Update of the Heat Flow Database in Türkiye
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1. Licence

2. Citation

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3. Data Description

The Turkey heat flow database includes several research articles obtained from the catalogue of The Global Heat Flow Data Assessment Project conducted by the International Heat Flow Commission (IHFC; www.ihfc-iugg.org). The presented database contains 725 heat-flow determinations compiled from 9 different publications generated between 1991-2023 reported within Turkey. For the reporting and sorting of the database, the structure documented by Fuchs et al. (2023) is followed. Within this dataset, 98% of the entries represent continental heat-flow data (onshore), while the remaining 2% correspond to marine data (offshore). 88% of the reported heat flow values were obtained via direct temperature measurements, while the remaining data (12%) were estimated from indirect Curie depth temperature calculations.

4. File description

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

4.1.Description of data tables

Table 1: Description of the column headers in Balkan-Pazvantoglu-et-al_HeatFlow_2023.xlsx

P01	**Heat-flow value**	q	mW/m²	Float (1 decimal place)	M	P	B,S	Terrestrial surface heat-flow value (q) for the location after all corrections for instrumental and environmental effects.
P02	**Heat-flow uncertainty**	q_uncertainty	mW/m²	Float (1 decimal place)	R	P	B,S	Uncertainty of the location heat-flow value [q] estimated by error propagation from the uncertainties [qc_uncertainty] of the relevant child [relevant_child] heat flow values [qc]
P03	**Site name**	name	-	Char (255)	M	P	B,S	Specification of the (local) name of the related heat-flow site or the related survey. Should be consistent with the publication.
P04	**Geographical latitude**	lat	deg	Float (5 decimal places)	M	P	B,S	Latitude (lat) is a geographic coordinate that specifies the North–South position of a point on the planetary's surface. The Equator has a latitude of 0°, the North Pole has a latitude of 90° North (written +90), and the South Pole has a latitude of 90° South (written -90). Numeric values (2 digits) with 5 decimal places are used for this database item instead of the N or S format (e.g., -80.00000 instead of 80° S).
P05	**Geographical longitude**	long	deg	Float (5 decimal places)	M	P	B,S	Longitude (long) is a geographic coordinate that specifies the east–west position of a point on the Earth's planetary surface. The Prime Meridian, which passes near the Royal Observatory, Greenwich, England, is defined as 0° longitude by convention. Positive longitudes are east of the Prime Meridian, and negative ones are west. Numeric values (3 digits) with 5 decimal places
P06	**Geographical elevation**	elevation	m	float (2 decimal places)	R	P	B,S	The elevation of a geographic location is its height above or below mean sea level. *Caution: different national reference systems are used. Also the reference level may be diverse depending on the study (drilling, lake, marine…).*
P07	**Basic geographical environment**	environment	-	Char (255)	M	P	B,S	Describes the general geographical setting of the heat-flow site (not the applied methodology).
P08	**General comments parent level**	p_comment	-	Char (255)	R	P	B,S	Comments to the reported heat-flow location value.
P09	**Flag heat production of theoverburden (heat-flow correction)**	corr_HP_flag	-	BIT field	R	P	B,S	Specifies if corrections to the calculated heat flow considers the contribution of the heat production of the overburden to the terrestrial surface heat flow q.

P10	**Total Measured Depth**	total_depth_MD	m	float (2 decimal places)	R	P	B	Specification of the the total depth. *Caution: different national reference systems are used. Also the reference level may be diverse depending on the study (drilling, lake, marine…).*
P11	**Total True Vertical Depth**	total_depth_TVD	m	float (2 decimal places)	R	P	B	Specification of the the total drilling depth below mean sea level. *Caution: different national reference systems are used. Also the reference level may be diverse depending on the study (drilling, lake, marine…).*
P12	**Type of exploration method**	explo_method	-	Char (255)	M	P	B	Specification of the general means by which the rock was accessed by temperature sensors for the respective data entry.
P13	**Original exploration purpose**	explo_purpose	-	Char (255)	R	P	B	Main purpose of the reconnaissance target providing access for the temperature sensors.
C01	**Heat-flow value child**	qc	mW/m²	Float (1 decimal place)	M	C	B,S	Any kind of heat-flow value (qc).
C02	**Heat-flow uncertainty child**	qc_uncertainty	mW/m²	Float (1 decimal place)	R	C	B,S	Uncertainty standard deviation of the reported heat-flow value [qc] as estimated by an error propagation from uncertainty in thermal conductivity and temperature gradient or deviation from the linear regression of the Bullard plot (corrected preferred over measured gradient).
C03	**Heat-flow method**	q_method	-	Char (255)	M	C	B,S	Principal method of heat-flow density calculation from temperature and thermal conductivity data. *Allowed entries: controlled vocabulary*
C04	**Heat-flow interval top**	q_top	m	Float (2 decimal places)	M	C	B,S	Describes the true vertical depth (TVD) of the top end of the heat-flow determination interval relative to the land surface/seafloor.
C05	**Heat-flow interval bottom**	q_bottom	m	Float (2 decimal places)	M	C	B	Describes the true vertical depth (TVD) of the bottom end of the heat-flow determination interval relative to the land surface.
C06	**Penetration depth**	probe_penetration	m	Float (2 decimal places)	M	C	S	Depth of penetration of marine probe into the sediment.
C07	**Primary publication reference**	publication_reference	-	Char (255)	M	C	B,S	References of primary publication related to the respective heat-flow entry.
C08	**Primary data reference**	data_reference	-	Char (255)	M	C	B,S	References of primary data publication related to the respective heat-flow entry.
C09	**Relevant child**	relevant_child	-	Boolean field	M	C	B,S	Specifies whether the child entry is used for computation of representative location heatflow values at the parent level or not.

C10	**General comments child level**	c_comment	-	Char (255)	R	P	B,S	Comments and further specifications to the individual reported heat-flow determination.
C11	**Flag in-situ thermal properties**	corr_IS_flag	-	Char (255)	R	C	B,S	Specifies whether the in-situ pressure and temperature conditions were considered to the reported thermal conductivity value or not.
C12	**Flag temperature corrections (instrumental correction)**	corr_T_flag	-	Char (255)	R	C	B,S	Specifies if instrumental corrections to the measured temperature data were required and performed.
C13	**Flag sedimentation effect (temperature correction)**	corr_S_flag	-	Char (255)	R	C	B,S	Specifies if sedimentation/subsidence effects with respect to the reported heat-flow value were present and if corrections were performed.
C14	**Flag erosion effect (heatflow correction)**	corr_E_flag	-	Char (255)	R	C	B,S	Specifies if erosion effects with respect to the reported heat-flow value were present and if corrections were performed.
C15	**Flag topographic effect (heat-flow correction)**	corr_TOPO_flag	-	Char (255)	R	C	B,S	Specifies if topographic effects with respect to the reported heat-flow value were present and if corrections were performed.
C16	**Flag paleoclimatic effect (heat-flow correction)**	corr_PAL_flag	-	Char (255)	R	C	B,S	Specifies if paleoclimatic effects with respect to the reported heat-flow value were present and if corrections were performed.
C17	**Flag transient climatic effect (heat-flow correction)**	corr_PAL_flag	-	Char (255)	R	C	B,S	Specifies if climatic conditions (glaciation, postindustrial warming, etc.) with respect to the reported heat-flow value were present and if corrections were performed.
C18	**Flag convection processes (heat-flow correction)**	corr_CONV_flag	-	Char (255)	R	C	B,S	Specifies if convection effects with respect to the reported heat-flow value were present and if corrections were performed.
C19	**Flag heat refraction effect (heat-flow correction)**	corr_HR_flag	-	Char (255)	R	C	B,S	Specifies if refraction effects, e.g., due to significant local conductivity contrasts, with respect to the reported heat-flow value were present and if corrections were performed.
C20	**Platform, Vessel, Expedition**	expedition	-	Char (255)	R	C	S	Specification of the expedition, cruise, platform or research vessel where the marine heat flow survey was conducted.
C21	**Probe type**	probe_type	-	Char (255)	R	C	S	Type of heat-flow probe used for measurement.
C22	**Probe length**	probe_length	m	Float (2 deimal places)	R	C	S	Length of heat-flow probe.
C23	**Probe tilt**	probe_tilt	deg	Float (1 decimal place)	R	C	S	Tilt of the marine heat-flow probe.

C24	**Bottom-water temperature**	water_temperature	°C	Float (2 decimal places)	O	P	S	Seafloor temperature where heat-flow measurements were taken. e.g. PT 100 or Mudline temperature for ocean drilling data.
C25	**Lithology**	geo_lithology	-	Char (255)	O	C	B,S	Dominant rock type/lithology within the interval of heat-flow determination.
C26	**Stratigraphic age**	geo_stratigraphy	-	Char (255)	O	C	B,S	Stratigraphic age (series/epoch or stage/age) of the depth range involved in the reported heatflow determination.
C27	**Calculated or inferred temperature gradient**	T_grad_mean	K/km	Float (2 decimal places)	R	C	B,S	Mean temperature gradient measured for theheat-flow determination interval.
C28	**Temperature gradient uncertainty**	T_grad_uncertainty	K/km	Float (2 decimal places)	R	C	B,S	Uncertainty standard deviation of mean measured temperature gradient [T_grad_mean] as estimated by an error propagation from the uncertainty in the top and bottom temperature determinations.
C29	**Mean temperature gradient corrected**	T_grad_mean_cor	K/km	Float (2 decimal places)	O	C	B,S	Mean temperature gradient corrected for borehole (drilling/mud circulation) and environmental effects (terrain effects/topography, sedimentation, erosion, magmatic intrusions, paleoclimate, etc.). Name the correction method in the corresponding item.
C30	**Corrected temperature gradient uncertainty**	T_grad_uncertainty _cor	K/km	Float (2 decimal places)	O	C	B,S	Uncertainty standard deviation of mean corrected temperature gradient [T_grad_mean] as estimated by error propagation from the uncertainty of the measured gradient and the applied correction approaches.
C31	**Temperature method (top)**	T_method_top	-	Char (255)	M	C	B	Method used for temperature determination at the top of the heat-flow determination interval.
C32	**Temperature method (bottom)**	T_method_bottom	-	Char (255)	M	C	B	Method used for temperature determination at the bottom of the heat-flow determination interval.
C33	**Shut-in time (top)**	T_shutin_top	hours	Integer (5)	R	C	B	Time of measurement at the interval top in relation to the end Values measuredduring the drilling are equal to zero.
C34	**Shut-in time (bottom)**	T_shutin_bottom	hours	Integer (5)	R	C	B	Time of measurement at the interval bottom in relation to the end Values measuredduring the drilling are equal to zero.

C35	**Temperature correction method (top)**	T_corr_top	-	Char (255)	R	C	B	Applicable only if gradient correction for borehole effects is reported. Approach applied to correct the temperature measurement for drilling perturbations at the top of the interval used for heat-flow determination.
C36	**Temperature correction method (bottom)**	T_corr_bottom	-	Char (255)	R	C	B	Applicable only if gradient correction for borehole effects is reported. Approach applied to correct the temperature measurement for drilling perturbations at the bottom of the interval used for heat-flow determination.
C37	**Number of temperature recordings**	T_number	-	Integer (6)	R	C	B,S	Number of discrete temperature points (e.g. number of used BHT values, log values or thermistors used in probe sensing) confirming the mean temperature gradient [T_grad_mean_meas]. Not the repetition of one measurement at a certain depth.
C38	**Date of acquisition**	q_date	-	POSIX date (YYYYMM)	M	C	B,S	The entry gives the year of the acquisition of the temperature data (which may differ from the year of publication). If the month is unknown use 01, i.e. for the year 2005 use 2005-01. For nonunique time values, define a range in the format: 'YYYY-MM; YYYY-MM'
C39	**Mean thermal conductivity**	tc_mean	W/(mK)	Float (2 decimal place)	M	C	B,S	Mean conductivity in vertical direction representative for the interval of heat-flow determination. The value should reflect the true in-situ conditions for the corresponding heat flow interval.
C40	**Thermal conductivity uncertainty**	tc_uncertainty	W/(mK)	Float (2 decimal place)	R	C	B,S	Uncertainty of mean thermal conductivity [tc_mean] given as one-sigma standard deviation.
C41	**Thermal conductivity source**	tc_source	-	Char (255)	M	C	B,S	Nature of the samples upon which thermal conductivity was determined [tc_mean].
C42	**Thermal conductivity location**	tc_location	-	Char (255)	M	C	B,S	location of the samples upon which thermal conductivity was determined [tc_mean].
C43	**Thermal conductivity method**	tc_method	-	Char (255)	R	C	B,S	Method used for thermal-conductivity determination for [tc_mean].
C44	**Thermal conductivity saturation**	tc_saturation	-	Char (255)	M	C	B,S	Saturation state of the studied rock interval studied for thermal conductivity [tc_mean].
C45	**Thermal conductivity pT conditions**	tc_pT_conditions	-	Char (255)	M	C	B,S	Qualified conditions of pressure and temperature under which the mean thermal conductivity [tc_mean] used for the heat-flow computation was determined.

C46	**Thermal conductivity pT assumed function**	tc_pT_function	-	Char (255)	R	C	B,S	Technique or approach used to correct the measured thermal conductivity towards in-situ pressure (p) and/or temperature (T) conditions.
C47	**Thermal conductivity number**	tc_number	-	Integer (4)	R	C	B,S	Number of discrete conductivity determinations used to determine the mean thermal conductivity [tc_mean], e.g. number of rock samples with a conductivity value used, or number of thermistors used by probe sensing techniques. Not the repetition of one measurement on one rock sample or one thermistor.
C48	**Thermal conductivity averaging methodology**	tc_strategy	-	Char (255)	R	C	B,S	Strategy that was employed to estimate the thermal conductivity [tc_mean] over the vertical interval of heat-flow determination.
C49	**IGSN**	Ref_IGSN	-	Char (255)	O	C	B,S	International Generic Sample Numbers (IGSN, semicolon separated) for rock samples used for laboratory measurements of thermal conductivity in the heat flow calculation.

Abbreviations – Level: Parent level (P), child level (C); Scheme: Applicable for marine borehole data (B), applicable for marine probe sensing data (S), relevant for all (BS); Classification – Class: Mandatory (M), Recommended (R), Optional (O);

5. Database

The database is constructed using published heat flow data available from Turkey region. It also serves the purpose of identifying errors in prior databases and uncovering data that may have been overlooked or forgotten.

6. References

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