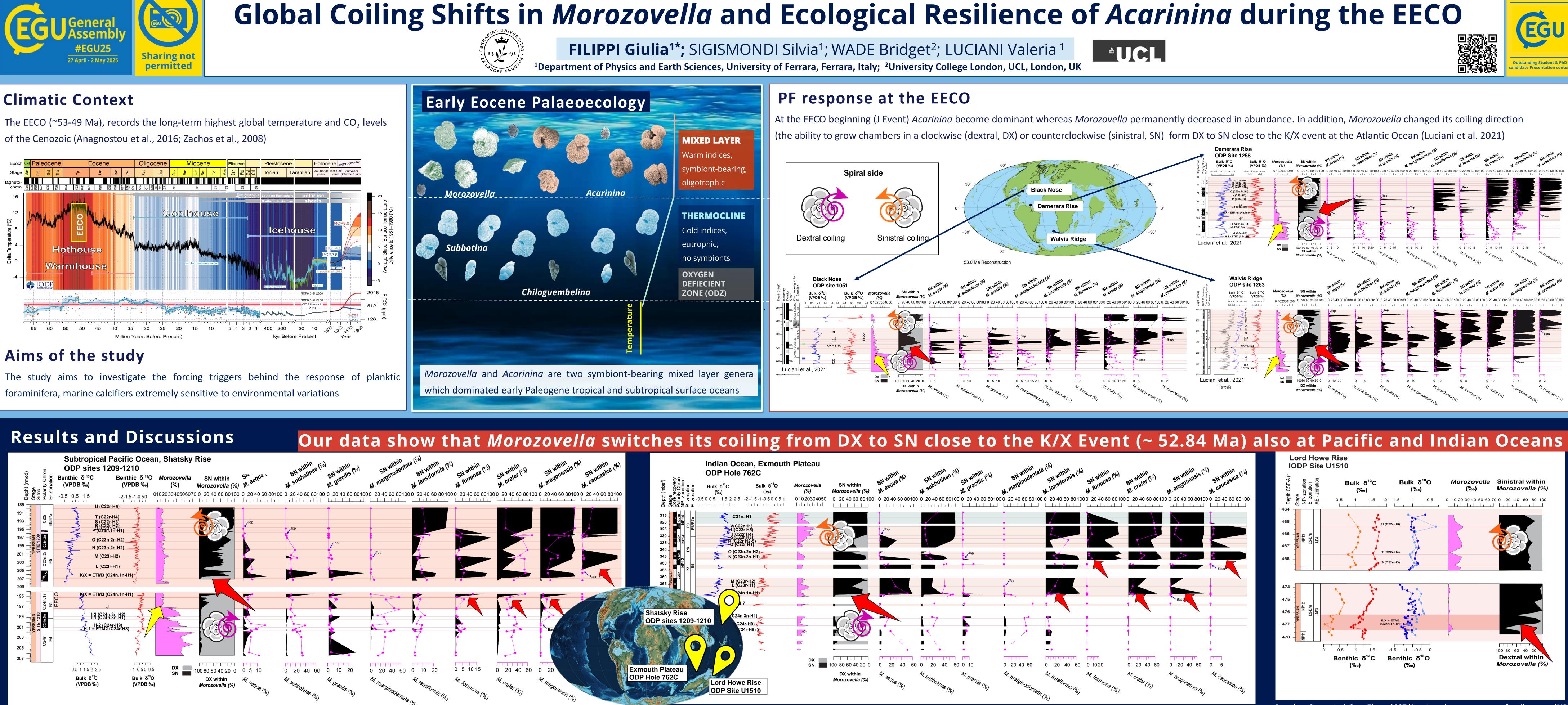
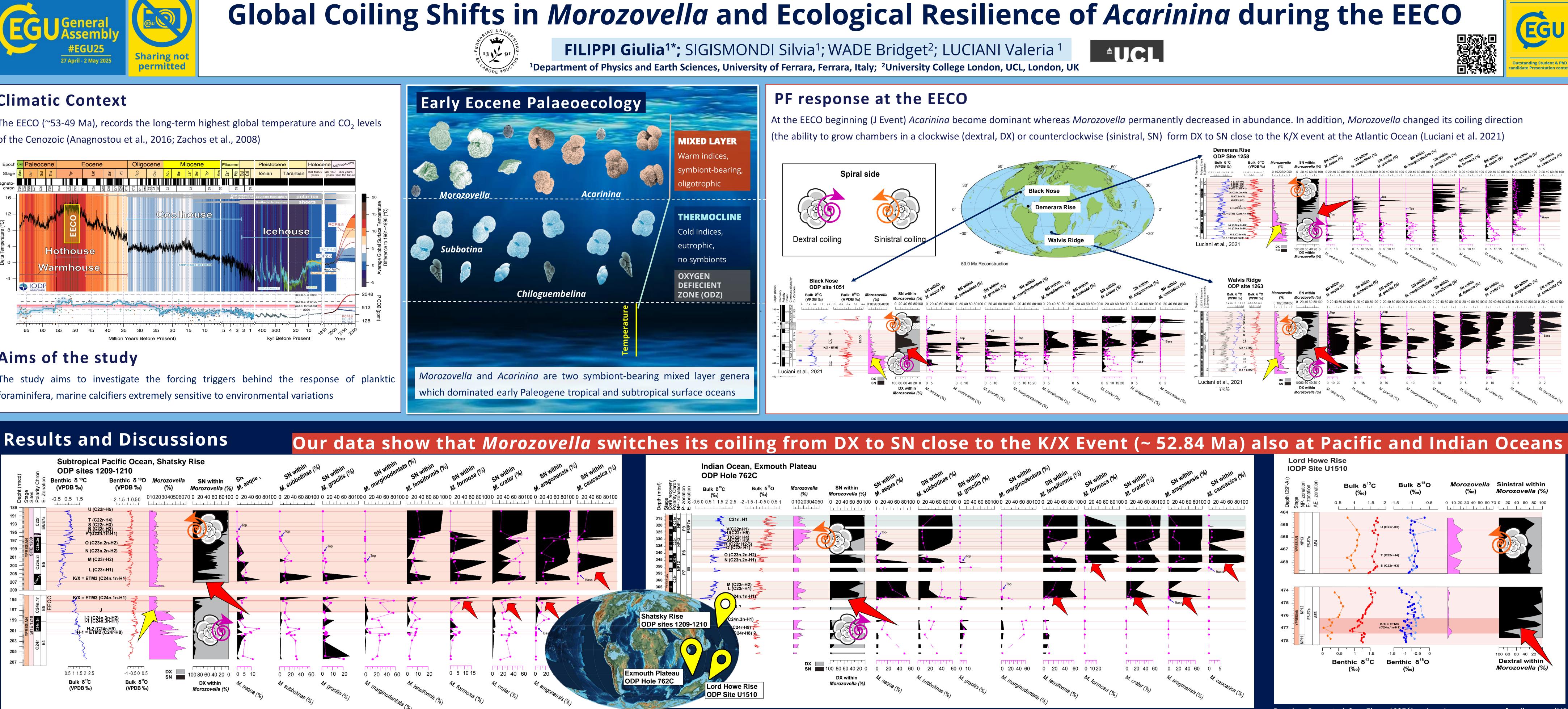
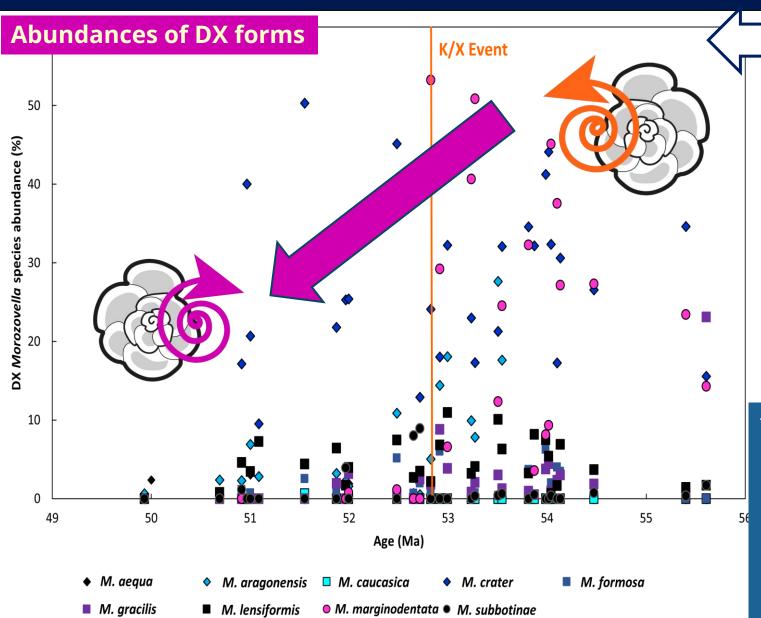


The EECO (~53-49 Ma), records the long-term highest global temperature and CO₂ levels of the Cenozoic (Anagnostou et al., 2016; Zachos et al., 2008)





Stable Benthic isotope curves, and magnetostratigraphy are from Westerhold et al. (2018). Planktic foraminiferal biostratigraphy, Bulk stable isotopes curves, and Morozovella genus relative abundances (%) are from Filippi et al. (2024). while Morozovella species abundances (in pink) are documented in Filippi et al. (2025).



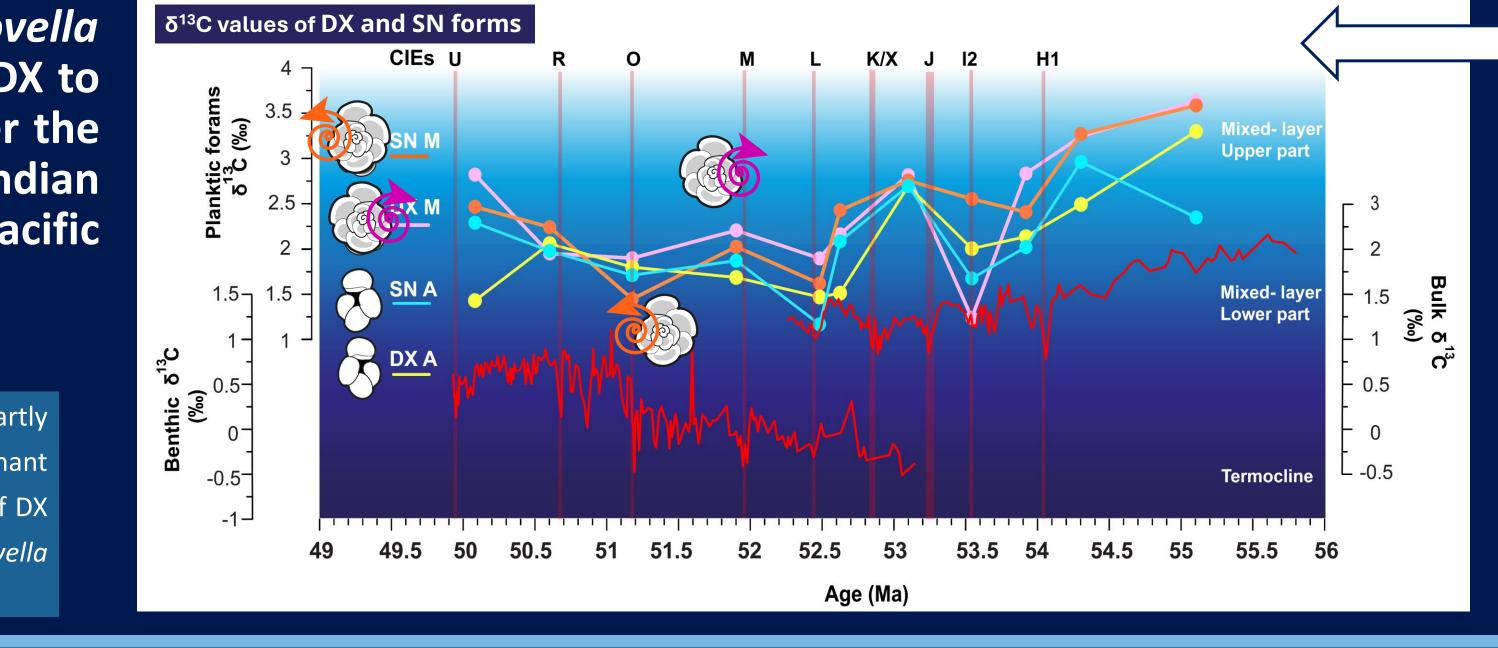
Morozovella switches from DX to SN ~30 kyr after the K/X Event in Indian and southern Pacific locations

The coiling shift can be partly explained by the predominant decrease in the abundances of DX morphotypes of *Morozovella* species (or cryptic species)

Conclusions

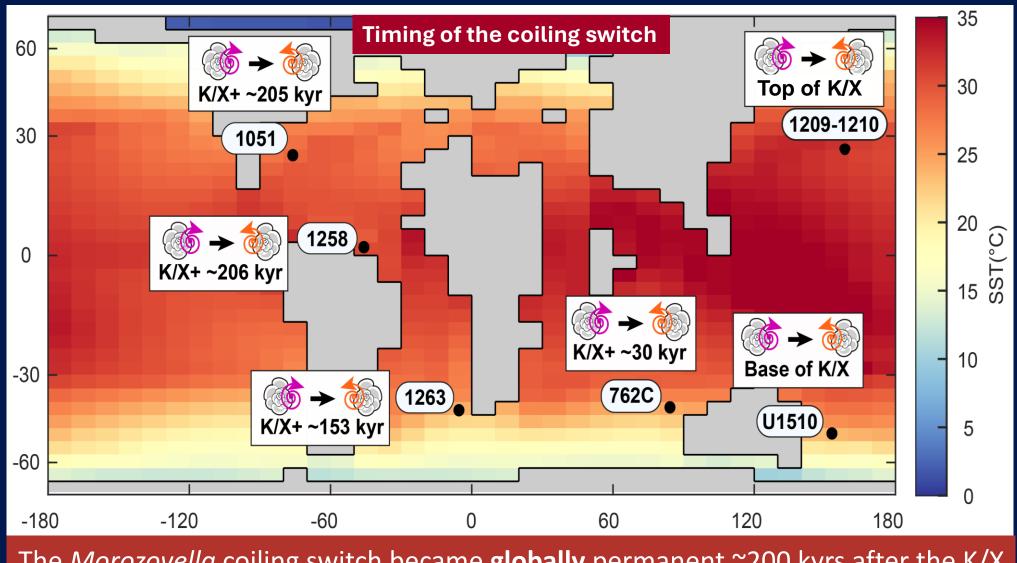
In the early ~ 800 kyrs of the EECO the genus *Morozovella* GLOBALLY declined in abundance and changes its coiling direction from DX to predominantly SN. The switch in coiling direction can be partially read as the demise in abundances of DX Morozovella species at the EECO onset (M. subbotinae, M. marginodentata, M., gracilis). Deepening in the mixed layer and reducing the symbiosis might have been a winning strategy adopted by the more flexible Acarinina and partially by Morozovella SN morphotypes, as recorded by lower stable isotopes data. *Morozovella* decline in abundance at the start of the EECO and its coiling switch after the K/X event might represent two important **biostratigraphic tools.**

Bulk stable isotopes, Morozovella genus and species abundances (%) (pink curves: Filippi and Luciani, 2025), Magnetostratigraphy:Shamrock et al. (2012) and Xu et al. (2021), calcareous nannofossil biozonation (NP): Siesser and Bralower, (1992). Planktic foraminifera zones(P-zonation): Hancock et al. (2002). E-zonation : Wade et al. (2011) as modified in Luciani and Giusberti (2014). The main CIEs labelled according to Westerhold et al. (2017).



Acarinina and SN Morozovella generally records lower $\delta^{13}C$ than DX Morozovella, values suggesting deeper ecological niche and partial symbiosis activity reduction.

This strategy enabled Acarinina to thrive and SN *Morozovella* to survive though in low abundance



The *Morozovella* coiling switch became **globally** permanent ~200 kyrs after the K/X event, thus representing a **powerful biostratigraphic tool**



Depths: Corrected Sea Floor (CSF/A m), calcareous nannofossil zones (NP Zones, Martini 1971), Stable Isotope curves: Alegret et al. (2021). Planktic forams zones (E Zones): Wade et al. (2011) Antarctic zonation AE: Huber and Quillévéré (2005).

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