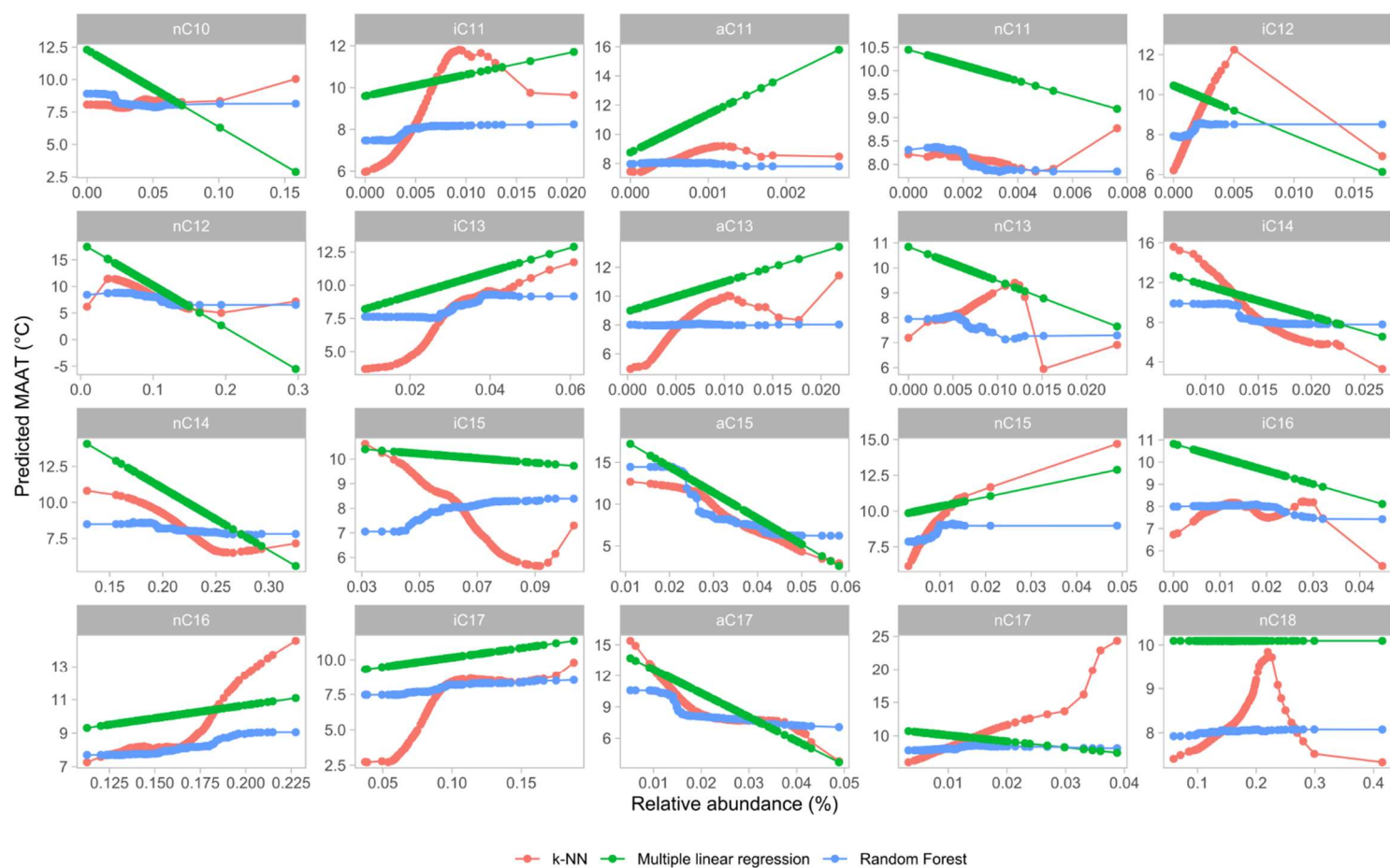
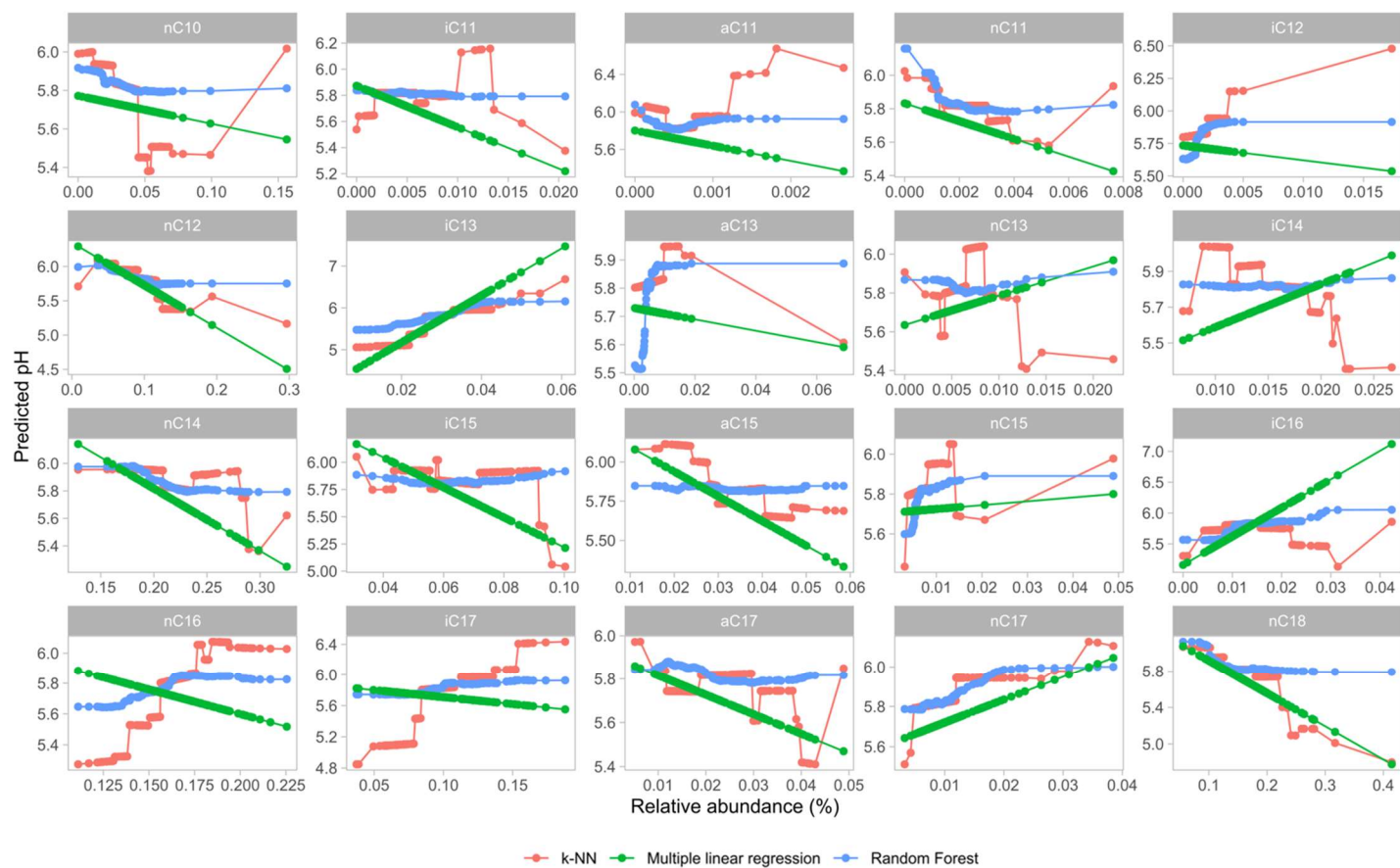


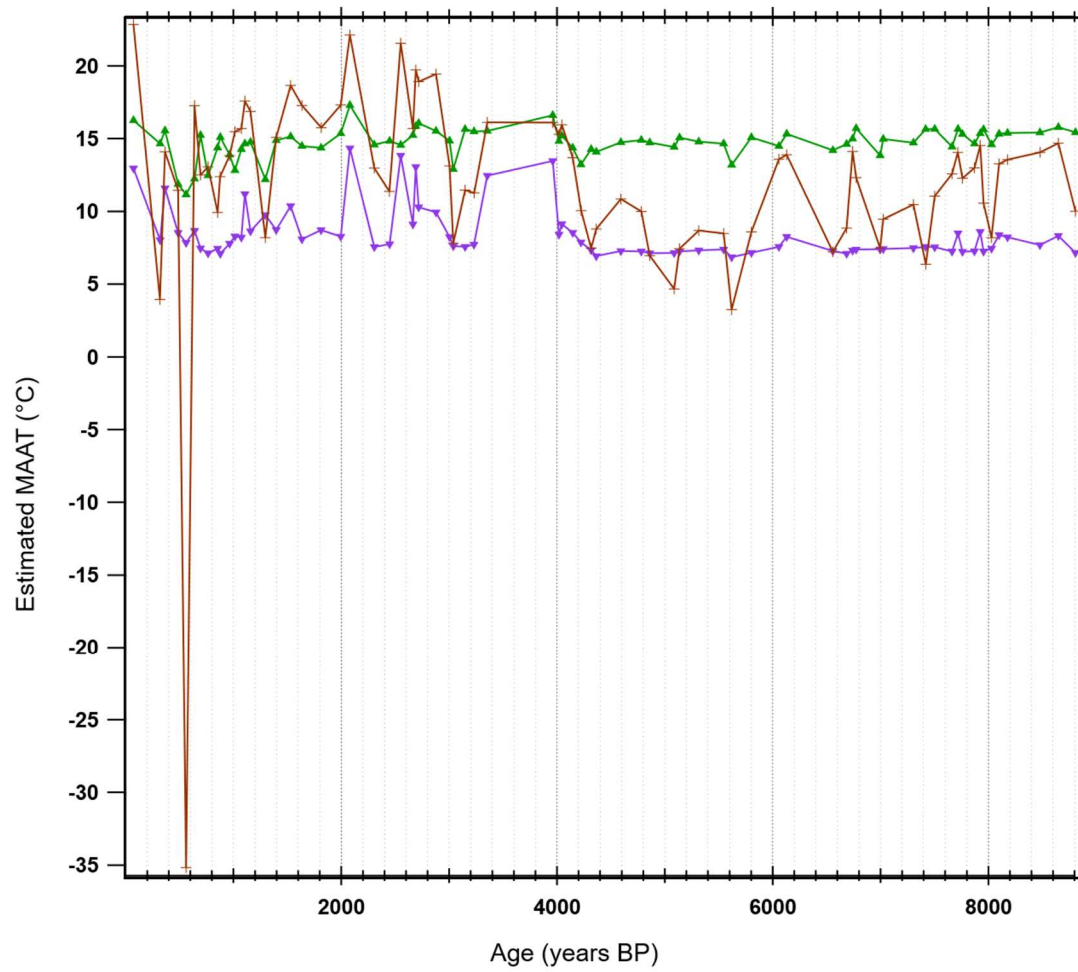
Supplementary Figure 1. PCA between pH, MAAT and 3-OH FA-derived proxies (RAN₁₅, RAN₁₇, RIAN) along Mts Rungwe, Pollino, Majella, Shegyla, Shennongjia, Lautaret-Galibier Peruvian Andes and Chilean Andes.



Supplementary Figure 2. Partial plots of the individual 3-OH FA variations in multiple regression, random forest and k-NN models proposed to estimate MAAT.



Supplementary Figure 3. Partial plots of the individual 3-OH FA variations in multiple regression, random forest and k-NN models proposed to estimate pH .



Supplementary Figure 4. Application of the three MAAT models proposed in this study and applied to the HS4 speleothem: random forest calibration (green); k-NN calibration (purple); multiple linear regression (brown).