ArAR – Argon Age Recalculator: Documentation

Version: 1.00.01

Group 18 Laboratories
School of Earth and Space Exploration
Arizona State University
Tempe, AZ 85287

Nomenclature

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Contents

In designing the *ArAR* software, I have attempted to use a set of intuitive symbols to represent the several physical quantities that must be defined to "recalculate" previously published (i.e., *legacy*) K-Ar and ^{40}Ar/^{39}Ar data. In the interest of clarity, however, I have compiled a list of the symbols that I employed in the *ArAR* graphical user interface (GUI), libraries, and change log, and I have explicitly defined them here. I have grouped them as follows: (1) ^{40}K Decay Constants, (2) K Isotopic Abundance Values, (3) Monitor Mineral Ages, (4) Multiple Intercalibration Quantities, and (5) Alternate and Additional Symbols. The symbols in groups 1–4 are exclusively used in the *ArAR* GUI, while those in group 5 are used in the *ArAR* libraries and change logs. For more details on how to use the *ArAR* software, please see the Manual.

1 ^{40}K Decay Constants

1.1   Symbols for 'Old' ^{40}K Decay Constants

λ_{40Ar_o} =   Partial decay constant for ^{40}K that accounts for the production of ^{40}Ar by electron capture and positron emission (i.e., $\lambda_{40Ar_o} = \lambda_{\varepsilon_o} + \lambda_{\beta_o^+}$), though the contribution from the latter decay mode is often considered negligible. This is the value that was used to obtain the originally published data.

λ_{β_o} =   Partial decay constant for ^{40}K that accounts for the production of ^{40}Ca by beta decay. This is the value that was used to obtain the originally published data.

λ_o =   Total decay constant for ^{40}K, calculated as $\lambda_o = \lambda_{40Ar_o} + \lambda_{\beta_o}$. This is the value that was used to obtain the originally published data.

$\lambda_{40Ar_o}/\lambda_o$ =   Branching ratio for the decay of ^{40}K; describes the fraction of decay events that produce ^{40}Ar. This value is displayed for convenience when recalculating legacy data.

$t_{1/2o}$ =   Half life of ^{40}K, calculated using the relation $t_{1/2o} = \log(2)/\lambda_o$, where log is the natural logarithm (base e).

τ_o =   Mean life of ^{40}K, calculated simply as $\tau_o = 1/\lambda_o$.

Note: only the partial decay constants, λ_{40Ar_o} and λ_{β_o}, and total decay constant, λ_o, are used when recalculating legacy data. By default, λ_o is calculated automatically from λ_{40Ar_o} and λ_{β_o} to maintain full machine precision during computation. However, it may be edited manually by unchecking the "Use Calculated Values" checkbox in the 'Old' Decay Constants panel of the main *ArAR* GUI. (The manually entered value will be used in this case.) The values for $\lambda_{40Ar_o}/\lambda_o$, $t_{1/2o}$, and τ_o are displayed for convenience. See the Calculations documentation for further details on how legacy data are recalculated.

1.2   Symbols for 'New' ^{40}K Decay Constants

λ_{40Ar} =   Partial decay constant for ^{40}K that accounts for the production of ^{40}Ar by electron capture and positron emission (i.e., $\lambda_{40Ar_o} = \lambda_{\varepsilon_o} + \lambda_{\beta_o^+}$), though the contribution from the latter decay mode is often considered negligible. This is the value that is used to recalculate legacy data.

λ_{β} =   Partial decay constant for ^{40}K that accounts for the production of ^{40}Ca by beta decay. This is the value that is used to recalculate legacy data.

λ = Total decay constant for ^{40}K. Value used to recalculate legacy data.

$\lambda_{^{40}Ar}/\lambda$ = Branching ratio for the decay of ^{40}K; describes the fraction of decay events that produce ^{40}Ar. This value is displayed for convenience when recalculating legacy data.

$t_{1/2}$ = Half life of ^{40}K, calculated using the relation $t_{1/2} = \log(2)/\lambda$, where log is the natural logarithm (base e).

τ = Mean life of ^{40}K, calculated simply as $\tau = 1/\lambda$.

Note: only the partial decay constants, $\lambda_{^{40}Ar}$ and λ_β, and total decay constant, λ, are used when recalculating legacy data. By default, λ is calculated automatically from $\lambda_{^{40}Ar}$ and λ_β to maintain full machine precision during computation. However, it may be edited manually by unchecking the "Use Calculated Values" checkbox in the 'New' Decay Constants panel of the main *ArAR* GUI. (The manually entered value will be used in this case.) The values for $\lambda_{^{40}Ar}/\lambda$, $t_{1/2}$, and τ are displayed for convenience. See the Calculations documentation for further details on how legacy data are recalculated.

2   K Isotopic Abundance Values

2.1   Symbols for 'Old' K Isotopic Abundances

$^{39}K_{ao}$ = Isotopic abundance of ^{39}K relative to total K (as percent). This value is displayed for convenience when recalculating legacy data.

$^{40}K_{ao}$ = Isotopic abundance of ^{40}K relative to total K (as percent). This is the value that was used to obtain the originally published data.

$^{41}K_{ao}$ = Isotopic abundance of ^{41}K relative to total K (as percent). This value is displayed for convenience when recalculating legacy data.

Note: only the relative isotopic abundance of ^{40}K, $^{40}K_{ao}$, is used when recalculating legacy data. See the Calculations documentation for further details on how legacy data are recalculated.

2.2   Symbols for 'New' K Isotopic Abundances

$^{39}K_a$ = Isotopic abundance of ^{39}K relative to total K (as percent). This value is displayed for convenience when recalculating legacy data.

$^{40}K_a$ = Isotopic abundance of ^{40}K relative to total K (as percent). This is the value that is used to recalculate legacy data.

$^{41}K_a$ = Isotopic abundance of ^{39}K relative to total K (as percent). This value is displayed for convenience when recalculating legacy data.

Note: only the relative isotopic abundance of ^{40}K, $^{40}K_a$, is used when recalculating legacy data. See the Calculations documentation for further details on how legacy data are recalculated.

3   Symbols for 'Old' and 'New' Monitor Mineral Ages

$$t_{m_o} \quad = \quad$$ The age of the monitor mineral that was used to determine dates for unknown samples. This is the value that was used to obtain the originally published data.

$$t_m \quad = \quad$$ The age of the monitor mineral that was used to determine dates for unknown samples. This is the value that is used to recalculate legacy data.

See the Calculations documentation for further details on how legacy data are recalculated.

4   Multiple Intercalibration Quantities

The *ArAR* Multiple Intercalibration Tool uses the same symbols for the ^{40}K Decay Constants as those listed in section 1.2. Additional symbols that are used in the Multiple Intercalibration Tool are listed below.

$$\kappa \equiv {}^{40}Ar^*/{}^{40}K \quad = \quad$$ The experimentally determined $^{40}Ar^*/^{40}K$ ratio of the primary standard used for multiple intercalibration of an unknown.

$$t_0 \quad = \quad$$ The age of the primary standard used for multiple intercalibration of an unknown.

$$t_i \quad = \quad$$ The age of a secondary standard used for multiple intercalibration of an unknown.

$$t_{n-1} \quad = \quad$$ The age of the unknown that is being intercalibrated against a primary standard and one or more secondary standards.

$${}^{40}Ar^*/{}^{39}Ar_K \quad = \quad$$ The experimentally determined $^{40}Ar^*/^{39}Ar_K$ ratio of a primary or secondary standard, or the unknown that is being intercalibrated.

5   Alternate and Additional Symbols

5.1   *Quantities Used in the* ArAR *Libraries*

To facilitate rapid recalculation of legacy K-Ar and ^{40}Ar/^{39}Ar data, *ArAR* includes three libraries with published values for K decay constants, K isotopic abundances, and monitor mineral

ages. For more information on how these libraries are stored and how to edit their contents, see the Manual. Since these libraries use alternate plain-text symbols for the quantities listed in the previous sections, the symbols are defined below.

L_40Ar $\implies$ Partial decay constant for ^{40}K that accounts for the production of ^{40}Ar by electron capture and positron emission (i.e., $\lambda_{40Ar} = \lambda_\varepsilon + \lambda_{\beta^+}$), though the contribution from the latter decay mode is often considered negligible. Library values for this quantity may be used for λ_{40Ar_o} and λ_{40Ar} in the main *ArAR* GUI.

L_b $\implies$ Partial decay constant for ^{40}K that accounts for the production of ^{40}Ca by beta decay. Library values for this quantity may be used for λ_{β_o} and λ_β in the main *ArAR* GUI.

39K $\implies$ Isotopic abundance of ^{39}K relative to total K (as percent). Library values for this quantity may be used for $^{39}K_{ao}$ and $^{39}K_a$ in the main *ArAR* GUI.

40K $\implies$ Isotopic abundance of ^{40}K relative to total K (as percent). Library values for this quantity may be used for $^{40}K_{ao}$ and $^{40}K_a$ in the main *ArAR* GUI.

41K $\implies$ Isotopic abundance of ^{41}K relative to total K (as percent). Library values for this quantity may be used for $^{41}K_{ao}$ and $^{41}K_a$ in the main *ArAR* GUI.

Values for monitor mineral ages are simply stored in the *ArAR* library under the heading "Age". Note, the values stored in these libraries are accessible to both the 'Old' and 'New' control panels in the *ArAR* GUI for each respective quantity. For example, values in the "K Decay Constants" library may be used in both the 'Old' and 'New' Decay Constants panels.

5.2 *Quantities Used in the Main* ArAR *Change Log and the Recalculation History Tool*

Every time a K-Ar or ^{40}Ar/^{39}Ar date is recalculated in *ArAR* , an entry is created in the change log for that date that includes all values used to recalculate the date (e.g., λ_o, λ, $^{40}K_{ao}$, $^{40}K_a$, t_{m_o}, t_m, etc.), as well as ancillary information related to the K decay constants (e.g., the half-life $t_{1/2o}$ corresponding to λ_o), K isotopic abundance values (e.g., the values of $^{39}K_a$ and $^{41}K_a$), monitor minerals (e.g., the names of the selected monitors), and *ArAR* library selections and warnings (e.g., if uncertainty values were assumed or any values were manually edited by the user in the main *ArAR* window). The change log is intended to preserve a record of all age recalculations, and because the column headers use alternate plain-text symbols for all quantities, the symbols are defined below. The symbols 'to,' 'toU,' 't,' and 'tU' are also employed in the *ArAR* Recalculation History Tool (see 'General Change Log Entries below and the *ArAR* Manual).

General Change Log Entries:

Method $\implies$ The algorithm that was used to recalculate legacy data: either 'K-Ar' or 'Ar-Ar.' See the Calculations documentation for further details.

to $\implies$ The value of the 'old' K-Ar or $^{40}Ar/^{39}Ar$ date before recalculation.

toU $\implies$ The uncertainty in the 'old' K-Ar or $^{40}Ar/^{39}Ar$ date before recalculation.

t $\implies$ The value of the 'new' K-Ar or $^{40}Ar/^{39}Ar$ date after recalculation.

tU $\implies$ The uncertainty in the 'new' K-Ar or $^{40}Ar/^{39}Ar$ date after recalculation.

Change Log Entries for 'Old' K Decay Constants:

oKdcRef $\implies$ The reference selected from the *ArAR* library for 'old' K decay constants. See the *ArAR* Manual for additional details.

Laro $\implies$ The same as $\lambda_{40_{Ar_o}}$ in the ^{40}K Decay Constants section.

LaroU $\implies$ The uncertainty in the value of 'Laro' (i.e., $\sigma_{\lambda_{40_{Ar_o}}}$).

Lbo $\implies$ The same as λ_{β_o} in the ^{40}K Decay Constants section.

LboU $\implies$ The uncertainty in the value of 'Lbo' (i.e., $\sigma_{\lambda_{\beta_o}}$).

Lo $\implies$ The same as λ_o in the ^{40}K Decay Constants section.

LoU $\implies$ The uncertainty in the value of 'Lo' (i.e., σ_{λ_o}).

Bo $\implies$ The same as $\lambda_{40_{Ar_o}}/\lambda_o$ in the ^{40}K Decay Constants section.

BoU $\implies$ The uncertainty in the value of 'Bo' (i.e., $\sigma_{\lambda_{40_{Ar_o}}/\lambda_o}$).

HLo $\implies$ The same as $t_{1/2o}$ in the ^{40}K Decay Constants section.

HLoU $\implies$ The uncertainty in the value of 'HLo' (i.e., $\sigma_{t_{1/2o}}$).

MLo $\implies$ The same as τ_o in the ^{40}K Decay Constants section.

MLoU $\implies$ The uncertainty in the value of 'MLo' (i.e., σ_{τ_o}).

oKdcModified $\implies$ Indicates whether the values and/or uncertainties for $\lambda_{40_{Ar_o}}$, λ_{β_o}, and/or λ_o were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.

oKdcUwarning $\implies$ Indicates that relative uncertainties were assumed for the 'old' K decay contants ('true'), or that uncertainties were available in the the *ArAR* library (warning was off, or 'false'). See the *ArAR* Manual for additional details.

oKdcUseCalced $\implies$ Indicates whether the 'old' total decay constant, λ_o, was calculated automatically from the partial decay constants ('true'), or that the user entered a value manually ('false).

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Change Log Entries for 'New' K Decay Constants:

nKdcRef	$\Longrightarrow$	The reference selected from the *ArAR* library for 'new' K decay constants. See the *ArAR* Manual for additional details.
Lar	$\Longrightarrow$	The same as $\lambda_{40_{Ar}}$ in the ^{40}K Decay Constants section.
LarU	$\Longrightarrow$	The uncertainty in the value of 'Lar' (i.e., $\sigma_{\lambda_{40_{Ar}}}$).
Lb	$\Longrightarrow$	The same as λ_{β} in the ^{40}K Decay Constants section.
LbU	$\Longrightarrow$	The uncertainty in the value of 'Lb' (i.e., $\sigma_{\lambda_{\beta}}$).
L	$\Longrightarrow$	The same as λ in the ^{40}K Decay Constants section.
LU	$\Longrightarrow$	The uncertainty in the value of 'L' (i.e., σ_{λ}).
B	$\Longrightarrow$	The same as $\lambda_{40_{Ar}}/\lambda$ in the ^{40}K Decay Constants section.
BU	$\Longrightarrow$	The uncertainty in the value of 'B' (i.e., $\sigma_{\lambda_{40_{Ar}}/\lambda}$).
HL	$\Longrightarrow$	The same as $t_{1/2}$ in the ^{40}K Decay Constants section.
HLU	$\Longrightarrow$	The uncertainty in the value of 'HL' (i.e., $\sigma_{t_{1/2}}$).
ML	$\Longrightarrow$	The same as τ in the ^{40}K Decay Constants section.
MLU	$\Longrightarrow$	The uncertainty in the value of 'ML' (i.e., σ_{τ}).
nKdcModified	$\Longrightarrow$	Indicates whether the values and/or uncertainties for $\lambda_{40_{Ar}}$, λ_{β}, and/or λ were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.
nKdcUwarning	$\Longrightarrow$	Indicates that relative uncertainties were assumed for the 'new' K decay contants ('true'), or that uncertainties were available in the the *ArAR* library (warning was off, or 'false'). See the *ArAR* Manual for additional details.
nKdcUseCalced	$\Longrightarrow$	Indicates whether the 'new' total decay constant, λ, was calculated automatically from the partial decay constants ('true'), or that the user entered a value manually ('false).

Change Log Entries for 'Old' K Isotopic Abundance Values:

oKiaRef	$\Longrightarrow$	The reference selected from the *ArAR* library for 'old' K isotopic abundances. See the *ArAR* Manual for additional details.
K39o	$\Longrightarrow$	The same as $^{39}K_{ao}$ in the K Isotopic Abundance Values section.
K39oU	$\Longrightarrow$	The uncertainty in the value of 'K39o' (i.e., $\sigma_{39_{K_{ao}}}$).
K40o	$\Longrightarrow$	The same as $^{40}K_{ao}$ in the K Isotopic Abundance Values section.
K40oU	$\Longrightarrow$	The uncertainty in the value of 'K40o' (i.e., $\sigma_{40_{K_{ao}}}$).
K41o	$\Longrightarrow$	The same as $^{41}K_{ao}$ in the K Isotopic Abundance Values section.
K41oU	$\Longrightarrow$	The uncertainty in the value of 'K41o' (i.e., $\sigma_{41_{K_{ao}}}$).

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Change Log Entries for 'Old' K Isotopic Abundance Values (cont'd):

oKiaModified	$\Longrightarrow$	Indicates whether the values and/or uncertainties for $^{39}K_{ao}$, $^{40}K_{ao}$, and/or $^{41}K_{ao}$ were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.
oKiaUwarning	$\Longrightarrow$	Indicates that relative uncertainties were assumed for the 'old' K isotopic abundance values ('true'), or that uncertainties were available in the the *ArAR* library (warning was off, or 'false'). See the *ArAR* Manual for additional details.

Change Log Entries for 'New' K Isotopic Abundance Values:

nKiaRef	$\Longrightarrow$	The reference selected from the *ArAR* library for 'new' K isotopic abundances. See the *ArAR* Manual for additional details.
K39	$\Longrightarrow$	The same as $^{39}K_a$ in the K Isotopic Abundance Values section.
K39U	$\Longrightarrow$	The uncertainty in the value of 'K39' (i.e., $\sigma_{^{39}K_a}$).
K40	$\Longrightarrow$	The same as $^{40}K_a$ in the K Isotopic Abundance Values section.
K40U	$\Longrightarrow$	The uncertainty in the value of 'K40' (i.e., $\sigma_{^{40}K_a}$).
K41	$\Longrightarrow$	The same as $^{41}K_a$ in the K Isotopic Abundance Values section.
K41U	$\Longrightarrow$	The uncertainty in the value of 'K41' (i.e., $\sigma_{^{41}K_a}$).
nKiaModified	$\Longrightarrow$	Indicates whether the values and/or uncertainties for $^{39}K_a$, $^{40}K_a$, and/or $^{41}K_a$ were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.
nKiaUwarning	$\Longrightarrow$	Indicates that relative uncertainties were assumed for the 'new' K isotopic abundance values ('true'), or that uncertainties were available in the the *ArAR* library (warning was off, or 'false'). See the *ArAR* Manual for additional details.

Change Log Entries for 'Old' Monitor Mineral Ages:

oMonUseLib	$\Longrightarrow$	Indicates that the 'old' monitor mineral age and uncertainty were sourced from the *ArAR* library ('true'), or that they were taken from the active dataset (oMonUseLib = 'false').
oMonUseExternal	$\Longrightarrow$	Indicates whether the external ('true') or internal ('false') uncertainty was used for the 'old' monitor mineral age (if data were sourced from the *ArAR* library).

Change Log Entries for 'Old' Monitor Mineral Ages (cont'd):

oMonMineral	$\implies$	The name of the 'old' monitor mineral selected from the *ArAR* library, 'Custom' if no mineral was selected from the *ArAR* library, or 'Custom from Dataset' if monitor age data were sourced from the active dataset.
oMonRef	$\implies$	The reference selected from the *ArAR* library for 'old' monitor mineral age data, 'Custom' if no reference was selected from the *ArAR* library, or 'Custom from Dataset' if monitor age data were sourced from the active dataset.
Mo	$\implies$	The same as t_{m_o} in the Symbols for 'Old' and 'New' Monitor Mineral Ages section.
MoU	$\implies$	The uncertainty in the value of 'Mo' (i.e., $\sigma_{t_{m_o}}$).
oMonModified	$\implies$	Indicates whether the values and/or uncertainties for t_{m_o} were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.
oMonUwarning	$\implies$	Indicates that a relative uncertainty was assumed for the 'old' monitor mineral age ('true'), or that an uncertainty was available in the the *ArAR* library (warning was off, or 'false'). See the *ArAR* Manual for additional details.

Change Log Entries for 'New' Monitor Mineral Ages:

nMonUseLib	$\implies$	Indicates that the 'new' monitor mineral age and uncertainty were sourced from the *ArAR* library ('true'), or that they were taken from the active dataset (nMonUseLib = 'false').
nMonUseExternal	$\implies$	Indicates whether the external ('true') or internal ('false') uncertainty was used for the 'new' monitor mineral age (if data were sourced from the *ArAR* library).
nMonMineral	$\implies$	The name of the 'new' monitor mineral selected from the *ArAR* library, 'Custom' if no mineral was selected from the *ArAR* library, or 'Custom from Dataset' if monitor age data were sourced from the active dataset.
nMonRef	$\implies$	The reference selected from the *ArAR* library for 'new' monitor mineral age data, 'Custom' if no reference was selected from the *ArAR* library, or 'Custom from Dataset' if monitor age data were sourced from the active dataset.

Change Log Entries for 'New' Monitor Mineral Ages (cont'd):

M	$\implies$	The same as t_m in the Symbols for 'Old' and 'New' Monitor Mineral Ages section.
MU	$\implies$	The uncertainty in the value of 'M' (i.e., σ_{t_m}).
nMonModified	$\implies$	Indicates whether the values and/or uncertainties for t_{m_o} were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.
nMonUwarning	$\implies$	Indicates that a relative uncertainty was assumed for the 'new' monitor mineral age ('true'), or that an uncertainty was available in the the *ArAR* library (warning was off, or 'false'). See the *ArAR* Manual for additional details.

Change Log Entries for Calculation Options:

propExtUncerts	$\implies$	Indicates whether or not ('true'/'false') external sources of uncertainty were propagated into the uncertainty of the recalculated K-Ar or ^{40}Ar/^{39}Ar date.
propKdcUncerts	$\implies$	Indicates whether or not ('true'/'false') external uncertainties from the K decay constants were propagated into the uncertainty of the recalculated K-Ar or ^{40}Ar/^{39}Ar date.
propKiaUncerts	$\implies$	Indicates whether or not ('true'/'false') external uncertainties from the K isotopic abundance values were propagated into the uncertainty of the recalculated K-Ar date.
propMonUncerts	$\implies$	Indicates whether or not ('true'/'false') external uncertainties from the monitor mineral ages were propagated into the uncertainty of the recalculated ^{40}Ar/^{39}Ar date.
MCEprop	$\implies$	Indicates that uncertainties were propagated using a Monte Carlo approach ('true'), or that uncertainties were propagated analytically (MCEprop = 'false').
MCsynthPopSize	$\implies$	The size of synthetic populations generated for Monte Carlo propagation of uncertainties.

5.3   *Quantities Used in the* ArAR *Multiple Intercalibration Log*

When an ^{40}Ar/^{39}Ar date for an unknown or standard is intercalibrated relative to a primary standard and one or more secondary standards using the *ArAR* Multiple Intercalibration Tool, all

values used during the intercalibration are tracked. The intercalibration summary and full log use alternate plain-text symbols for all quantities as defined below. See the Calculations documentation for details on how intercalibration calculations are performed, and see the Manual for details on exporting the intercalibration logs.

Items in Both the Summary and Full Intercalibration Logs:

σ = SD $\implies$ The standard deviation, i.e., one sigma uncertainty, associated with a quantity. In the exported summary log, all results are expressed with 1σ (1 SD) uncertainties. In the full log, results are shown with 1σ (1 SD) and 2σ (2 SD) uncertainties, and input values are shown with 1σ (1 SD) uncertainties.

$R_i{}^{i+1}$ = R_i,i+1 $\implies$ An intercalibration factor given by $R_i^{i+1} \equiv F_{i+1}/F_i$, where $F_i = (^{40}Ar^*/^{39}Ar_K)_i = (e^{\lambda t_i} - 1)$. In the exported summary log, $R_i{}^{i+1}$ appears with no superscripts or subscripts, e.g., $R_0{}^1$ appears as R01. If a supplemental intercalibration is performed with the mean F value of secondary/unknown samples, the intercalibration factor $R_{primary}^{sample}$ appears as RPS. In the exported full log, an intercalibration factor like $R_0{}^1$ appears as R_0,1. $R_{primary}^{sample}$ appears as R_P,S.

$\prod$R = BigPiR $\implies$ The product of all intercalibration factors, i.e., $\prod R \equiv \prod_{i=0}^{n-1} R_i^{i+1}$, where n is the total number of 'primary' and 'secondary' standards used to intercalibrate the unknown sample.

MSWD $\implies$ The mean squared weighted deviation, a goodness-of-fit statistic that is commonly known as the reduced chi-squared statistic.

Items Only in the Full Intercalibration Log:

Lar $\implies$ The same as $\lambda_{^{40}Ar}$ in the ^{40}K Decay Constants section.

Lb $\implies$ The same as λ_β in the ^{40}K Decay Constants section.

L $\implies$ The same as λ in the ^{40}K Decay Constants section.

KdcModified $\implies$ Indicates whether the values and/or uncertainties for $\lambda_{^{40}Ar}$, λ_β, and/or λ were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.

KdcUwarning $\implies$ Indicates that relative uncertainties were assumed for the K decay contants ('true'), or that uncertainties were available in the the *ArAR* library (warning was off, or 'false'). See the *ArAR* Manual for additional details.

Items Only in the Full Intercalibration Log (cont'd):

KdcUseCalced　$\implies$　Indicates whether the total decay constant, λ, was calculated automatically from the partial decay constants ('true'), or that the user entered a value manually ('false).

KdcRef　$\implies$　The reference selected from the *ArAR* library for K decay constants. See the *ArAR* Manual for additional details.

ptModified　$\implies$　Indicates whether the values and/or uncertainties for the age of the 'primary' standard, t_0, were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.

ptSource　$\implies$　The reference selected from the *ArAR* library for the age of the 'primary' standard, or a message describing how t_0 was calculated or specified by the user.

pKappaModified　$\implies$　Indicates whether the values and/or uncertainties for the κ value of the 'primary' standard were edited manually by the user. If 'true,' the values used during calculations may not reflect those stored in the *ArAR* library for the selected reference.

pKappaSource　$\implies$　The reference selected from the *ArAR* library for the κ value of the 'primary' standard, or a message describing how κ was calculated or specified by the user.

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