**Appendix D. Inverse Modelling: Methodological Details and Models**

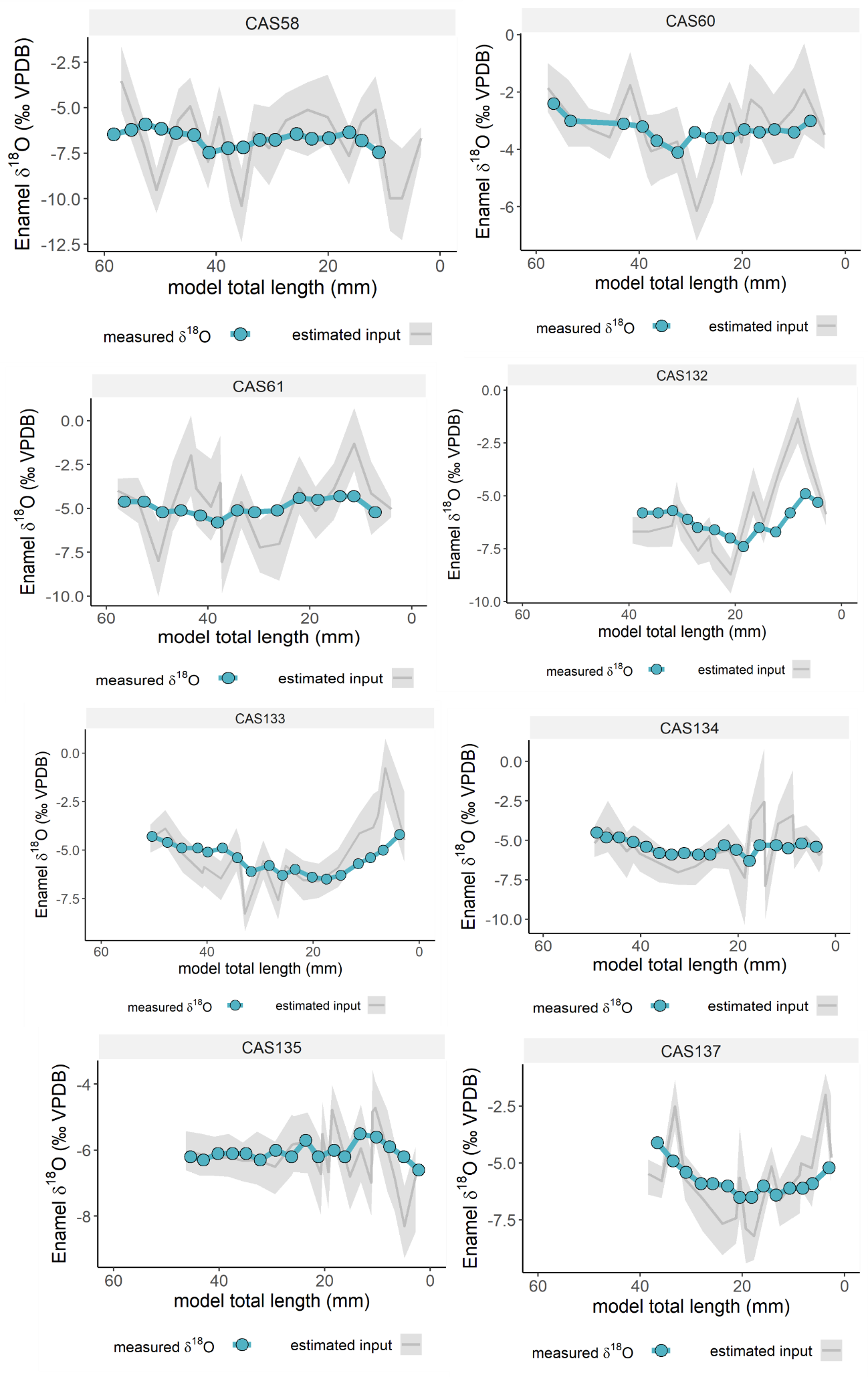
The intratooth δ18O profiles presented in this study were obtained through the application of inverse modelling, using an adapted version of the code published in reference (Passey et al., 2005). This modeling approach allowed for the correction of the damping effect and the reconstruction of the original δ18O input time series. The model utilizes different species-specific parameters related to enamel formation, which vary between bovines and equids. These parameters have been established based on previous studies (Bendrey et al., 2015; Blumenthal et al., 2014; Kohn, 2004; Passey and Cerling, 2002; Zazzo et al., 2012). For Bos/Bison sp., the initial mineral content of enamel is fixed at 25%, the enamel appositional length is set at 1.5 mm, and the maturation length is 25 mm. For *Equus* sp., the initial mineral content of enamel is fixed at 22%, the enamel appositional length is set at 6 mm, and the maturation length is 28 mm.

In addition, the model requires other variables related to sampling geometry, as well as error estimates derived from mass spectrometer measurements. The distance between samples varies for each tooth, but as a general trend, the sampling depth on the tooth enamel surface in the samples of this study represents approximately 70% of the total enamel depth. The standard deviation of the measurements obtained from the mass spectrometer was typically set at 0.12%, taking into account the uncertainty associated with the standards. Finally, the models require a damping factor that determines the cumulative damping along the isotopic profile by adjusting the measured error (Emeas) to the prediction error (Epred). In the teeth analysed in this study, the damping factor ranged from 0.001 to 0.1. The most likely model solutions were selected, and summer and winter values were extracted from the δ18O profiles, considering the original peaks and troughs identified in the unmodelled δ18O profile. This approach was adopted to prevent the introduction of artificial peaks that the model may produce, particularly in teeth without a distinct sinusoidal shape.

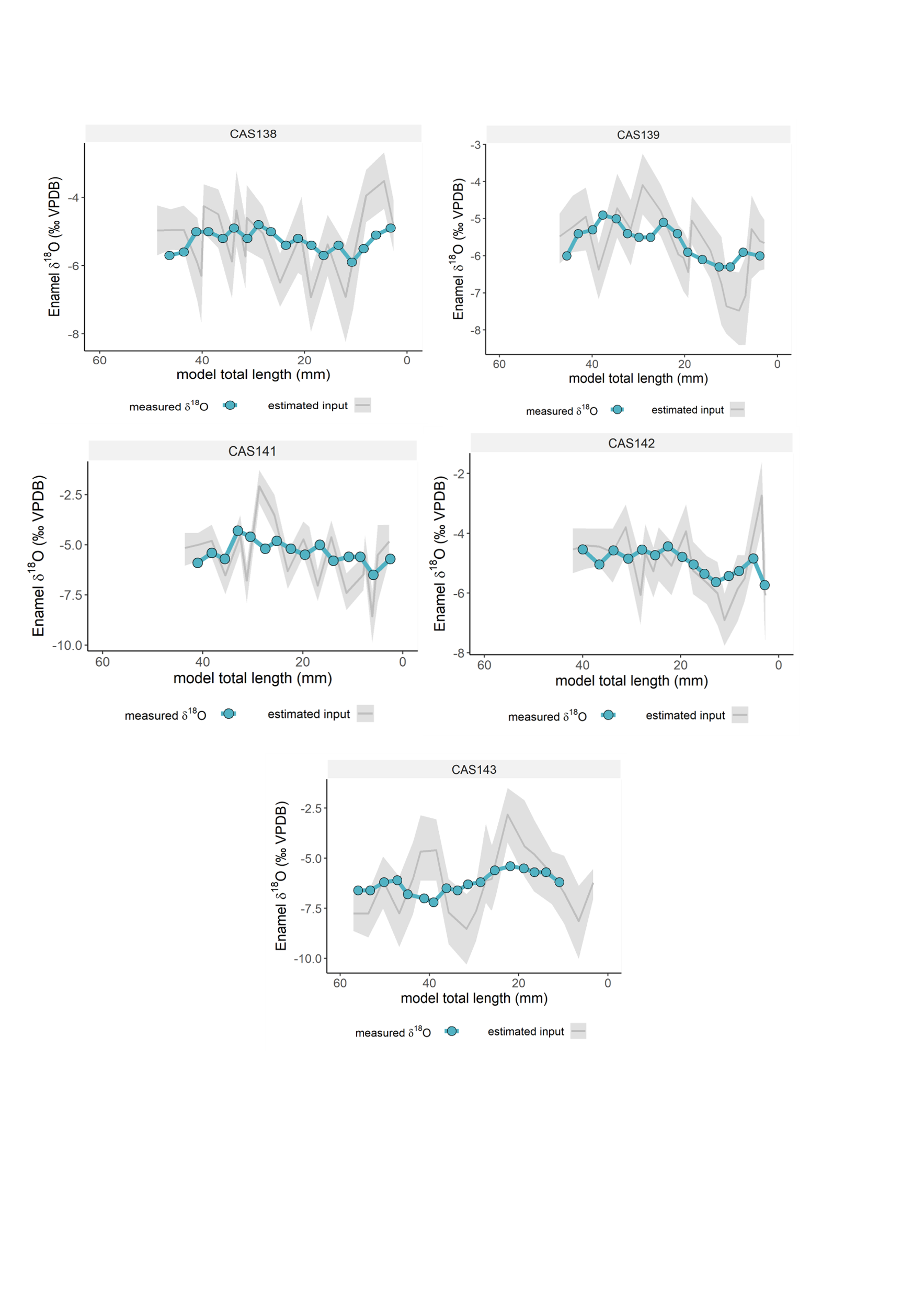
**Imagen que contiene Interfaz de usuario gráfica

Descripción generada automáticamente**

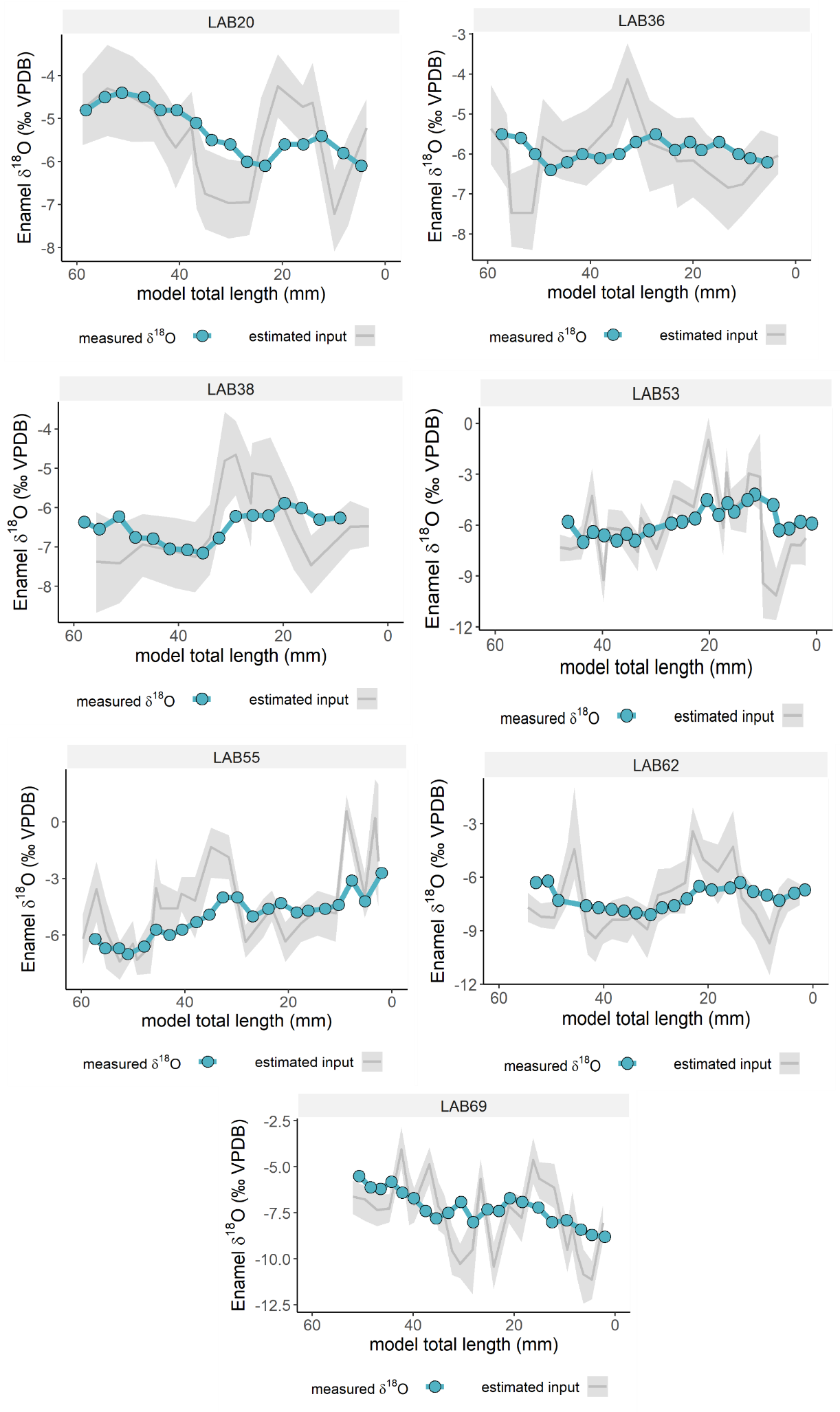
**Figure D1.** Inverse models for oxygen isotope composition (δ18O) from teeth from Axlor, considering distance from enamel root junction. The blue line and points correspond to original data and grey line the most likely model solution, with the 95% confidence interval shown in shaded areas.



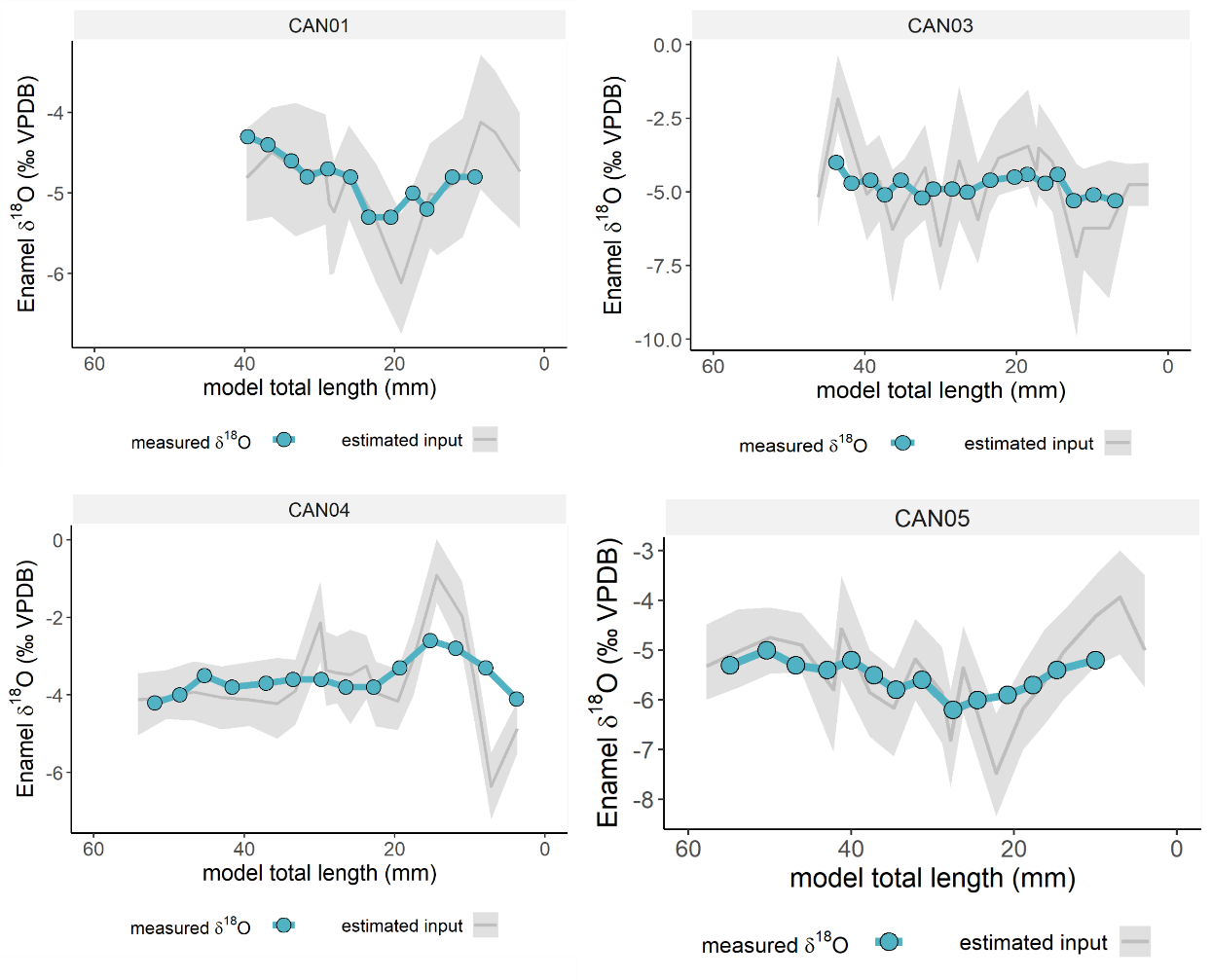
**Figure D2.** Inverse models for oxygen isotope composition (δ18O) from teeth from El Castillo, considering distance from enamel root junction. The blue line and points correspond to original data and grey line the most likely model solution, with the 95% confidence interval shown in shaded areas.

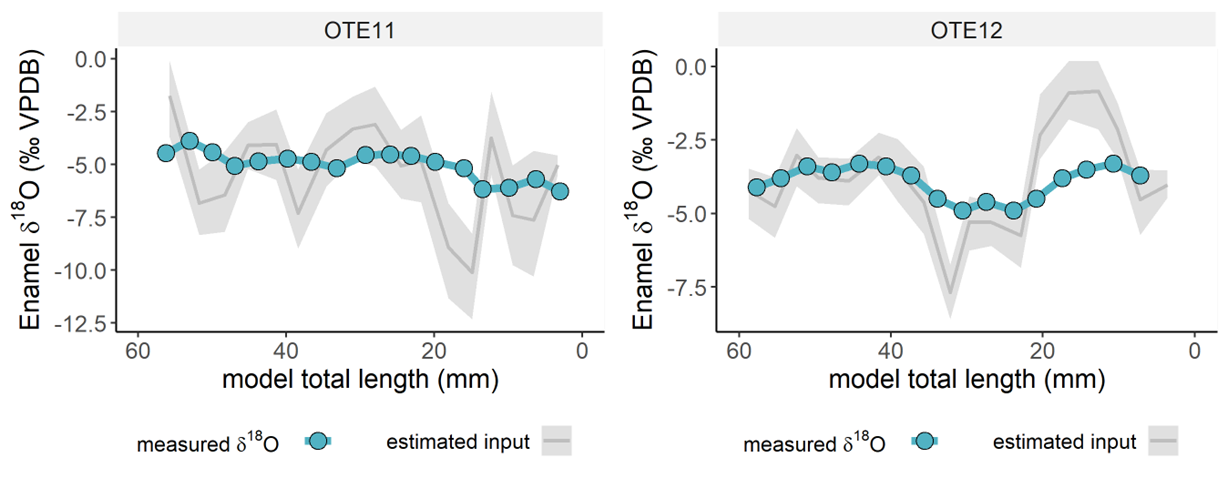


**Figure D3.** Inverse models for oxygen isotope composition (δ18O) from teeth from El Castillo, considering distance from enamel root junction. The blue line and points correspond to original data and grey line the most likely model solution, with the 95% confidence interval shown in shaded areas.

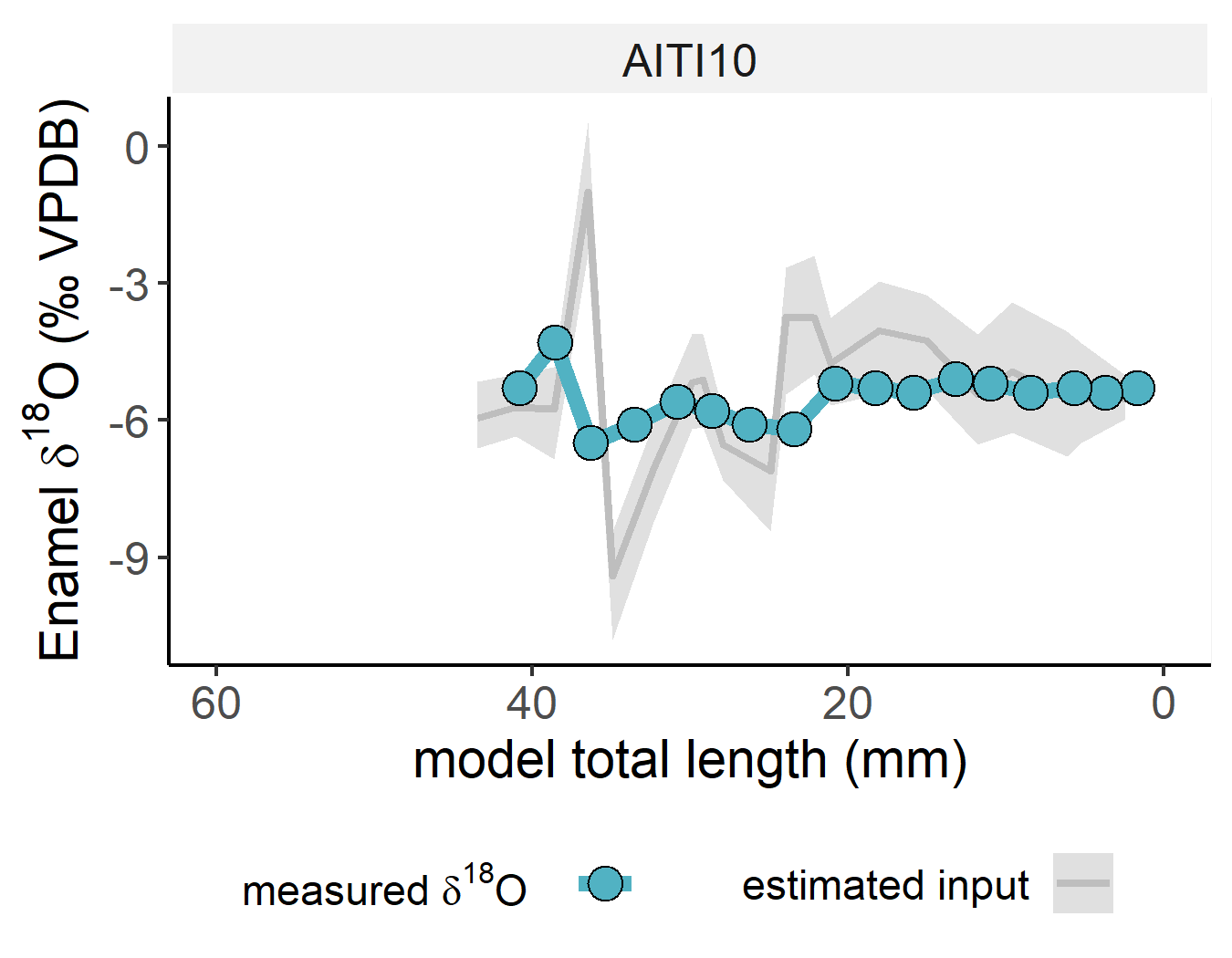


**Figure D4.** Inverse models for oxygen isotope composition (δ18O) from teeth from Labeko Koba, considering distance from enamel root junction. The blue line and points correspond to original data and grey line the most likely model solution, with the 95% confidence interval shown in shaded areas.

 **Figure D5.** Inverse models for oxygen isotope composition (δ18O) from teeth from Canyars considering distance from enamel root junction. The blue line and points correspond to original data and grey line the most likely model solution, with the 95% confidence interval shown in shaded areas.



**Figure D6.** Inverse models for oxygen isotope composition (δ18O) from teeth from El Otero, considering distance from enamel root junction. The blue line and points correspond to original data and grey line the most likely model solution, with the 95% confidence interval shown in shaded areas.



**Figure D7.** Inverse models for oxygen isotope composition (δ18O) from teeth from Aitzbitarte III, considering distance from enamel root junction. The blue line and points correspond to original data and grey line the most likely model solution, with the 95% confidence interval shown in shaded areas.

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