

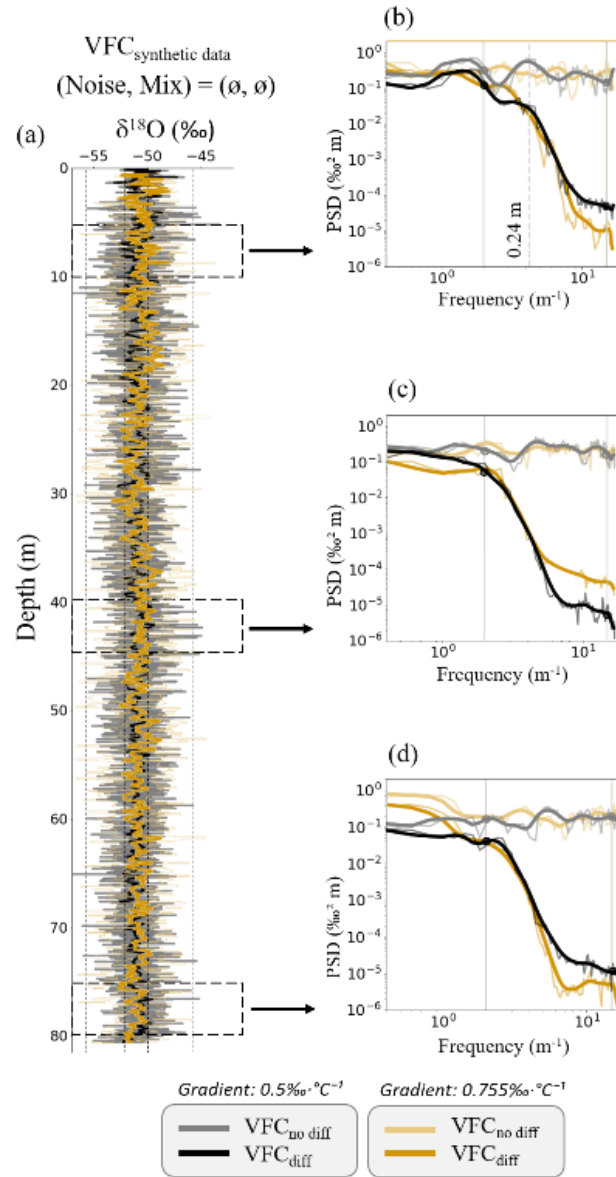


Figure R1 – VFC $\delta^{18}\text{O}$ profile before (VFCno diff) and after (VFCdiff) diffusion, built from monthly synthetic climatic data with a slope of $0.5\text{‰}\cdot^{\circ}\text{C}^{-1}$ (in grey before the diffusion, in black after) and with a slope of $0.755\text{‰}\cdot^{\circ}\text{C}^{-1}$ (light and dark yellow), on (a) on the 80 m long-scale. No noise nor mixing has been added to the model (Noise, Mix) = $(\emptyset, \emptyset)$. We display three profile sections between (window 1, b) 5-10m, (window 2, d) 40-45m, (window 3, f) 75-80m depth and their spectra on the right (c, e, g, respectively). The two solid lines in grey delimit the spectral domain where we evaluate the attenuation of the high frequencies after the inflection point (corresponding to Frequency = 2m^{-1}).

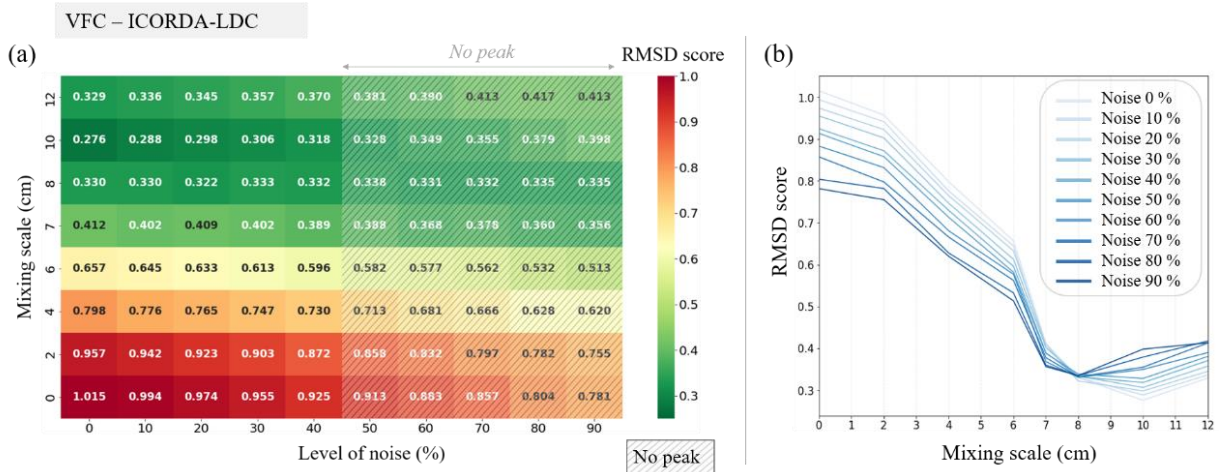


Figure (N1) – (a) Model-observations RMSD score for the various sensitivity tests of the VFC model, with a noise level varying from 0 to 90 % and a mixing scale ranging from 0 to 12 cm. The hatched grey area corresponds to simulations where the frequency peak at 18-19 cm does not appear. (b) Evolution of the RMSD score along with the mixing scale for each level of noise. A low RMS score indicates a good match between the model and the observations, while a high RMS score indicates that the model-observation fit is poor.

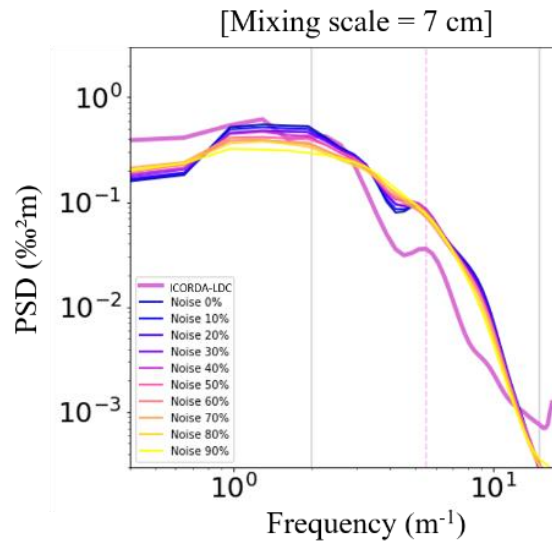


Figure (N2) – Comparison of ICORDA-LDC spectrum and VFC spectra for a range of noise levels between 0 and 90%, and a mixing scale of 7 cm. The dashed line highlights the frequency peak in the observations and the grey solid lines delimit the spectral domain to evaluate the model.

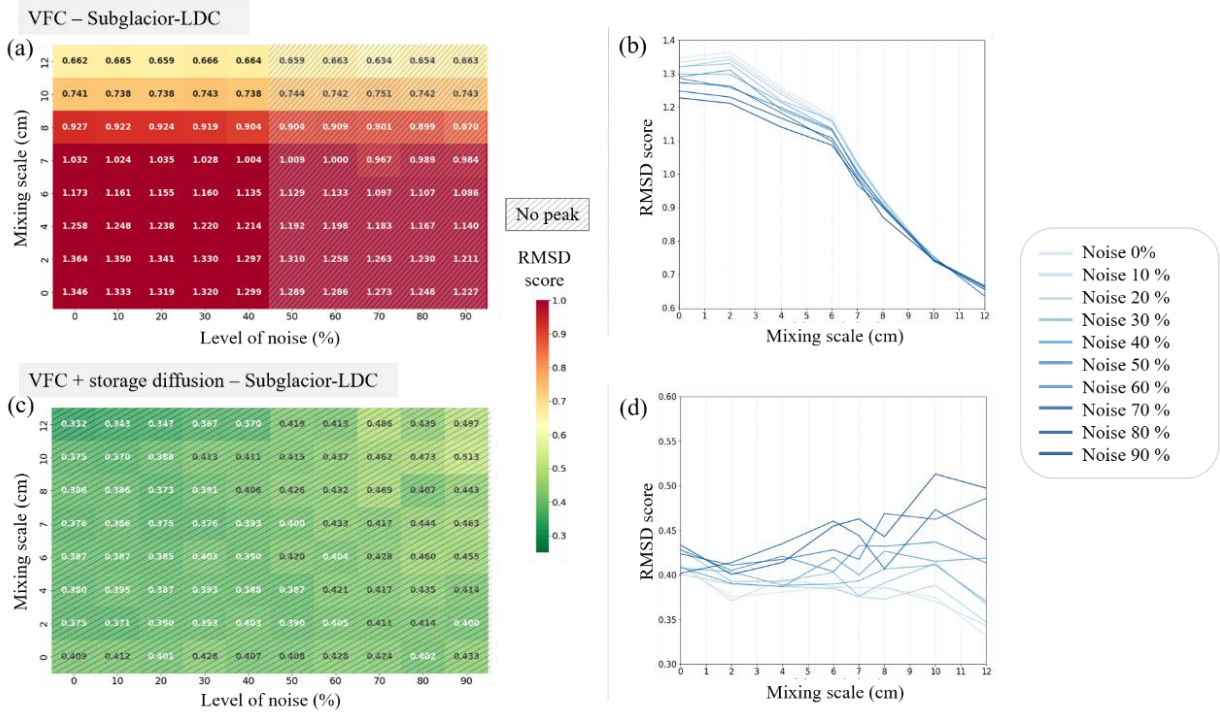


Figure (N3) – Model-observations RMSD score for the various sensitivity tests of the VFC model, with a noise level varying from 0 to 90 % and a mixing scale ranging from 0 to 12 cm, (a) before and (c) after implementing the storage diffusion. The hatched grey area corresponds to simulations where the frequency peak at 18-19 cm does not appear. Evolution of the RMSD score along with the mixing scale for each level of noise, (b) before and (d) after adding the storage diffusion. A low RMS score indicates a good match between the model and the observations, while a high RMS score indicates that the model-observation fit is poor.

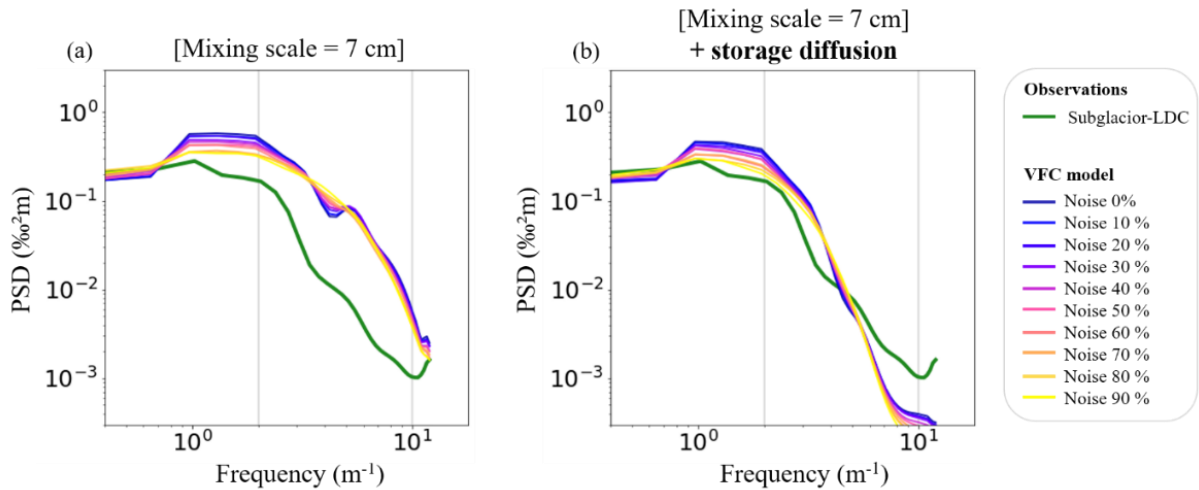


Figure (N4) – Comparison of ICORDA-LDC spectrum and VFC spectra for a range of noise levels between 0 and 90%, and a mixing scale of 7 cm, (a) before and (b) after implementing the storage diffusion. The dashed line highlights the frequency peak in the observations and the grey solid lines delimit the spectral domain to evaluate the model.



Figure R2 - Calculation of the error propagation for firm cores dating between each tie point. Volcanic horizons are marked by black crosses, where the dating error is minimal. This error increases with distance from the nearest tie point and reaches its maximum values midway between two tie points.