Hodell, D.A., Abrantes, F., Alvarez Zarikian, C.A., and the Expedition 397 Scientists
Proceedings of the International Ocean Discovery Program Volume 397
publications.iodp.org

Data report: implications of using the CSF-B depth scale type for stratigraphic correlation at IODP Expedition 397 Site U1588[1]

Peter Blum,[2] Huai-Hsuan M. Huang,[2] Timothy Herbert,[2] David A. Hodell,[2] Fatima Abrantes,[2] and Carlos A. Alvarez Zarikian[2]

[1] Blum, P., Huang, H.-H.M., Herbert, T., Hodell, D.A., Abrantes, F., and Alvarez Zarikian, C.A., 2025. Data report: implications of using the CSF-B depth scale type for stratigraphic correlation at IODP Expedition 397 Site U1588. In Hodell, D.A., Abrantes, F., Alvarez Zarikian, C.A., and the Expedition 397 Scientists, Iberian Margin Paleoclimate. Proceedings of the International Ocean Discovery Program, 397: College Station, TX (International Ocean Discovery Program). https://doi.org/10.14379/iodp.proc.397.201.2025
[2] **Expedition 397 Scientists' affiliations**. Correspondence author: **blum@iodp.tamu.edu**

Contents

Keywords
International Ocean Discovery Program, IODP, *JOIDES Resolution*, Expedition 397, Iberian Margin Paleoclimate, Site U1588, depth scales, composite depths, stratigraphic correlation

Supplementary material

References (RIS)

MS 397-201
Received 1 October 2024
Accepted 27 February 2025
Published 25 April 2025

Abstract

Shipboard scientists on International Ocean Discovery Program (IODP) Expedition 397 encountered extremely high and variable core expansions due to gas expansion at Site U1588. To address the resulting recovery and curation issues, half cores were drilled in some of the holes so the core material could expand within the liner without loss of material. This created challenges in stratigraphic correlation of cores from adjacent holes using the conventional method whereby proxy data at the standard CSF-A depth scale type are shifted to construct the CCSF composite depth scale, which is then used to assemble a splice that represents the complete stratigraphic section. To mitigate these challenges, the science team decided to use the unconventional Method B approach of shifting cores at the CSF-B depth scale where cores longer than the cored intervals they originate from are virtually compressed and so constructed a CCSF-B composite scale for splicing. This shipboard Method B was applied for the first time in IODP history, and existing database routines and reports do not handle it correctly. Computations of CCSF-B depths for samples, and sample identities for CCSF-B data points and splice intervals, must therefore be carried out separately and correctly to avoid significant sample positioning and depth errors. This report reviews the standard methods followed by the Method B depth scale conversions and provides Excel workbooks with example data and computations to convert sample identities to CCSF and CCSF-B depths, and vice versa.

1. Introduction

Cores from Expedition 397 Site U1588 experienced extreme gas expansion upon recovery (**Abrantes et al.**, 2024). To avoid loss of core material, half cores were taken using half-advance XCB drilling so they could expand into the empty core liner, resulting in the core length exceeding the interval they were drilled from, with calculated recoveries far greater than 100% (**Abrantes et al.**, 2024). The standard International Ocean Discovery Program (IODP) curatorial protocol assigns the driller's top depth of the cored interval to the top of the curated core, then assigns a top depth to each section subsequently cut based on the length of the section, and finally computes a depth for each sample or measurement based on the offset from the top of its section. In soft-sediment coring, this depth scale type, known as core depth below seafloor, method A (CSF-A) (see IODP Depth Scales Terminology v.2 at **https://www.iodp.org/policies-and-guidelines/142-iodp-depth-scales-terminology-april-2011/file**), typically creates an overlap in nominal depths for samples and measurements taken in the lower part of a core with those in the upper part of the subsequent core. The relationship between the curatorial identity of a sample or measurement (site, hole, core, section, and offset in section) and its assigned depths makes no more sense in stratigraphic analyses. These stratigraphic overlaps were much more severe at Site U1588 and even resulted in loss of material at the bottom of cores.

In the case of multiple holes cored at a site, the overlap is typically resolved with a standard stratigraphic correlation procedure whereby cores at their hole-specific CSF-A scales are depth shifted to align correlative features identified in the data, resulting in the core composite depth below seafloor (CCSF) scale for a site (IODP Depth Scales Terminology v.2). Given the extent of the core expansion at Site U1588, this method was insufficiently helpful, prompting a modified procedure for the stratigraphic correlation. This Method B was based on shifting cores at the core depth below seafloor, Method B (CSF-B) scale. CSF-B was formally defined as a way to remove core overlap by virtually compressing cores with >100% recovery to fit into the cored interval (IODP Depth Scales Terminology v.2), a rudimentary way of plotting data without overlaps even in single-hole scenarios. The resulting depth scale type was referred to as CCSF-B (**Abrantes et al.**, 2024).

Using the CCSF-B scale has implications that investigators should be aware of. IODP databases were not configured to handle either CCSF Method B in their depth transformations from sample or measurement identity to depth or CCSF-B depths back to sample identities for the purpose of sampling (Figure **F1**). This report provides the computational basis as well as spreadsheet implementations (Excel workbooks; see CASEWKBK in **Supplementary material**) that perform all necessary transforms. The standard methods are summarized first for reference and because they can be applied to data from other IODP sites. The Excel workbooks allow investigators to copy-paste their own input data, including sample lists or depth series, matching section and core summary tables, as well as core shift tabulations (affine tables) and splice tables, which are frequently updated months or years after the expedition that recovered the cores.

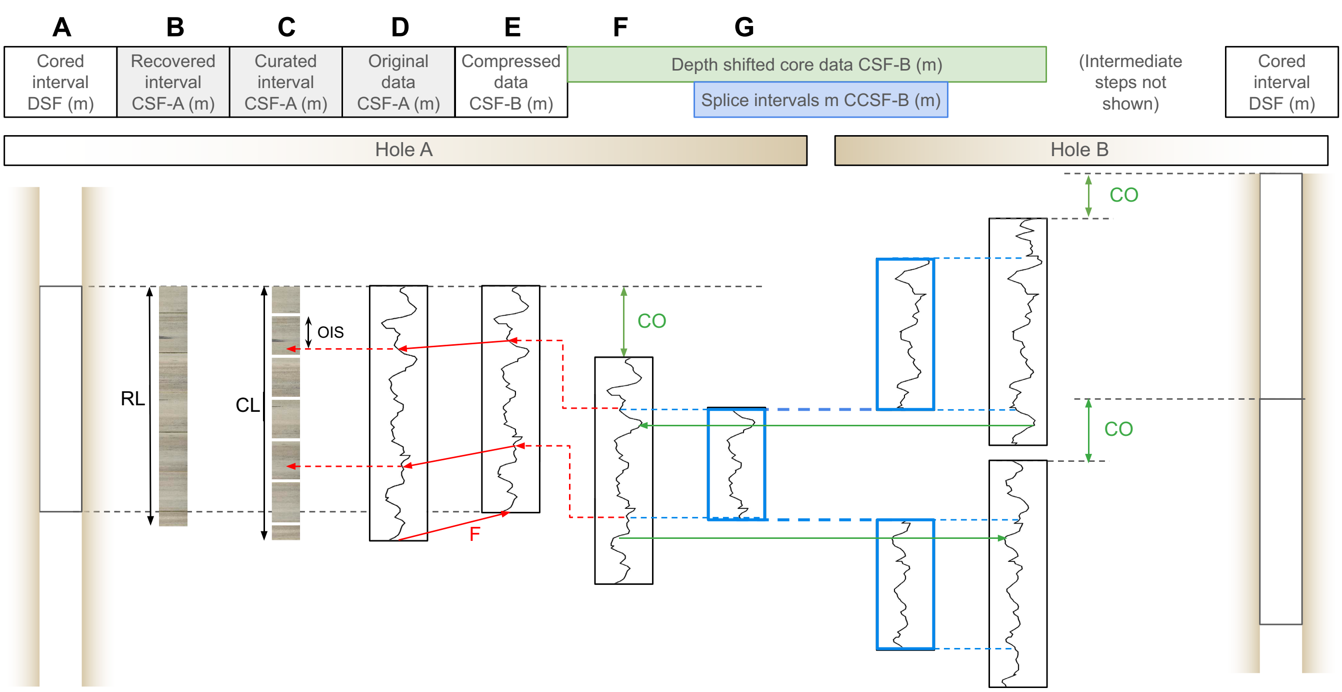

Figure F1. Schematic of steps in depth assignments to an IODP drill core and its samples and measurements in the case of Site U1588, where depth shifting and splicing was done at the core composite depth below seafloor, Method B (CCSF-B), depth scale. A. Cored interval or advancement at the driller's depth below seafloor (DSF) scale. B. Recovered core length (RL), typically expanded in soft sediments. C. Curated core length (CL) after curation, which typically deviates slightly from the RL. D. Core depth below seafloor, Method A (CSF-A), scale assigned to core samples and measurements based on section lengths and the offset in section (OIS). E. Virtually compressed core depth below seafloor, Method B (CSF-B), scale assigned to measurements using the core-specific factor F. F. Correlated core at the core composite depth below seafloor, Method B (CCSF-B), scale defined by the cumulative offset (CO). G. Splice interval selected from the core. To derive the sample identities from the CCSF-B depths, both reverse steps F to E (green arrows) and E to D (red arrows) must be applied before the correct CSF-A depths and OIS can be found.

2. Methods

2.1. Standard depth computations

2.1.1. Compute CSF-A

The CSF-A scale is a standard used for decades in scientific ocean drilling. The depth of a sample or measurement is based on the top of the cored interval provided by the driller at the driller's depth below seafloor (DSF) scale (IODP Depth Scales Terminology v.2). The sum of all curated section lengths shallower than that of the sample or measurement, plus the offset (cm) of the sample or measurement from the top depth of their section, are added:

$$x_{coretop\_}\text{CSF-A} = x_{top\_drilled\_interval\_}\text{DSF}, \quad (1)$$

$$x_{section\_top\_}\text{CSF-A} = x_{coretop\_}\text{CSF-A} + \Sigma_{lengths\_of\_shallower\_sections\_}\text{CSF-A, and} \quad (2)$$

$$x_{SM\_}\text{CSF-A} = x_{section\_top\_}\text{CSF-A} + \text{offset\_in\_section}, \quad (3)$$

where x stands for depth below seafloor and SM stands for sample or measurement.

2.1.2. Compute CSF-B

To eliminate the overlaps of samples and measurements in cores with recovery >100%, the CSF-B depth is computed routinely for any sample or measurement reported from the LIMS database system. Core overlaps at the CSF-A scale are common in soft sediments because of elastic expansion and formation of gas voids upon recovery. At the CSF-B scale type, cores that have >100% recovery are scaled to fit into the cored interval (the driller's advancement at the DSF scale) by the core-specific compression factor F:

$$F = \text{advancement}_{core}/\text{curated\_length}_{core}. \quad (4)$$

Then, for each sample or measurement in a given core,

$$x_{SM\_}\text{CSF-B} = x_{SM\_}\text{CSF-A} \times F_{core}. \quad (5)$$

If samples are taken and registered in a data system other than LIMS, investigators may need to compute the CSF-B depths for their samples or measurements.

2.1.3. Compute CCSF

The CCSF depth scale is constructed to integrate cores and their data from multiple holes at a site. Selected stratigraphic proxy data (e.g., magnetic susceptibility, sediment color reflectance, and natural gamma radiation) are used to shift cores and align features without virtually stretching or squeezing the core records (affine transform). This affine constraint is important to keep the initial correlation process simple and to make the resulting CCSF depths easy to convert back to the CSF-A depths and the sample identities needed to sample the cores. The shipboard procedure on the research vessel (R/V) *JOIDES Resolution* began with the export of the proxy data as well as the curated section summary information from the LIMS database, at the CSF-A scale type, using the Correlation Downloader custom application. These files were imported to the Correlator application, where cores were depth-shifted by aligning one stratigraphic feature in the proxy data present in any two cores from two different holes. The CCSF depth scale is defined by the difference, or cumulative offset (m), between the CCSF and CSF-A depths for each core top. For any sample or measurement,

$$x_{SM\_}\text{CCSF} = x_{SM\_}\text{CSF-A} + \text{cumulative\_offset}_{core}. \quad (6)$$

The cumulative offsets are reported in a listing of all cores at a site, known as the affine table. On *JOIDES Resolution*, affine tables are exported from the Correlator application and uploaded to the LIMS database. Users downloading any data from the LIMS database can select a valid CCSF depth scale in the online interface, and the report will include the CCSF depths instead of the CSF-B depths. If samples are taken and registered in a data system other than LIMS, users need to compute the CCSF depths for their samples or measurements per Equation **E6**.

Three spreadsheet implementations are described in **Results** for the three types of sample reports currently in circulation: one for the LIMS sample registry used on *JOIDES Resolution* and at the Gulf Coast Repository (GCR), and two used for samples registered at and reported from the Bremen Core Repository (BCR). Corresponding Excel workbooks are provided in CASEWKBK in **Supplementary material**.

2.1.4. Create a splice

The goal of stratigraphic correlation is to create a splice of intervals in cores from multiple holes at the common CCSF depth scale for a continuous, most complete stratigraphic representation at a drill site. If available, the splice is sampled for most stratigraphic investigations. The Correlator application is the standard tool on *JOIDES Resolution* to assemble a splice and creates a splice interval table where each row defines the top and the bottom of a splice interval with its sample identity (site, hole, core, section, and offset in section), CSF-A depth, and CCSF depth. Investigators can export the splice table and spliced data sets from the Correlator application. The splice interval table can also be uploaded to LIMS, from which any data can be downloaded as a representation of a valid splice.

The sample identity and depth computations presented in this report do not address fundamental splicing issues. Splicing is typically accomplished after all cores have been shifted to the common CCSF scale. Use of a splice table that is compatible with the affine it is based on is critical because mixing different versions of splice and affine tables will give undesirable results. If core shifts are adjusted after the splice has been created, the affected splice interval boundaries must be adjusted to ensure complete stratigraphic coverage and prevent gaps (the Correlator applications provides helpful features). Splice interval boundaries must have the same cumulative offset (CCSF depth-CSF-A depth) as their core top registered in the affine table, which is a simple validity test for a standard splice at an affine-based CCSF scale.

2.1.5. Compute sample identity from CCSF depths

Investigators may want to select data points at the CCSF scale, within or outside the splice, and get the sample identities so they can take the corresponding samples at the core repository for detailed analysis. This is essentially the reverse process of computing CCSF depths for samples and measurements and can be accomplished in various ways. Given that the site, hole and CCSF depths of the data points are known, we first need to find the cores corresponding to the data points based on two conditions:

$$\text{SiteHole}_{\text{data\_point}} \text{ matches SiteHole}_{\text{affine\_table}}\text{, and} \tag{7}$$

$$\text{x\_core\_top}_{\text{affine\_table}}\text{\_CCSF is an exact match or next value} > \text{x}_{\text{data\_point}}\text{\_CCSF.} \tag{8}$$

With the core ID found through a stepwise function combining filtering and lookup, we can use it to look up the core-specific cumulative offset for each data point and compute the CSF-A as

$$\text{x}_{\text{data\_point}}\text{\_CSF-A} = \text{x}_{\text{data\_point}}\text{\_CCSF} - \text{cumulative\_offset}_{\text{core}}. \tag{9}$$

Next, we find the sections corresponding to the data points, based on two conditions:

$$\text{Core}_{\text{data\_point}} \text{ matches Core}_{\text{section\_summary}}\text{, and} \tag{10}$$

$$\text{x}_{\text{data\_point}}\text{\_CSF-A is an exact match or the next value} > \text{x\_sec\_top}_{\text{section\_summary}}\text{\_CSF-A.} \tag{11}$$

With the section ID found through a stepwise function combining filtering and lookup, we can use it to look up the section top depth and calculate the offset in section for each data point:

$$\text{offset\_in\_section}_{\text{data\_point}}\text{\_CSF-A} = \text{x}_{\text{data\_point}}\text{\_CSF-A} - \text{x\_sec\_top}_{\text{section\_summary}}. \tag{12}$$

The spreadsheet implementation is described in **Results**, and the corresponding Excel workbook is provided in CASEWKBK in **Supplementary material**.

2.2. Depth computation when correlating at CSF-B (Site U1588)

2.2.1. Rationale for correlating at the CSF-B scale

Correlations between holes at Site U1588 were based on the CSF-B scale (**Abrantes et al.**, 2024). The site chapter refers to this approach as Method B and the resulting depth scale as CCSF-B. We are adopting this terminology here but caution that the term CCSF-B has been used with different meanings for past IODP expeditions. The drilling and correlation strategies were unique at this site because of severe core expansion due to high methane contents, resulting in apparent recoveries of up to 192%. APC, full-advance XCB, and half-advance XCB coring was used, resulting in different degrees of core expansion at each hole. This presented a challenge for the creation of a composite section. Instead of shifting cores at the CSF-A depth scale, cores were correlated at the CSF-B depth scale where nominal recoveries are 100% or less. Given the high-quality XCB cores and the high sedimentation rates at this site, a nearly complete composite section at the CCSF-B scale was constructed. The issue arising with Method B is that the conversions between sample and measurement identities, the standard CSF-A scale, and the constructed CCSF-B scale need careful consideration.

The LIMS infrastructure, with its rigorous depth utilities, was not designed to handle affine and splice tables that were constructed based on the CSF-B scale. Likewise, the Correlator application and its routines to compute sample identities assume that the data imported for correlation were at the CSF-A scale. The correlation process is not affected by this, but the affine and splice tables output by Correlator are expected to be at the CSF-A scale, and are labeled as such, but for Site U1588 the data are not. When sampling cores in the repository based on these resources, errors greater than 1 m are possible.

2.2.2. Computation of factor FF versus F

It is noted here for completeness that Expedition 397 scientists computed the compression factor slightly differently from the standard factor F computation implemented in the LIMS database (Equation **E4**). We refer to that approximated factor as FF and the resulting depth scale type as CSF-BB. FF uses the reported recovery rate in percent, rounded to the whole number. For cores with a recovery rate >100%,

$$FF = 100/\text{recovery\_rate}_{core}. \tag{13}$$

Then, for each sample or measurement in each core,

$$X_{SM}\_\text{CSF-BB} = x_{SM}\_\text{CSF-A} \times FF_{core}. \tag{14}$$

Computations for Site U1588 should be made using FF (and corresponding CSF-BB and CCSF-BB) to avoid the introduction of small errors. For simplicity, the formulas in this method section are only presented for F, CSF-B, and CCSF-B. In the spreadsheet implementations described in **Results**, and in the Excel workbooks provided in CASEWKBK in **Supplementary material**, computations are given for both F and FF, and the resulting very small differences are also reported.

2.2.3. Compute CCSF-B from CSF-A

CCSF-B is not automatically reported from any database or in any sample report. In fact, the CCSF depths reported from LIMS for Site U1588, if specified by the investigator, are inaccurate because LIMS assumes the CCSF scale is based on the CSF-A scale. To compute CCSF-B for any sample or measurement, we first calculate CSF-A from the sample identity (Equations **E1**, **E2**, **E3**). Then we calculate F (Equation **E4**) or FF (Equation **E13**) and apply it to the CSF-A depths to obtain CSF-B (Equation **E5**) or CSF-BB (Equation **E14**). In the case of data obtained from LIMS, CSF-B is readily reported in the second depth column by default. Now we can use the cumulative offsets from the affine table based on the Method B correlation to obtain CCSF-B or CCSF-BB, respectively:

$$x_{SM}\_\text{CCSF-B} = x_{SM}\_\text{CSF-B} + \text{cumulative\_offset}_{core}\_\text{CSF-B, and} \tag{15}$$

$$x_{SM}\_\text{CCSF-BB} = x_{SM}\_\text{CSF-BB} + \text{cumulative\_offset}_{core}\_\text{CSF-BB}. \tag{16}$$

Spreadsheet implementations are described in **Results** and Excel workbooks are provided in CASEWKBK in **Supplementary material** for each of the three sample reports currently in circulation: one from LIMS for samples registered on *JOIDES Resolution* and at the GCR and two for samples registered at the BCR.

2.2.4. Compute sample identities from CCSF-B

Backing out sample identities from a data set that has only CCSF-B (or CCSF-BB) depths requires the most computational steps (Figure **F1**): subtract the cumulative offset at CSF-B (CSF-BB) from the CCSF-B (CCSF-BB) depths to get the CSF-B (CSF-BB) depths, decompress the CSF-B (CSF-BB) depths using F (FF) to obtain the CSF-A depths, and finally find the offset in section for the samples or measurements. Given that the site, hole and CCSF-B (CCSF-BB) depths of the data points are known, we first need to find the cores corresponding to the data points. We find the core ID for the samples or measurements based on two conditions:

$$\text{SiteHole}_{\text{data\_point}} \text{ matches SiteHole}_{\text{core\_summary}}\text{, and} \quad (17)$$

$$x_{\text{data\_point}}\text{\_CCSF-B is an exact match, or next value} > \text{x\_core\_top}_{\text{affine\_table}}\text{\_CCSF-B.} \quad (18)$$

With the core ID found using a stepwise function combining filtering and lookup, we can look up the core-specific cumulative offset in the affine table for each data point and compute CSF-B (CSF-BB) as

$$x_{\text{data\_point}}\text{\_CSF-B} = x_{\text{data\_point}}\text{\_CCSF-B} - \text{cumulative\_offset}_{\text{core}}\text{, and} \quad (19)$$

$$x_{\text{data\_point}}\text{\_CSF-BB} = x_{\text{data\_point}}\text{\_CCSF-BB} - \text{cumulative\_offset}_{\text{core}}. \quad (20)$$

The core ID is also used to look up each core's advance and curated length to compute F using Equation **E4** and the recovery rate to compute FF using Equation **E13**. To decompress the cores, we also look up the depth of the core top and compute the depth of the data point in the core, D, so we can apply the core-specific factor F (FF):

$$D_{\text{SM}}\text{\_CSF-B} = x_{\text{SM}}\text{\_CSF-B} - x_{\text{core\_top}}\text{\_CSF-A, and} \quad (21)$$

$$D_{\text{SM}}\text{\_CSF-BB} = x_{\text{SM}}\text{\_CSF-BB} - x_{\text{core\_top}}\text{\_CSF-A.} \quad (22)$$

Note that the depth of the core top is the same at the CSF-A and CSF-B scales. Next, we apply the core-specific factor F (FF) to each sample or measurement depth:

$$x_{\text{SM}}\text{\_CSF-A} = x_{\text{core\_top}}\text{\_CSF-A} + D_{\text{SM}}\text{\_CSF-B/F, and} \quad (23)$$

$$x_{\text{SM}}\text{\_CSF-A} = x_{\text{core\_top}}\text{\_CSF-A} + D_{\text{SM}}\text{\_CSF-BB/FF.} \quad (24)$$

From here on, finding the sample identities follows Equation **E10**, **E11**, and **E12**.

Two spreadsheet implementations are described in **Results**: one for the general case of a Site-Hole-CCSF-BB depth series specifically for Site U1588, and one for the Site U1588 splice table based on correlating at the CSF-BB scale type. Corresponding Excel workbooks are provided in CASEWKBK in **Supplementary material**. It is emphasized again here that the splice intervals reported by the Correlator application and the LIMS database are incorrect because those programs are agnostic of the depth scale type of the data imported for correlation. The splice interval top (SIT) and splice interval bottom (SIB) depths are at the CCSF-BB and CSF-BB scales, even if the column headers don't say so, and the corresponding sample IDs are not directly applicable to sampling the physical cores. Without applying the core decompression, an error of magnitude F (or FF) times position in the core is introduced. For a typical F~1.1 and a position of 5 m in the core, the error would be ~0.5 m.

3. Results

3.1. Spreadsheet implementations

The computations in the methods section are implemented in 10 Excel workbooks provided in CASEWKBK in **Supplementary material**. Each workbook has two to four input data sheets (blue tabs), one to three sheets with the necessary computations, and one sheet with the output data (red tab). The input data sheets are prepopulated with real data for Sites U1385 (standard method) and U1588 (Method B). Investigators can replace the input data on the first sheet with their own data for a site. The relevant column information must match that of the example data for the computations to work correctly. Other input data (section summary, core summary, and affine table) must be provided in the LIMS format given in the examples and must be for the same site as the sample or measurement data. All the spreadsheet formulas use the latest dynamic array functions, which means that the user of the Excel workbooks does not need to copy down any formulas.

3.2. Standard depth computations

The cases presented here focus on (1) the computation of CSF-A and CCSF depths based on the sample identities (site, hole, core, section, and offset in section) and (2) the reverse, to compute the sample identities for data points at the standard CCSF scale.

Samples and data registered on *JOIDES Resolution* and downloaded from the LIMS database (using the LORE portal: **https://web.iodp.tamu.edu/LORE/**) automatically provide the standard CSF-A depths and the alternate CSF-B depths. Furthermore, if the user selects a site-compatible CCSF scale from the LORE interface, the CSF-B depths are replaced with the CCSF depths. However, the sample reports for samples registered at the BCR only provide CSF-A depths (with occasionally reported errors), which are repeated in the column labeled MCD_TOP. Furthermore, the BCR sample report changed in the summer of 2024 to a format that omits the standard IODP sample identity nomenclature parsed into separate columns. We are therefore including three subcases: (1a) the LIMS sample report, for context; (1b) the old BCR sample report; and (1c) the new BCR sample report. The Excel workbooks are populated with example sample reports from Site U1385.

3.2.1. Case 1a: CCSF for LIMS sample reports

This IODP sample report is the most easily accessible, using the LORE portal, and it is also the report with the most extensive metadata. The Excel workbook computes the CSF-A and CCSF depths the same way the LIMS database does. The first nine columns have the standard sample interval identity that all scientific drill cores should have: Exp, Site, Hole, Core, Type, Sect, A/W, Top offset in section (cm), Bottom offset in section (cm). In addition, due the LIMS recursive hierarchical sample concept, which ensures that the sample parentage is always recorded, the report also has Top offset in parent (cm) and Bottom offset in parent (cm). The latter two parameters have caused confusion in the past and therefore are labeled and mentioned here explicitly. The worksheets in the Case 1a workbook are listed in Figure **F2**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

3.2.2. Case 1b: CCSF for old BCR sample reports

Following the 2023 coordinated sampling meeting at the BCR, investigators were provided with sample reports like the example included in the first input sheet, here referred to as the old BCR report. Its irregular characteristics are

Sheet	Type	Sheet name
1	Input 1	Your LIMS sample list
2	Input 2	Your LIMS section summary
3	Input 3	Your affine table
4	Computations	
5	Output	

Figure F2. Workbook sheets for Case 1a.

- Parameters: only the top offsets and depths are given for a sample.
- Site ID: no "U" is given in front of the site number (for *JOIDES Resolution* recovered cores). The spreadsheet routines add it as needed.
- Section numbering: instead of using CC for the core catcher sample, the core catchers are successively numbered with the other sections and the presence of a core catcher is indicated in a separate column (Yes or No). This spreadsheet routine converts the numbers back to CC.
- Alternate depths: no alternate depths are provided. A column MCD_TOP (for CCSF depths) exists; however, the depths are copies of the MBSF_TOP (for CSF-A depths).

The worksheets in the Case 1b workbook are listed in Figure **F3**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

3.2.3. Case 1c: CCSF for new BCR sample reports

During the summer of 2024, a new sample report online interface became available, associated with the mDIS database (**https://mdis2.marum.de/#/**). Its format differs greatly from established IODP sample reports such as the LIMS report and the old BCR report:

- Parameters: the parameters are organized very differently compared to more traditional sample lists, like the ones in Cases 1a and 1b. The spreadsheet implementation and Excel workbook presented reformat the sample list to resemble the LIMS report before doing the depth computations.
- Sample identity: the sample identity parameters are not reported separately, but only as a concatenated string that is formatted differently from past IODP usage. This spreadsheet implementation parses the concatenated string into the more accessible parameters to create the keys for the lookup functions required in the depth computations.
- Section numbering: instead of using CC for the core catcher, the core catchers are still successively numbered with the other sections. The difference with the old BCR report is that the core catchers are not identified at all. This is a problem because core catchers have special meanings, and not all cores have core catcher samples. For the purpose of linking information in this workbook, and since we cannot tell which sections are core catchers, the CC in the LIMS section summary are converted to numbers. This is a workaround and not ideal.

This workbook required the same worksheets as those for Case 1a and 1b, with the addition of two worksheets to reformat this new type of sample report (Your mDIS sample list) into one resembling the LIMS report (Your reformatted sample list). The worksheets for Case 1c are listed in Figure **F4**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

Sheet	Type	Sheet name
1	Input 1	Your old BCR sample list
2	Input 2	Your LIMS section summary
3	Input 3	Your affine table
4	Computations	
5	Output	Your samples with CSF-A, CCSF

Figure F3. Workbook sheets for Case 1b.

Sheet	Type	Sheet name
1	Input 1	Your mDIS sample list
2	Input 2	Your LIMS section summary
3	Input 3	Your affine table
4	Computations	Reformatting
5	Computations	Your reformatted sample list
6	Computations	
7	Output	Your samples with CCSF depths

Figure F4. Workbook sheets for Case 1c.

3.2.4. Case 2: Sample IDs for CCSF depths

This spreadsheet implementation applies to the situation where an investigator selects data points from correlated proxy data at the CCSF depth scale and wants to find the exact position in the physical core section (i.e., the sample identity). The worksheets for Case 2 are listed in Figure **F5**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

3.3. Method B depth computations

3.3.1. Case 3a: CCSF-BB for LIMS sample reports

This spreadsheet implementation computes CSF-A, CSF-B, CSF-BB, CCSF-B, and CCSF-BB depths for sample reports downloaded from the LORE portal. Computations are based on the standard sample interval identity. Compared with Case 1a for computing CCSF, the core summary is required as an additional input to compute the factor F (FF). The worksheets in Case 3a are listed in Figure **F6**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

3.3.2. Case 3b: CCSF-BB for old BCR sample reports

Case 3b applies to the BCR sample report available until early 2024. Computations are based on the standard sample identity for the top of the interval. Compared with Case 1b for computing CCSF, the core summary table is required as an additional input to compute the factor F (FF). The worksheets in the Case 3b workbook are listed in Figure **F7**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

Sheet	Type	Sheet name
1	Input 1	Your CCSF depth series
2	Input 2	Your affine table
3	Input 3	Your LIMS section summary
4	Computations	
5	Output	Your sample IDs with CCSF depths

Figure F5. Workbook sheets for Case 2.

Sheet	Type	Sheet name
1	Input 1	Your LIMS sample list
2	Input 2	Your LIMS section summary
3	Input 3	Your LIMS core summary
4	Input 4	Your affine table
5	Computations	
6	Output	Your LIMS samples with CCSF-BB

Figure F6. Workbook sheets for Case 3a.

Sheet	Type	Sheet name
1	Input 1	Your old BCR sample list
2	Input 2	Your LIMS section summary
3	Input 3	Your LIMS core summary
4	Input 4	Your affine table
5	Computations	
6	Output	Your old BCR samples with CCSF-BB

Figure F7. Workbook sheets for Case 3b.

3.3.3. Case 3c: CCSF-BB for new BCR sample reports

Case 3c applies to the new BCR or mDIS sample report. Computations are based on the standard sample identity for the sample interval. As with Cases 3a and 3b, the core summary table is required as an input to compute the factor F (FF).

As in Case 1c, where more information about this new mDIS type of report is given, two additional worksheets are used to reformat the report into one resembling the LIMS report. The worksheets for Case 3c are listed in Figure **F8**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

3.3.4. Case 4: CCSF-BB for LIMS data

Shipboard data from Site U1588 downloaded from the LIMS database are not able to return CCSF-B (CCSF-BB) depths, whether downloaded by selecting a depth scale or by selecting the splice. The LIMS database is not designed to deal with this unique CCSF-BB depth scale type. Therefore, this spreadsheet implementation is provided specifically to add CCSF-B (CCSF-BB) depths to Site U1588 data downloaded from the LIMS database. The NGR example data can be replaced by other data sets if the sample identities are provided correctly in the first seven columns of the first input sheet. The worksheets for Case 4 are listed in Figure **F9**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

3.3.5. Case 5a: Sample IDs from CCSF-BB depths

This spreadsheet implementation applies to the situation where an investigator selects data points from correlated proxy data for a specific hole at the CCSF-BB depth scale and wants to find the exact position in the physical core section (i.e., the sample identity). The worksheets for Case 5a are listed in Figure **F10**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

3.3.6. Case 5b: Sample IDs for CCSF-BB splice intervals

Very similar to Case 5a, this spreadsheet implementation applies to the situation where an investigator (or in this example, the Correlator application) selects data points from correlated proxy data at the CCSF-BB depth scale and the investigator wants to find the exact position in the physical

Sheet	Type	Sheet name
1	Input 1	Your mDIS sample list
2	Input 2	Your LIMS section summary
3	Input 3	Your LIMS core summary
4	Input 4	Your affine table
5	Computations	Reformatting
6	Computations	Your reformatted sample list
7	Computations	
8	Output	Your new BCR samples w CCSF-BB

Figure F8. Workbook sheets for Case 3c.

Sheet	Type	Sheet name
1	Input 1	Your LIMS point data
2	Input 2	Your LIMS section summary
3	Input 3	Your LIMS core summary
4	Input 4	Your affine table
5	Computations	
6	Output	Your LIMS data with CCSF-BB

Figure F9. Workbook sheets for Case 4.

Sheet	Type	Sheet name
1	Input 1	Your CCSF-BB depth series
2	Input 2	Your LIMS core summary
3	Input 3	Your affine table
4	Input 4	Your LIMS section summary
5	Computations	
6	Output	Your sample IDs for CCSF-BB

Figure F10. Workbook sheets for Case 5a.

Sheet	Type	Sheet name
1	Input 1	Your incorrect CCSF-BB IDs
2	Input 2	Your affine table
3	Input 3	Your LIMS core summary
4	Input 4	Your LIMS section summary
5	Computations	
6	Output	Your correct CCSF-BB IDs

Figure F11. Workbook sheets for Case 5b.

core section (i.e., the sample identities). The example input data used are in fact the shipboard Site U1588 splice interval table top and bottom depths. The worksheets for Case 5b are listed in Figure **F11**, and the Excel workbook is provided in CASEWKBK in **Supplementary material**.

4. Acknowledgments

The lead author's work was funded through the NSF Award OCE-1326927.

References

Abrantes, F., Hodell, D.A., Alvarez Zarikian, C.A., Brooks, H.L., Clark, W.B., Dauchy-Tric, L.F.B., dos Santos Rocha, V., Flores, J.-A., Herbert, T.D., Hines, S.K.V., Huang, H.-H.M., Ikeda, H., Kaboth-Bahr, S., Kuroda, J., Link, J.M., McManus, J.F., Mitsunaga, B.A., Nana Yobo, L., Pallone, C.T., Pang, X., Peral, M.Y., Salgueiro, E., Sanchez, S., Verma, K., Wu, J., Xuan, C., and Yu, J., 2024. Site U1588. In Hodell, D.A., Abrantes, F., Alvarez Zarikian, C.A., and the Expedition 397 Scientists, Iberian Margin Paleoclimate. Proceedings of the International Ocean Discovery Program, 397: College Station, TX (International Ocean Discovery Program). **https://doi.org/10.14379/iodp.proc.397.106.2024**

Blum, P., Huang, H.-H.M., Herbert, T., Hodell, D.A., Abrantes, F., and Alvarez Zarikian, C.A., 2025. Supplementary material, **https://doi.org/10.14379/iodp.proc.397.201supp.2025**. In Blum, P., Huang, H.-H.M., Herbert, T., Hodell, D.A., Abrantes, F., and Alvarez Zarikian, C.A., Data report: implications of using the CSF-B depth scale type for stratigraphic correlation at IODP Expedition 397 Site U1588. In Hodell, D.A., Abrantes, F., Alvarez Zarikian, C.A., and the Expedition 397 Scientists, Iberian Margin Paleoclimate. Proceedings of the International Ocean Discovery Program, 397: College Station, TX (International Ocean Discovery Program).