

Sedimentary Analysis of Fire History and Paleohydrology, Eagle Lake, California

David B. Calo

Department of Geological and Environmental Sciences, California State University, Chico

Introduction

This project used a high-resolution sedimentary technique to characterize the fire history and paleohydrology of Eagle Lake, California from present to 18 kyrs BP. To understand global fire history trends, and the influence of climatic and anthropogenic factors, continued mapping and analysis of fire history as an earth systems process is essential. Wigand et al. (1995) recommended a high resolution paleofire study be performed at Eagle Lake. Eagle Lake is located in central Lassen County, California, near Susanville, CA. To match other studies (e.g. Minckley et al. (2007)) fire history was analyzed at the regional and millennial scales.

Study Area: Eagle Lake, California



Figure 1 - Geography of Eagle Lake, California



Figure 2 - Hydrography of Eagle Lake Watershed

Methods

A 1m sediment core was extracted from Eagle Lake using the sediment sampler in Fig. 3. Fire history and paleohydrology were analyzed using methods similar to Minckley et al. (2007).

1. Macro-charcoal
2. Magnetic susceptibility
3. Chemostratigraphy
4. Radiochronology
5. Lithostratigraphy

Fire history was characterized using CharAnalysis.

Paleohydrology was characterized using a combination of lithostratigraphy and magnetic susceptibility.

Chemostratigraphy was used to perform zonation analysis. Radiochronology was used to establish a geochronology.

Various project photos:

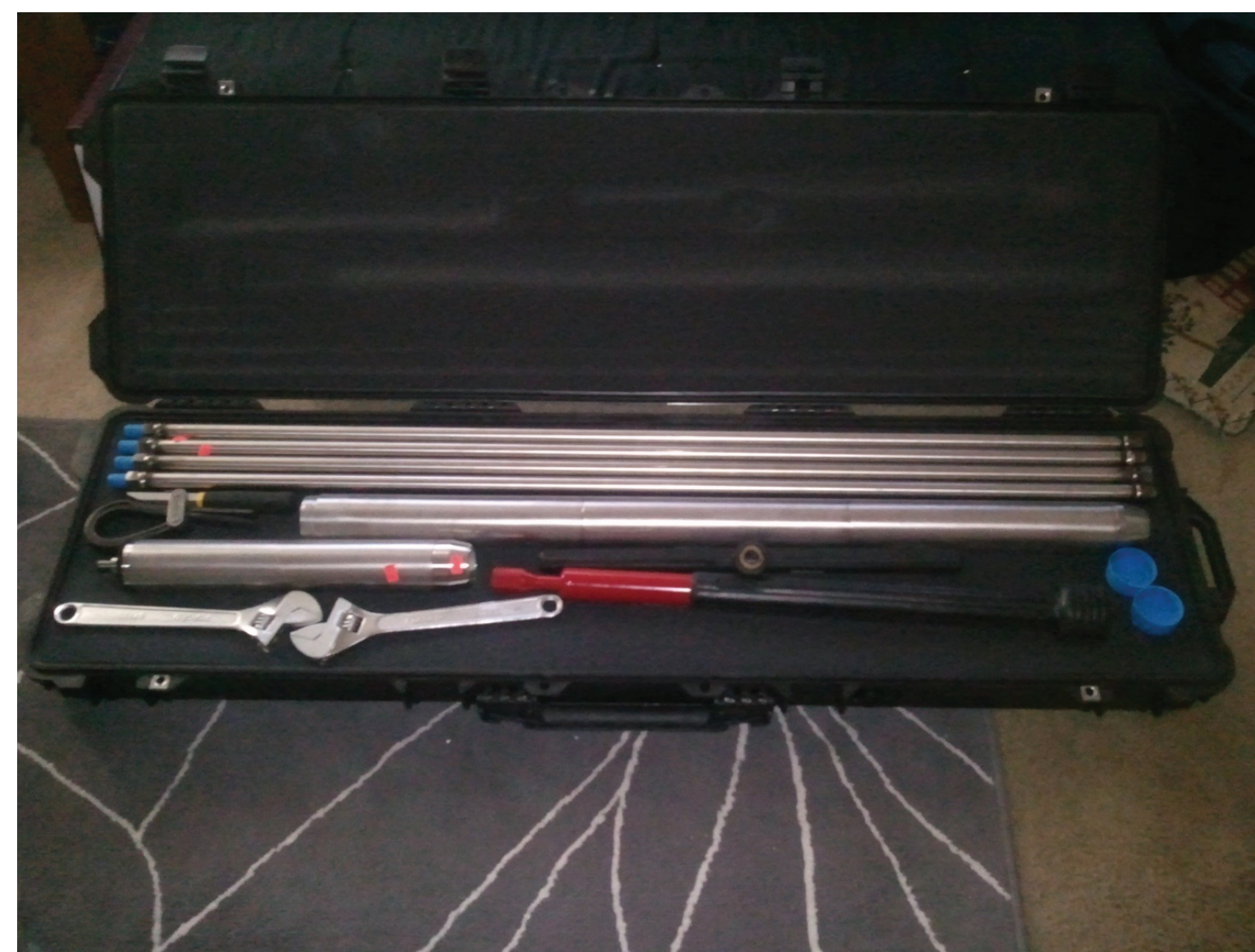


Figure 3 - Sediment Sampler



Figure 4 - Core Analysis



Figure 5 - Sediment Analysis

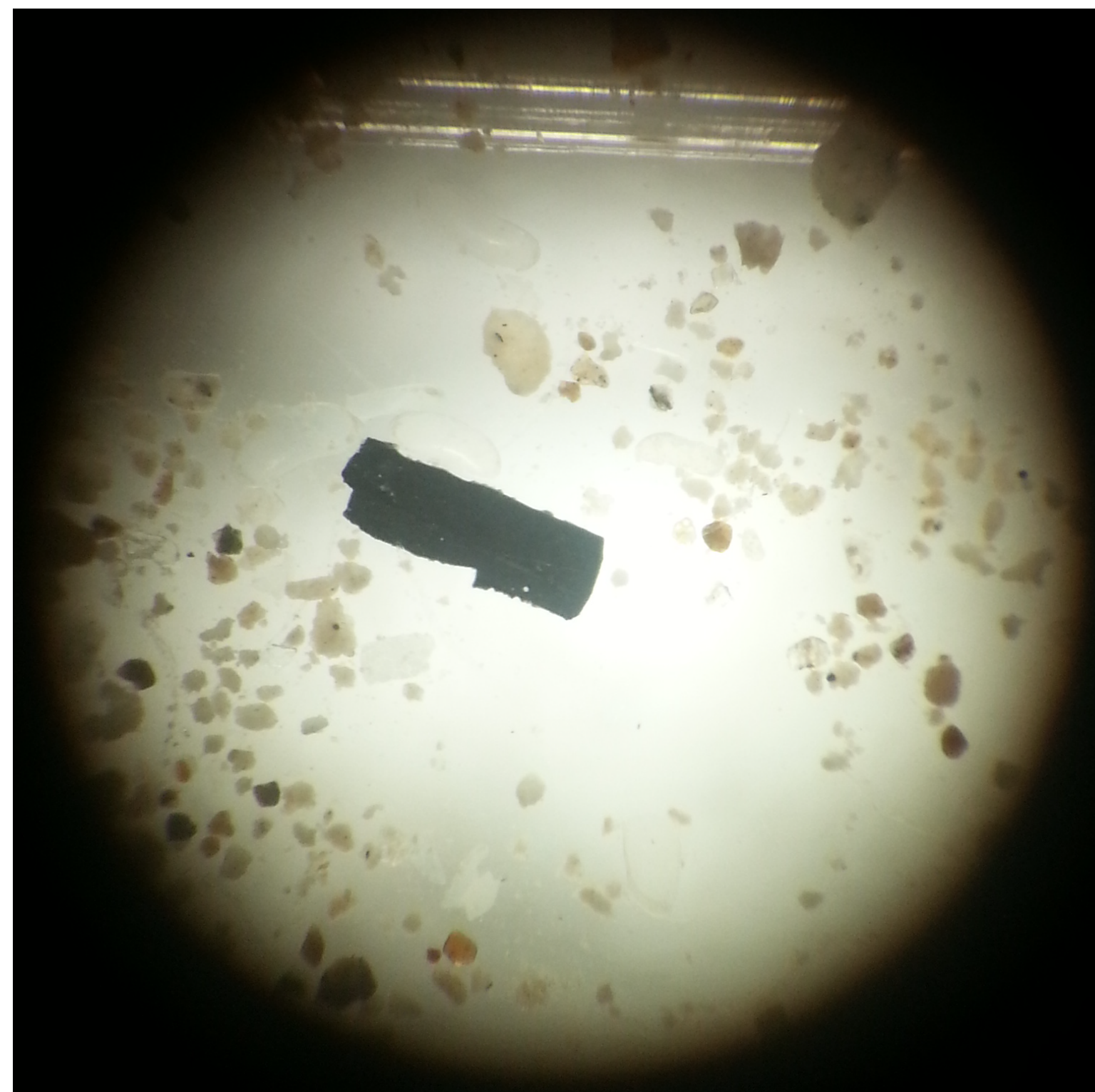


Figure 6 - Sample Photo

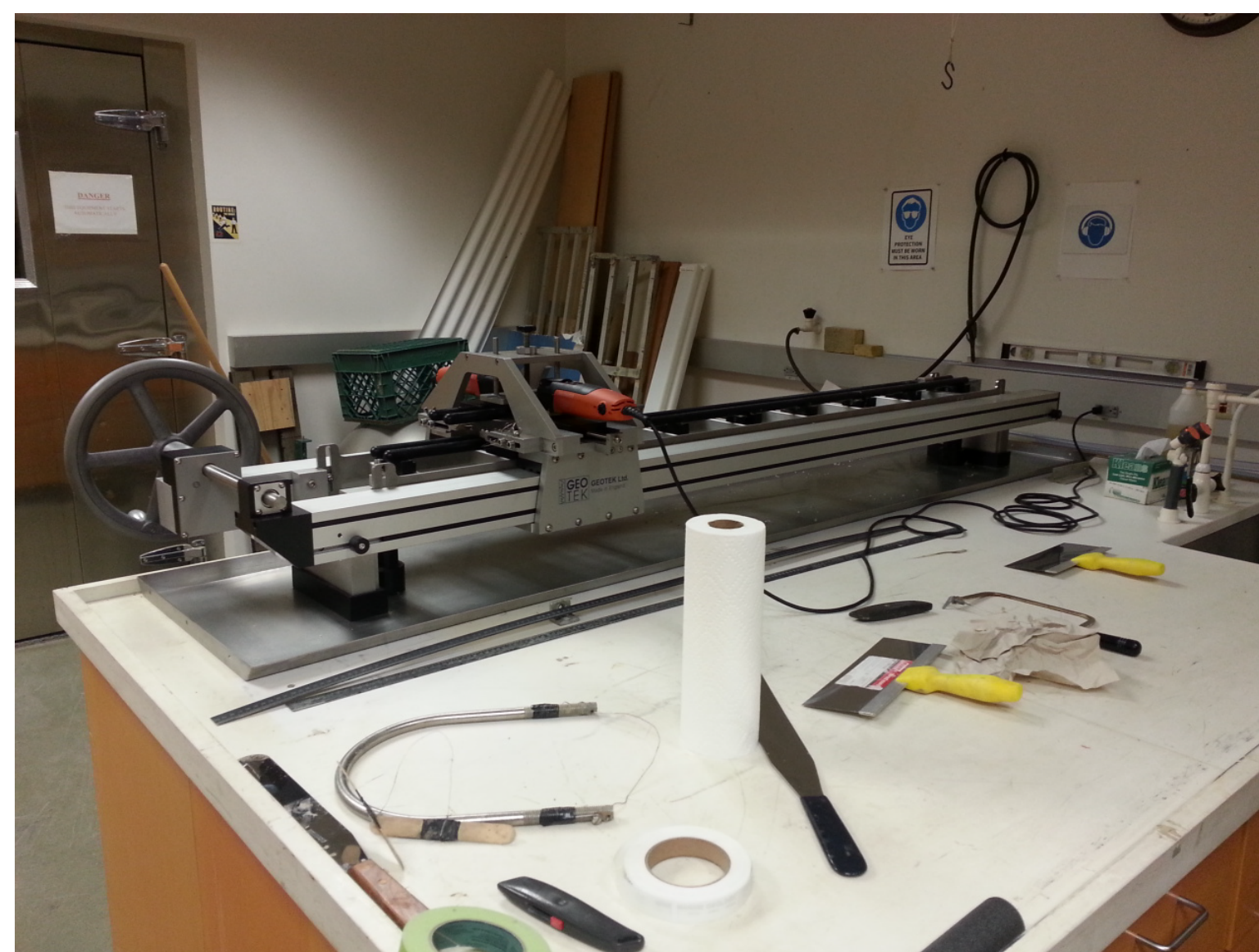


Figure 7 - Core Splitter

Results

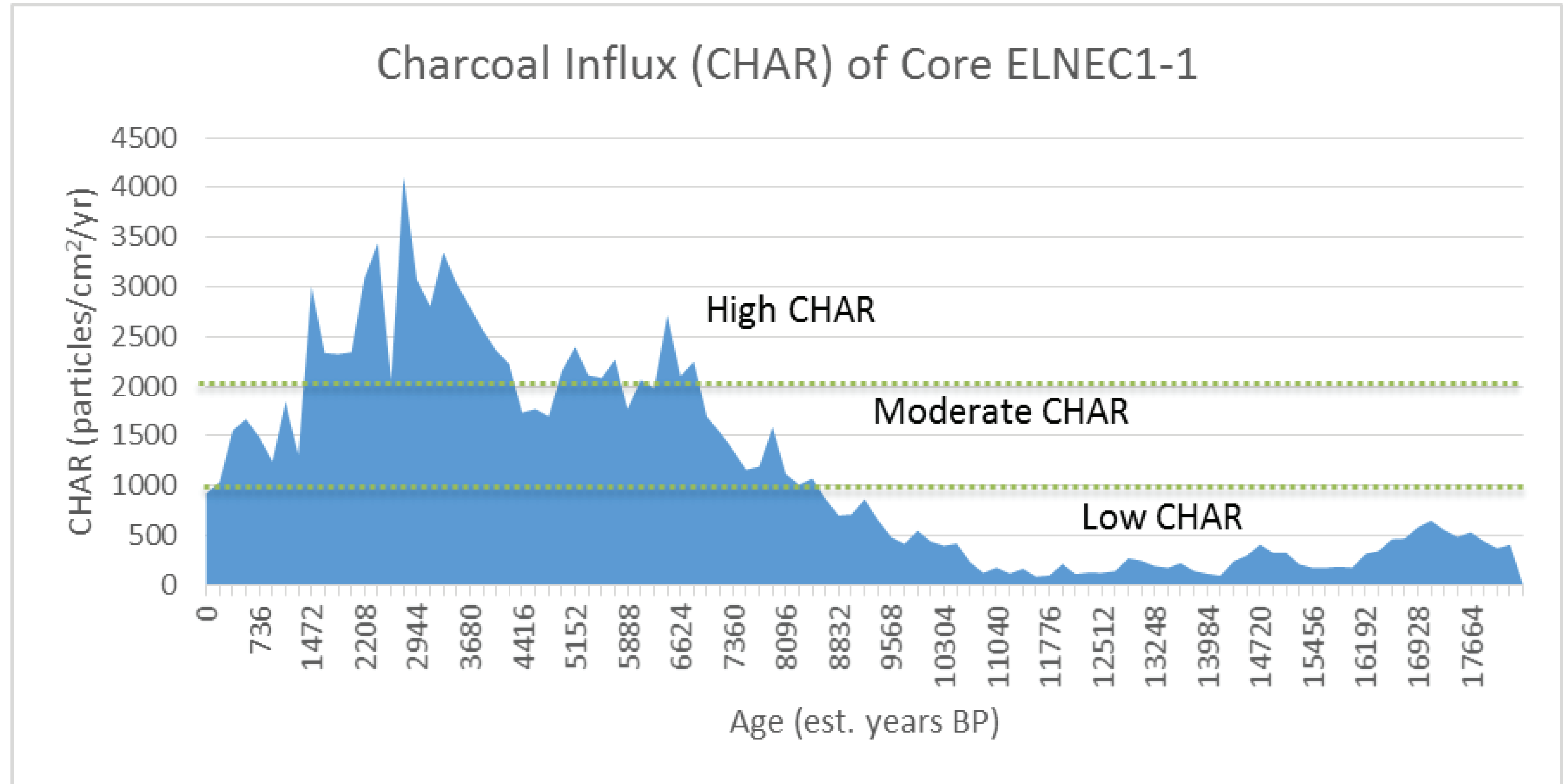


Figure 8 - Charcoal influx (CHAR)

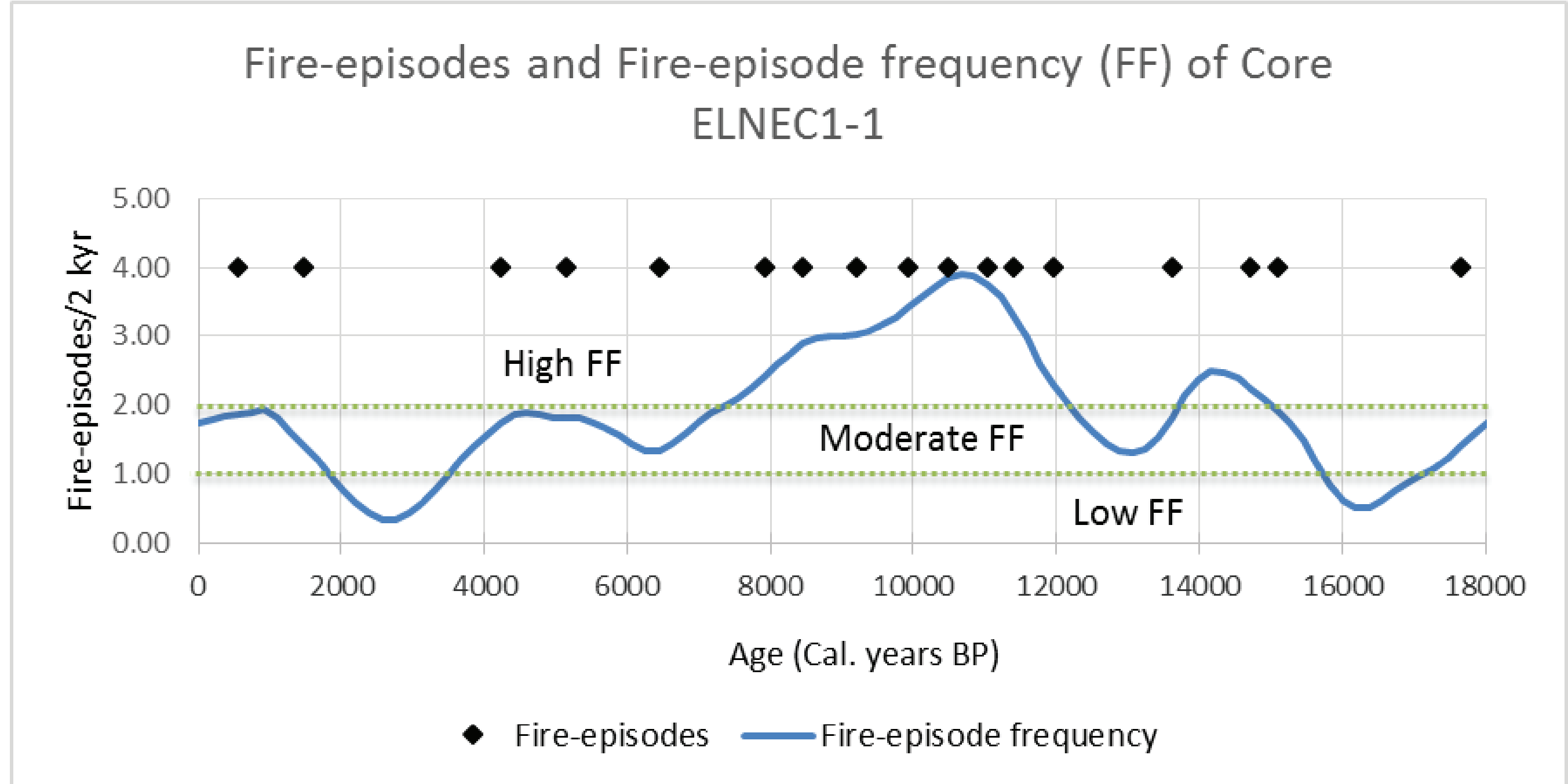


Figure 9 - Fire frequency (FF) and fire-episodes (peaks)

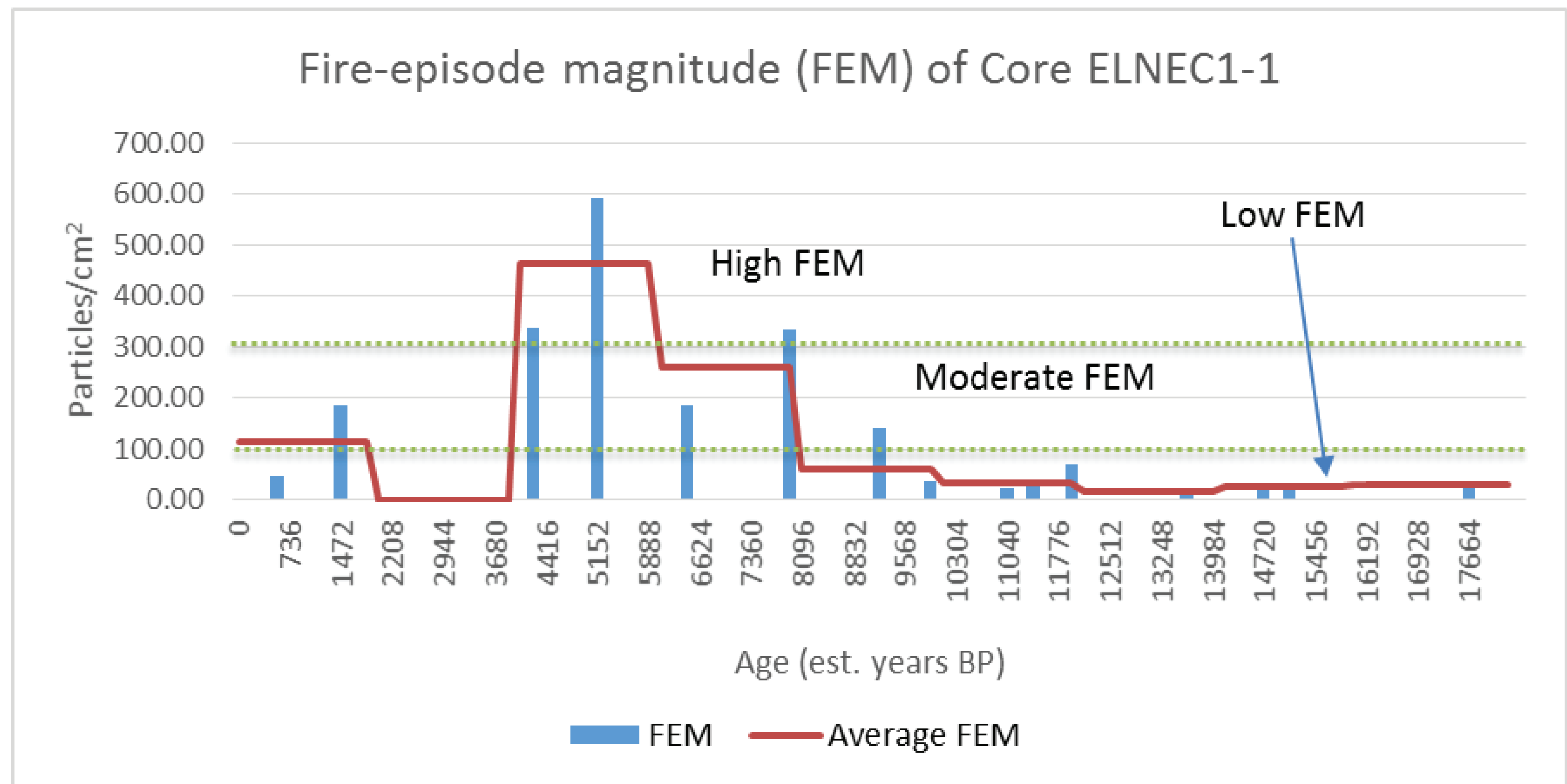


Figure 10 - Fire-episodes magnitude (FEM)

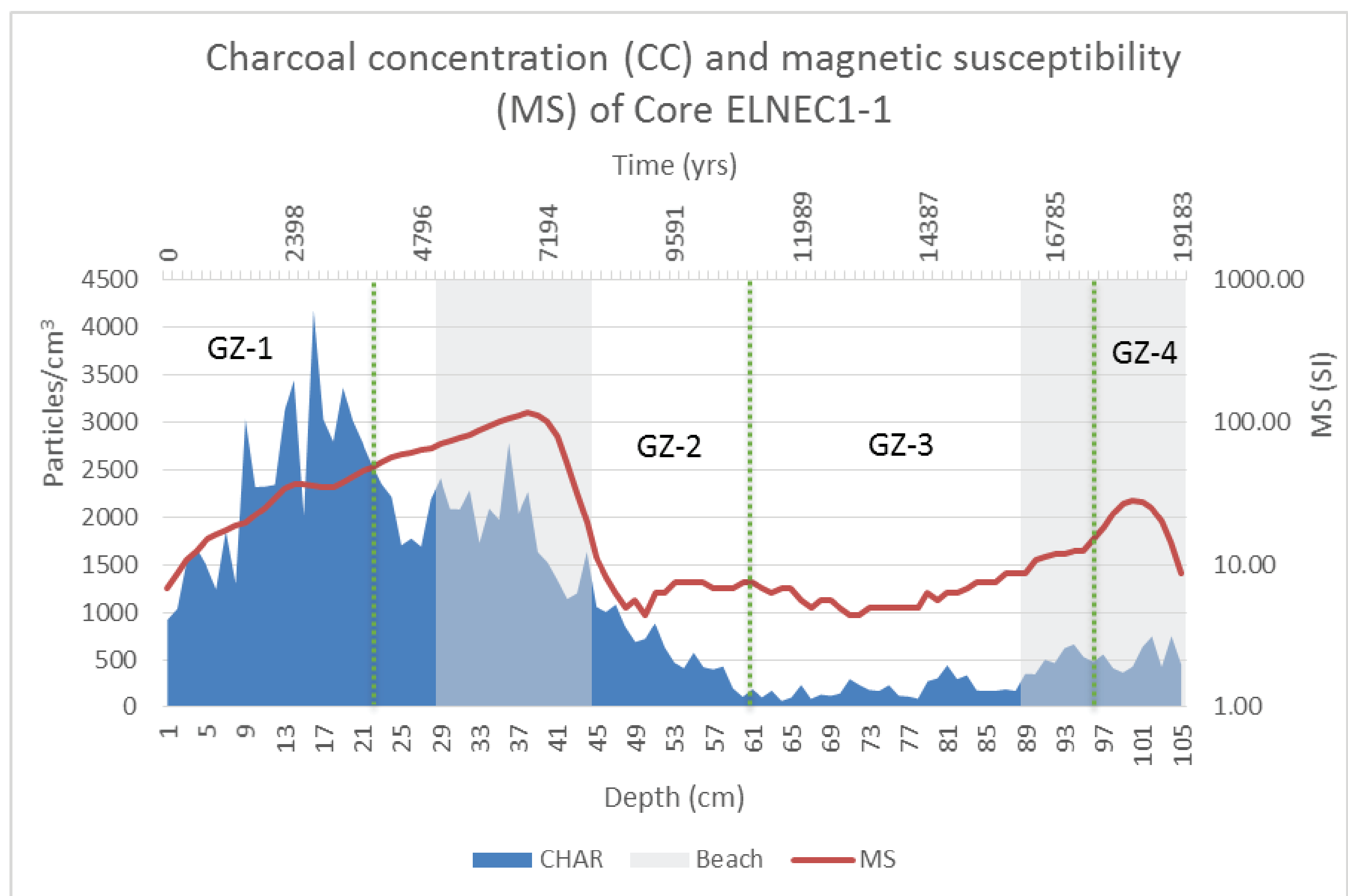


Figure 11 - Charcoal Concentration (CC) and magnetic susceptibility (MS)

Conclusion

The fire history of the Eagle Lake can be divided into three periods: 18 to 10 kyrs BP, 10 to 2.8 kyrs BP, and 2.8 kyrs BP to present. Hydrologic activity during the first period was low, limiting fuel availability, and supporting small frequent fires. Hydrologic activity during the second period was initially low due to limited fuel availability, supporting small frequent fires. The beginning of the second period marks the end of the glacial period. After approximately 8 kyrs BP, hydrologic activity increased to moderate/high levels, and fuel availability increased, supporting larger moderately frequent fires until 4.2 kyrs BP. From 4.2 to 1.5 kyrs BP, fire frequency and magnitude were low due to neoglaciation. Hydrologic activity during the third period was moderate and decreased to present, allowing for low to moderately frequent fires with moderate magnitude. The climate of Eagle Lake prior to 15 kyrs BP was cold and moist, from 15 to 8.5 kyrs BP it was warm and dry, from 8.5 kyrs to 4 kyrs BP it was warm and wet, and from 4 kyrs BP to present it was cool and wet. Indigenous populations clearly influenced the fire history of Eagle Lake, moderated fire frequency over the Holocene, and set fires for forest understory management, wildlife management, manufacturing, and agricultural purposes. Despite evidence of indigenous occupation, it is difficult to distinguish anthropogenic influences from climatic trends.

Acknowledgements

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References

- Minckley, T.A., Whitlock, C., and Bartlein, P.J., 2007, Vegetation, fire, and climate history of the northwestern Great Basin during the last 14,000 years: Quaternary Science Reviews, v. 26, p. 2167–2184, doi: 10.1016/j.quascirev.2007.04.009.
- Wigand, P.E., Hemphill, M.L., Sharpe, S., and Patra, S., 1995, Eagle Lake Basin, Northern California, Paleocological Study: Semi-Arid Woodland and Montane Forest Dynamics During the Late Quaternary in The Northern Great Basin and Adjacent Sierras: University and Community College System of Nevada, 27 p.