zoth\_1971b, Haenel\_1972c, Haenel\_1973a, Haenel\_1973c, Haenel\_1974a, Haenel\_1983, Haenel\_1974b, Haenel\_Zoth\_1975, Haenel\_Bram\_1977, Oelsner\_1978, Haenel\_1975, Bram\_1979a, Glaeser\_1983, Schulz\_1987, Schulz\_1988, Burkhardt\_etal\_1989a, Burkhardt\_etal\_1989b, Zoth\_1985, Huenges\_Zoth\_1991, Clauser\_etal\_1997, Foerster\_Foerster\_2000, Hurter\_Haenel\_2002, Norden\_etal\_2008, Orilski\_etal\_2010, Fuchs\_Foerster\_2010, Fuchs\_etal\_2015, Fuchs\_Balling\_2016b, Kaemmlin\_etal\_2020*

## 6. Acknowledgements

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