

The SCEC Community Paleoseismic Database (CPD)

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1: INTRODUCTION

Paleoseismic observations provide critical information for seismic hazard assessments, geophysical/geodetic modeling, earthquake simulators, geologic studies, and many other efforts in earthquake research. These observations include dates and rates of earthquake recurrence, fault slip rates, and measurements of surface slip per earthquake that can be used to determine the spatial and temporal rupture patterns of surface rupturing earthquakes over multiple seismic cycles. In other countries where active faults pose significant hazards (e.g., Italy, Spain, New Zealand, and Japan), existing paleoseismic information is often available online as databases that are spatially referenced and queryable. In contrast, paleoseismic data compilations in the U.S. are commonly shared in pdf and/or Excel formats, are not queryable or interactive, and often are included in peer-reviewed publications that are not open access. This has led some investigators, many of whom are not paleoseismologists, to spend hours creating and maintaining their own ad-hoc paleoseismology compilations. To facilitate access to existing paleoseismic data for faults within southern California, we are developing a SCEC Community Paleoseismic Database (CPD).

2: INITIAL CPD SITES

Numerous studies have characterized paleoearthquake chronologies and/or fault slip rates in California. The USGS has led a significant effort in compiling published slip rate data along active faults in western USA (Hatem et al., 2021), along with an earthquake chronology database for the entire western USA. While many SCEC scientists have compiled their own ad hoc paleoseismic databases, no openly accessible and searchable community resource of this critical data exists. Furthermore, in many such ad hoc compilations, earthquake age constraints were taken directly from the original publications using different versions of different software packages and radiocarbon calibration curves, leading to inaccurate and/or outdated event ages. The initial CPD will focus on the USGS compilations and building a user-friendly web-based tool.

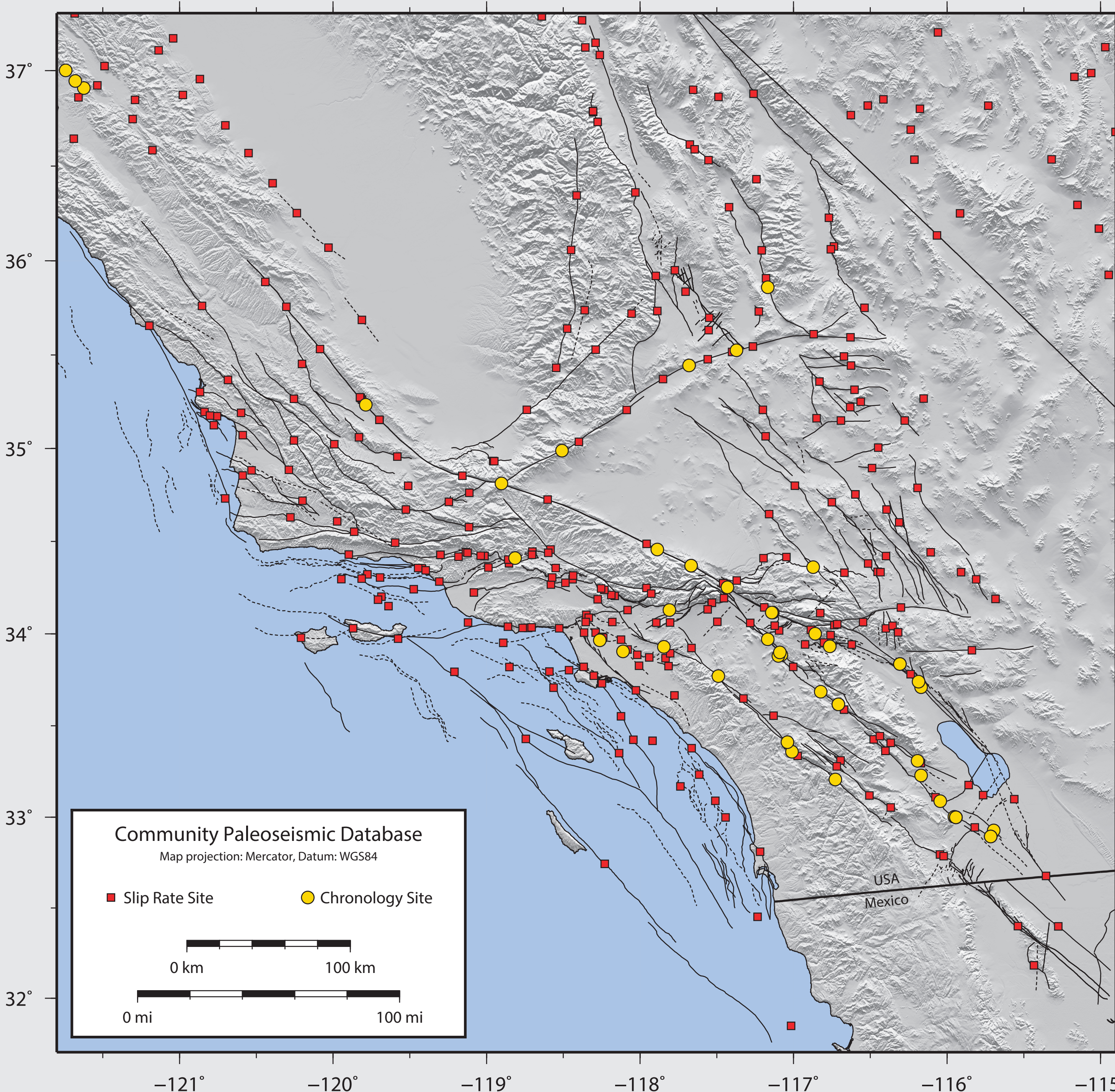


Figure 1: Map showing the slip rate sites (red squares, n=358) compiled by Hatem et al. (2021) and paleoseismic sites with earthquake chronology (gold circles, n=65) compiled by Weldon et al. (2013) and Rockwell and Biasi (2018) that we have already included in our database. CFM5.3 fault traces are shown with black lines and are dashed where blind. Data will be visualized as points at study site locations where the source data was collected and will be associated with the appropriate CFM fault object.

3: THE KML (GOOGLE EARTH) VERSION OF THE CPD

The CPD will consist of two main components:

- 1) A Google Earth (.kml) spatial database of slip rate and chrology sites, cross-referenced to the appropriate SCEC CFM fault object.
- 2) An Excel spreadsheet with metadata for each site. The metadata will include slip rate estimates, locations, references, individual paleoearthquake ages, and OxCal scripts for users to recalibrate ages, etc...

A novel component of the CPD will involve the calibration of existing published paleoevent ages as past dates were likely calculated using different calibration curves. We will recalibrate existing radiocarbon data and recalculate new earthquake ages (where data is available) using the most recent carbon calibration curve (IntCal20 Northern Hemisphere Radiocarbon Calibration Curve (Reimer et al., 2020)) and the OxCal software package. OxCal scripts will be included in the database for future re-calculation efforts.

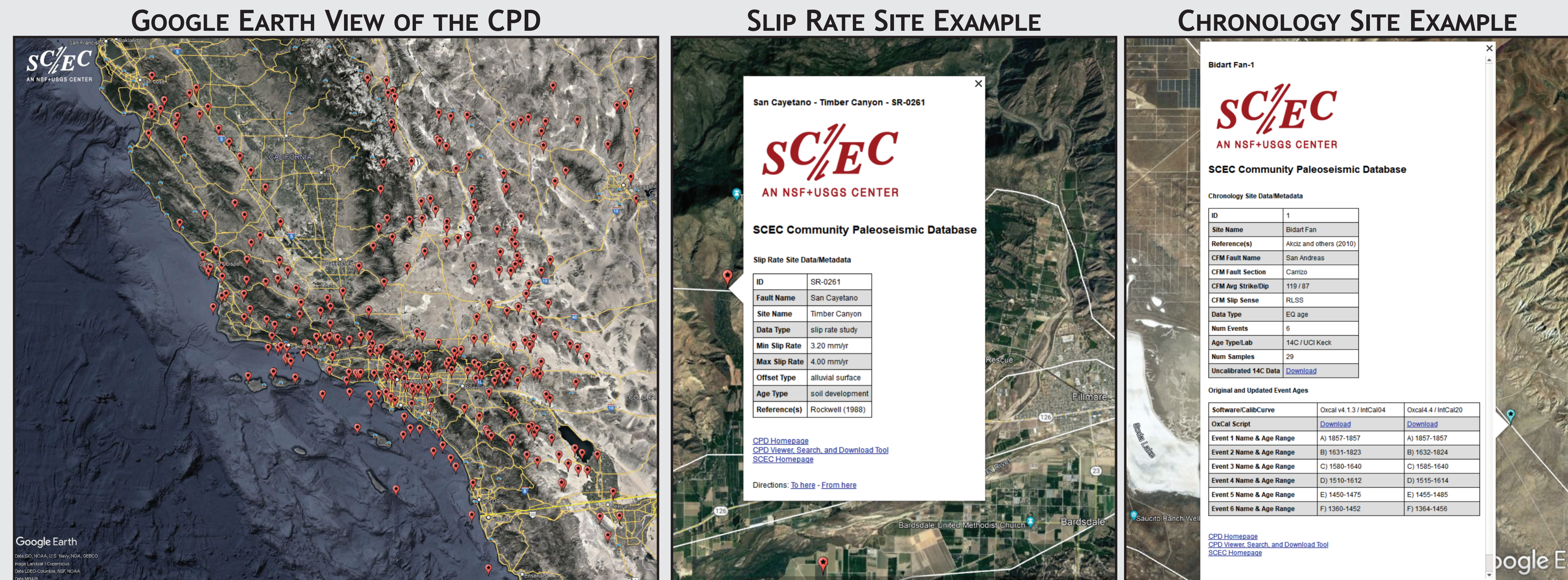


Figure 2: Views of the preliminary CPD as viewed in Google Earth. A) The entire CPD, B) A slip rate site, C) A chronology site.

4: THE WEB-BASED VERSION OF THE CPD (PLANNED FOR 2023)

The CPD will also have web-based tools that allow users to visualize and query the CPD database with an interactive map-based interface similar to the CFM web tools. Building on compilations gathered by the USGS, UCERF, and SCEC researchers (notably in the Salton Trough region) and leveraging web-based applications already developed for the SCEC Community Models, the CPD will be cross-referenced with the SCEC Community Fault Model (CFM) so that observations from each paleoseismic study location will be associated with the corresponding CFM fault. The CPD data and metadata will not only be queryable, but also downloadable as plain text (.csv) and Google Earth (.kml) files. These web-based tools will unify delivery of paleoseismic data that previously would have required multiple searches on numerous platforms.

WHAT IS MOST USEFUL? WHICH PARAMETERS? WHAT DOWNLOAD FORMATS?

HERE IS WHAT IS PLANNED

SLIP RATE SITES

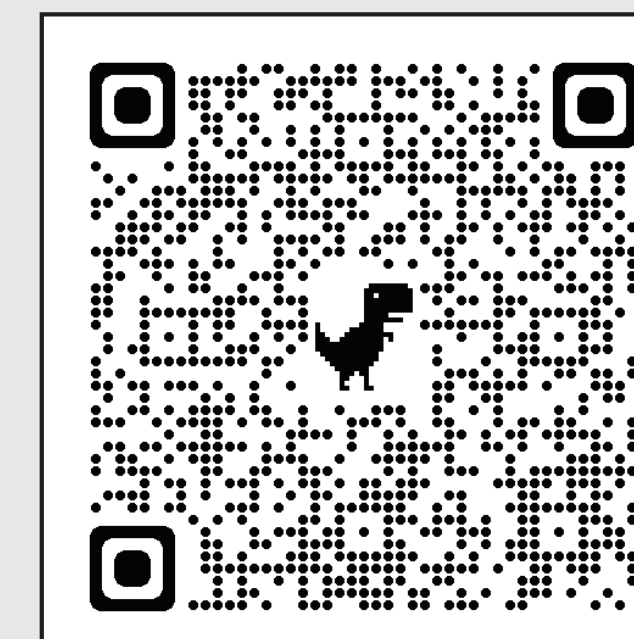
Fault Name	Reference	Site Name	Data Type
Min Slip Rate	Max Slip Rate	Offset Type	Age Type
Slip Sense	CPD ID	CFM ID	

CHRONOLOGY SITES

Fault Name	Reference	Site Name	Data Type
Age Type/Lab	Num Samples	Num Events	Raw Data
Slip Sense	CPD ID	CFM ID	

ORIGINAL AND RECALIBRATED AGES, WITH OXCAL SCRIPTS

Software/Calib Curve
Event 1 Name & Age
Event 2 Name & Age
Event N Name & Age



<https://forms.gle/MK5BeCczECiybbca9>

DID WE MISS A SITE? FILL OUT THE FORM AT THE LINK ABOVE

MOCKUP OF POTENTIAL CPD WEB INTERFACE (BASED ON CFM WEB TOOLS)

