

The role of sediments in regulating the Earth's climate

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Carbon concentrations

- A significant increase in the atmospheric carbon over the last 260 years, from 280 ppm (Sundquist et al., 2008) to 419 ppm in May 2021 (NOAA-ESRL, 2021).
- Increase in the oceanic uptake of carbon (from around 330 μatm in 1990s to 375 μatm in 2013 (NOAA-ESRL, 2013))
- Additional sequestration in the marine sediments
 - Not thoroughly researched
 - Only a couple of calculations (e.g. Atwood et al., 2020 and references therein)



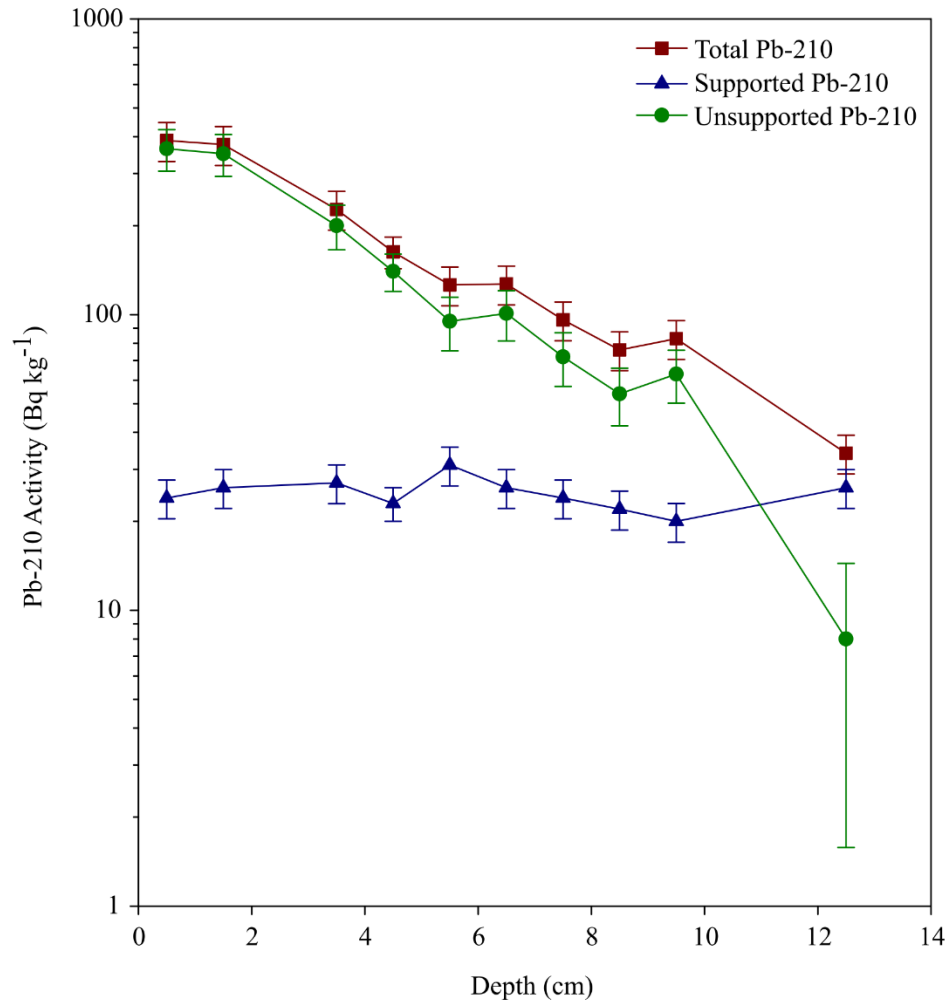
Adriatic and the Black Sea



- Different environments -> important difference - stratification
- Adriatic sea - no significant stratification, continuous salinity, oxic
- Black Sea - surface layer = less dense, lower salinity ($S \approx 18 \text{ ‰}$), oxic
 - bottom layer = more dense, higher salinity ($S \approx 23 \text{ ‰}$), anoxic
 - shallow oxycline ($\sim 100 \text{ m}$) (Murray et al., 2007)



Pb-210 dating and carbon concentrations measurements

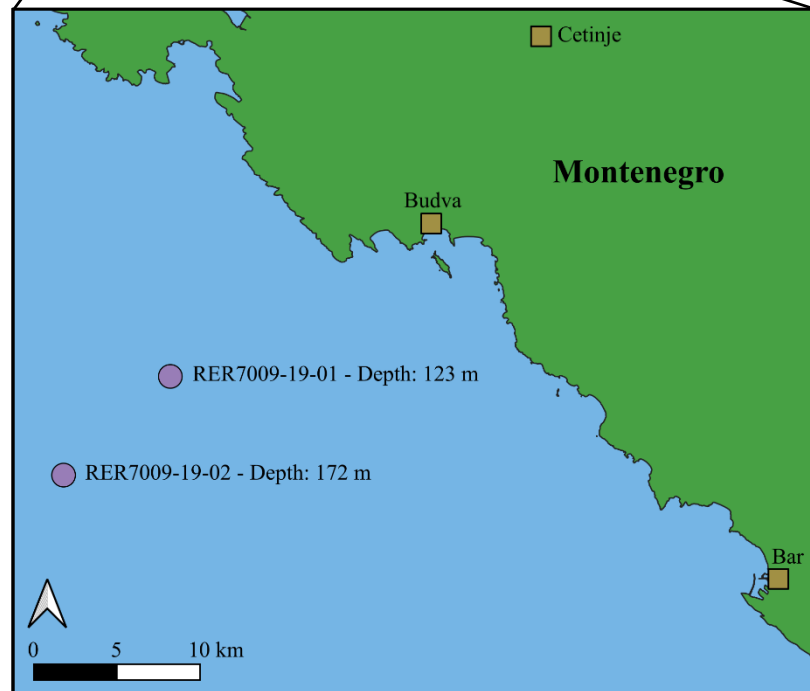
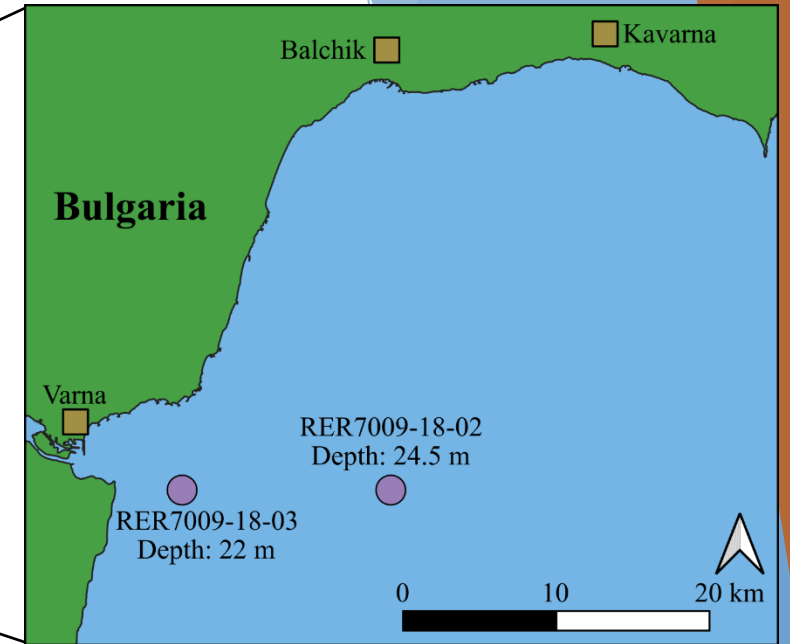
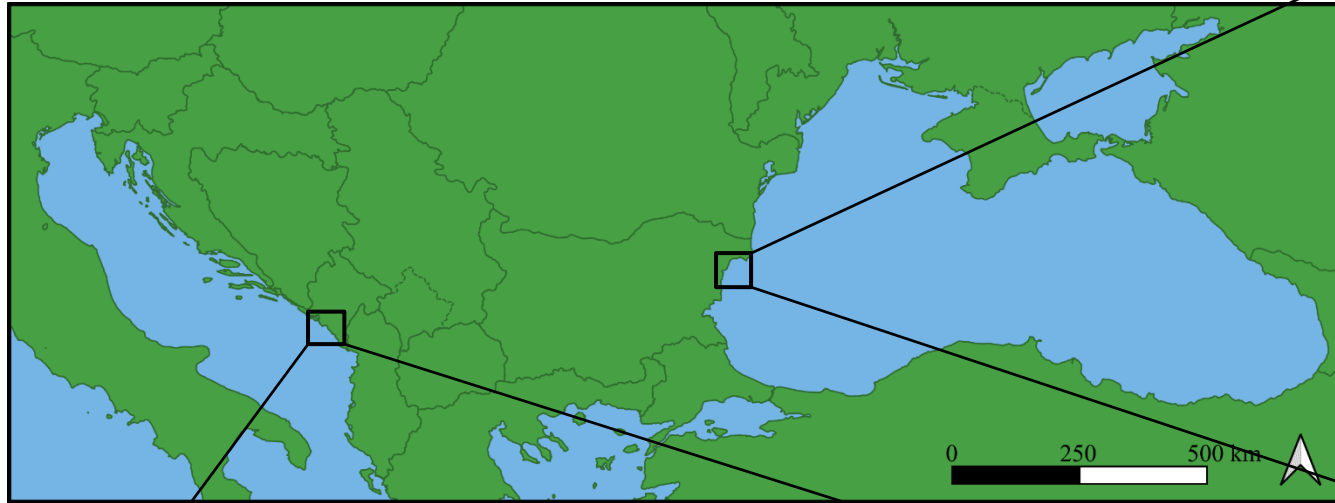


- In sediments:
Total carbon = Total organic carbon +
Total inorganic carbon
 $TC (\%) = TOC (\%) + TIC (\%)$
- OC can be removed by combustion
- IC can be removed by acidification
- Mostly measured by carbon analyzers

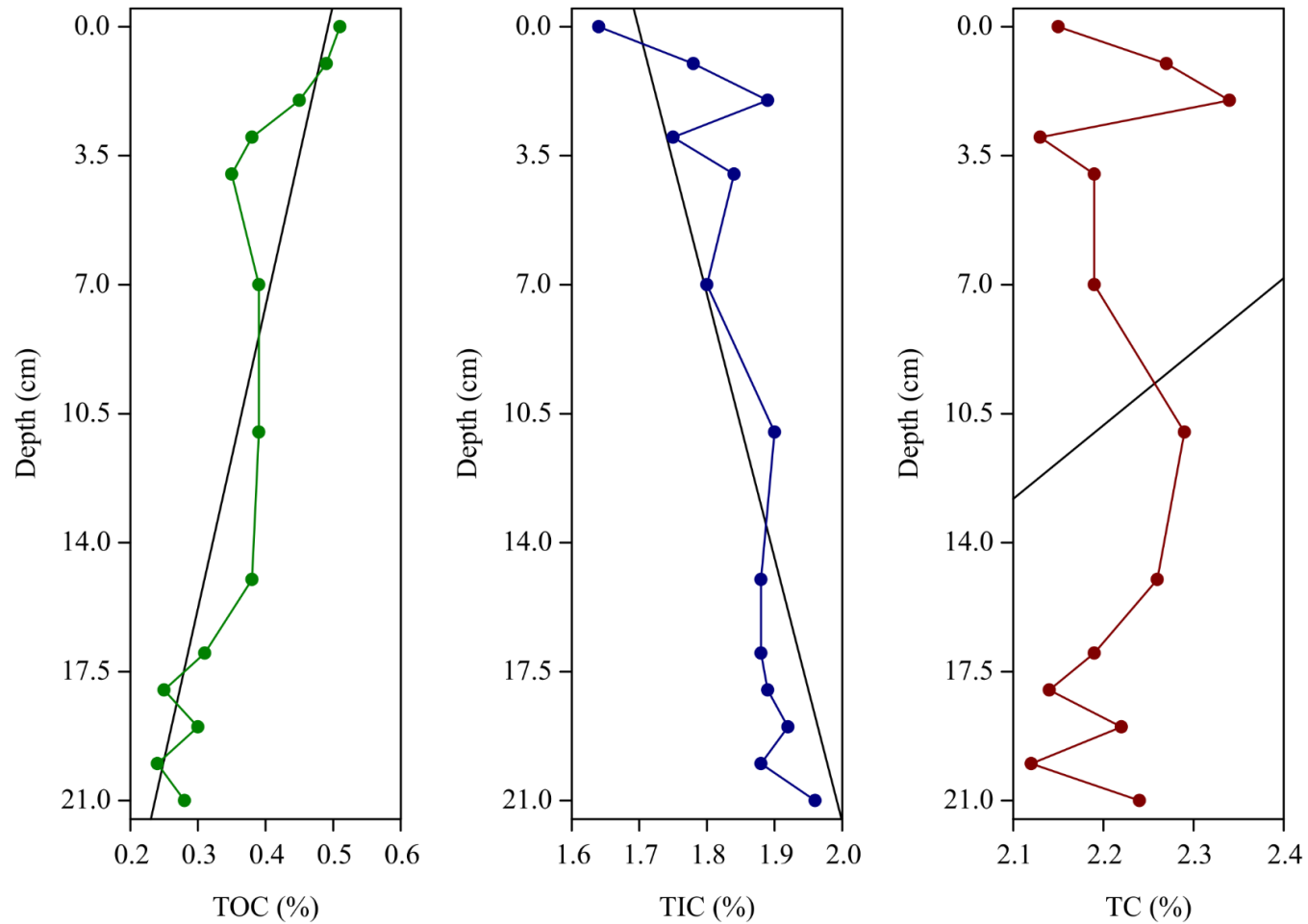
- Mostly measured by gamma spectrometers



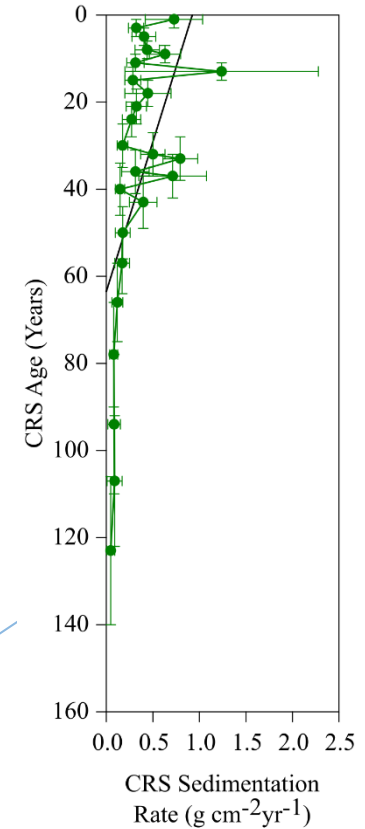
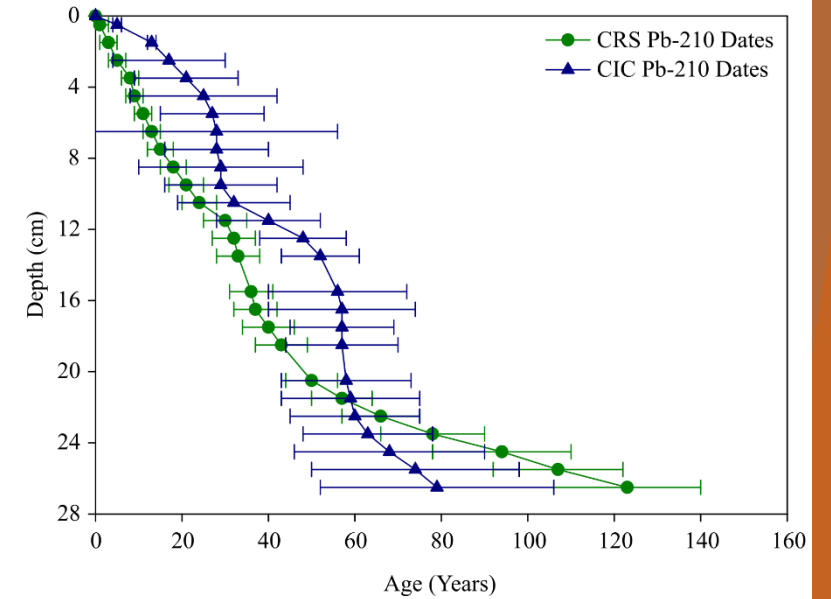
Results



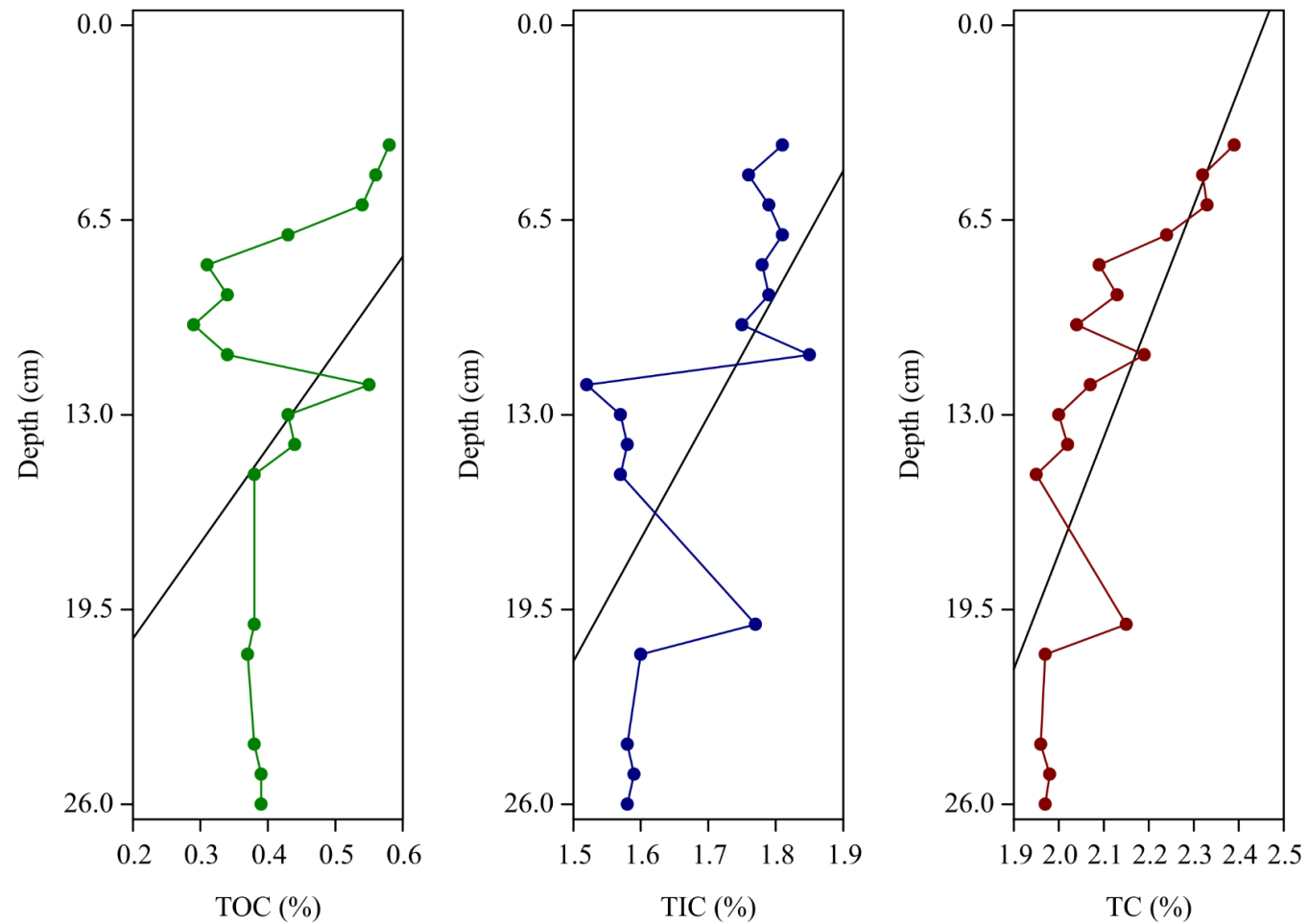
Black Sea core - RER7009/18-2



- Water depth: 24.5 m



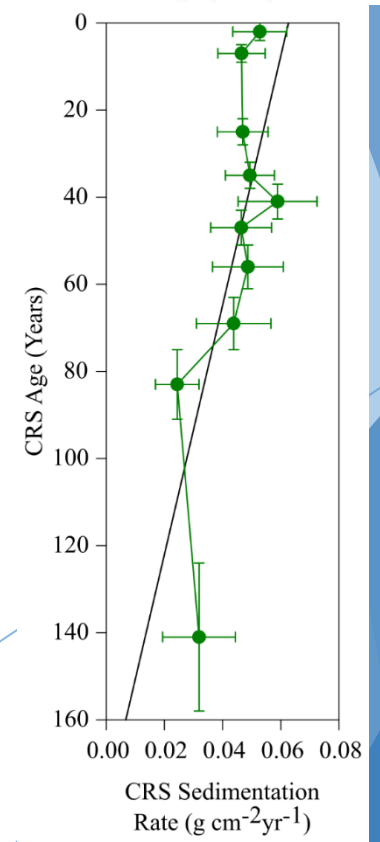
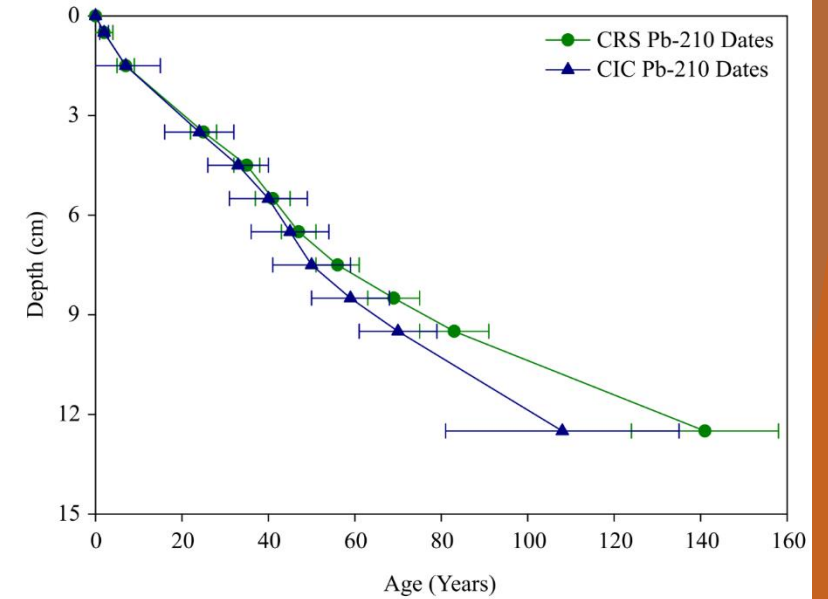
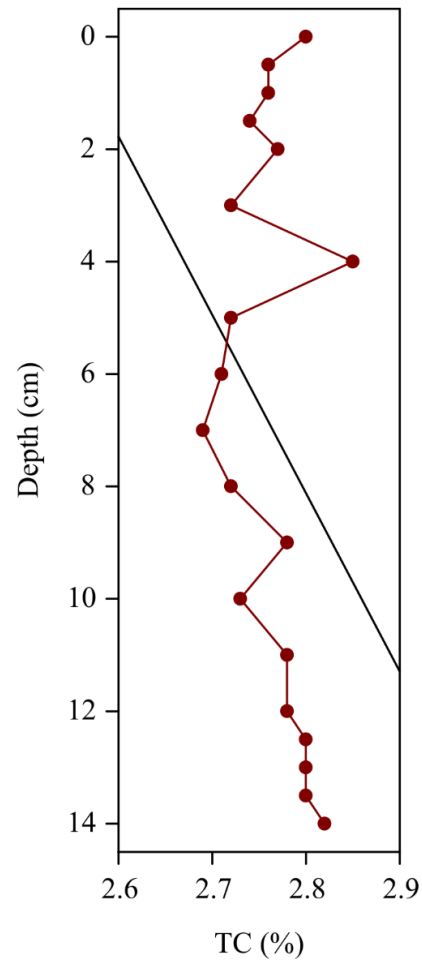
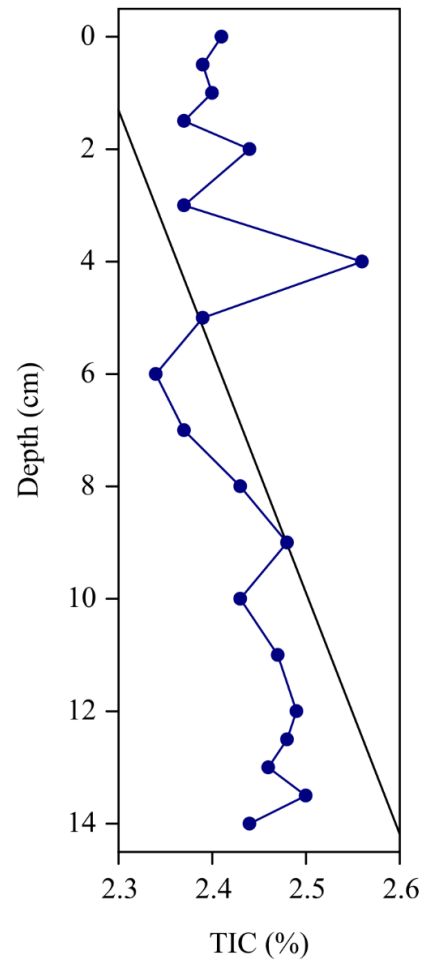
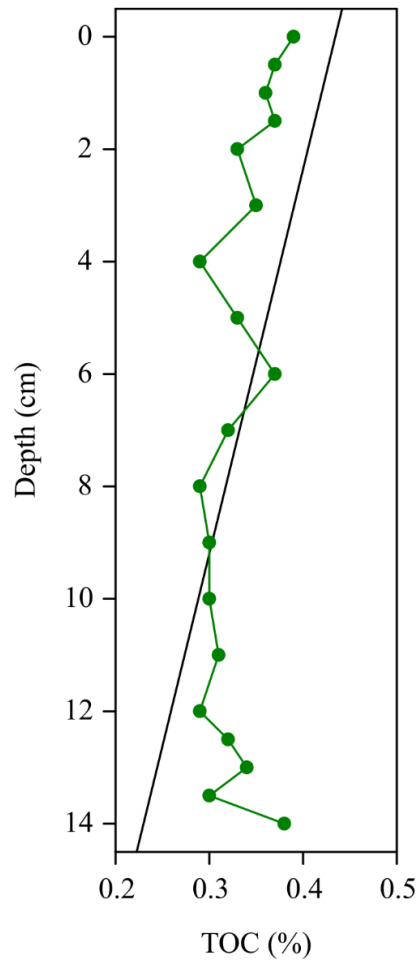
Black Sea core - RER7009/18-3



- Water depth: 22 m



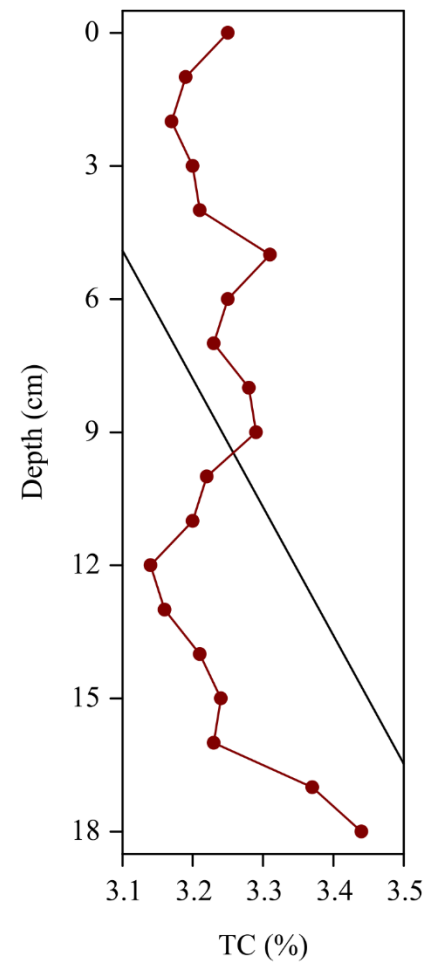
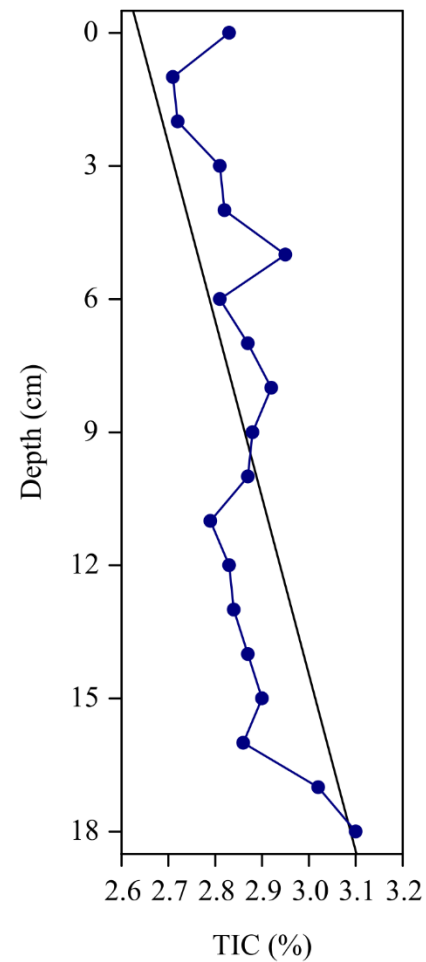
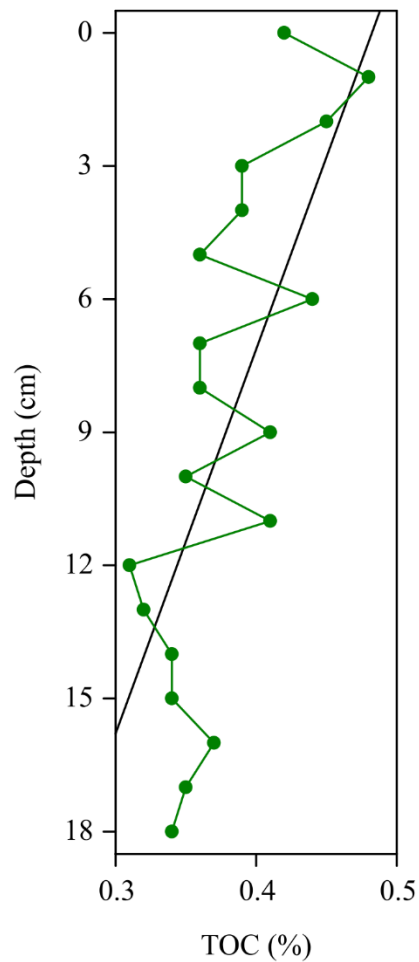
Adriatic Sea core - RER7009/19-1



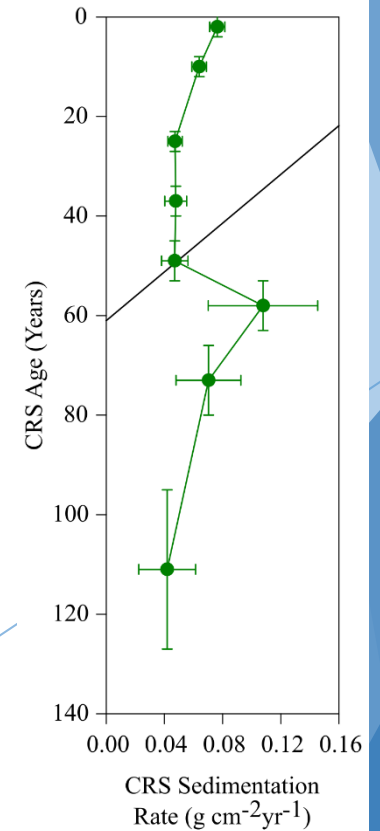
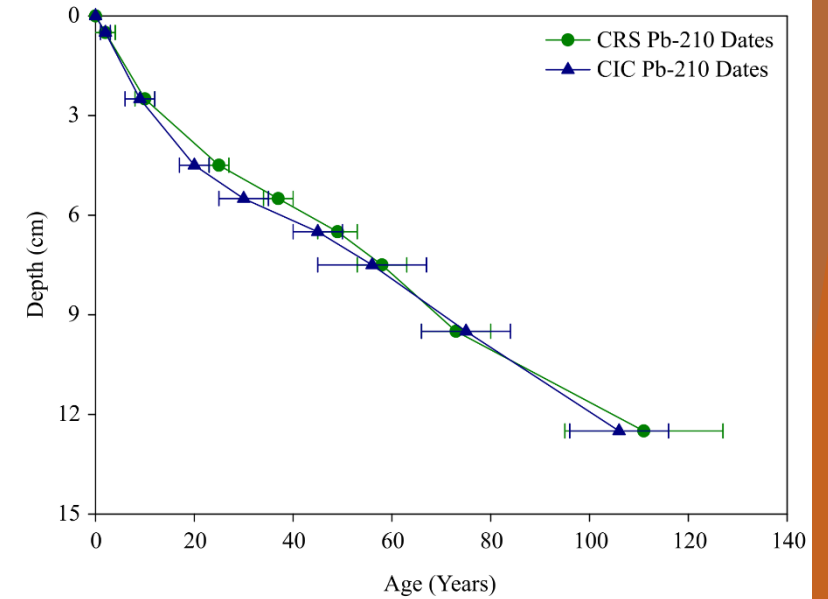
- Water depth: 123 m



Adriatic Sea core - RER7009/19-2



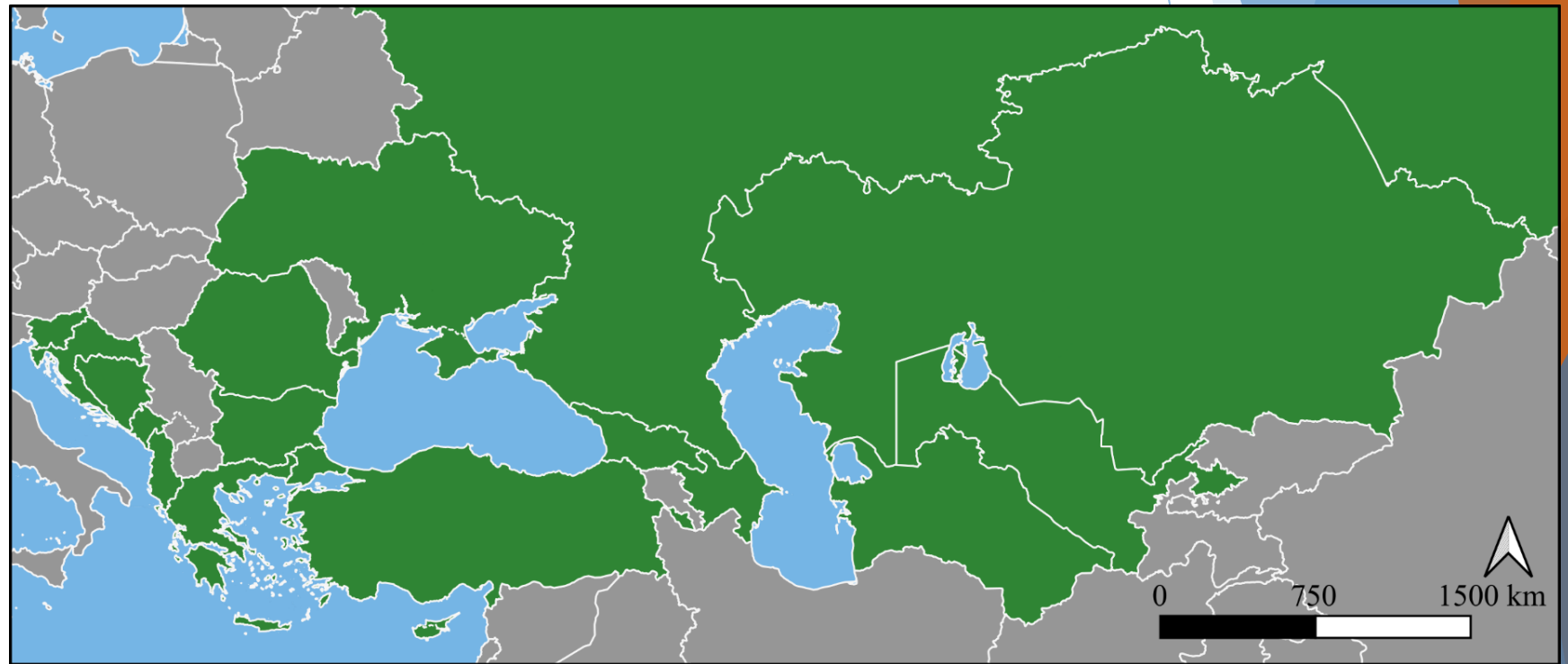
- Water depth: 172 m



Collaboration - IAEA project RER7015 “Enhancing Coastal Management in the Mediterranean, the Black Sea, the Caspian Sea, and the Aral Sea by Using Nuclear Analytical Techniques”

17 countries involved:

- Albania
- Azerbaijan
- Bosnia and Herzegovina
- Bulgaria
- Croatia
- Cyprus
- Georgia
- Greece
- Kazakhstan
- Montenegro
- Romania
- Russia
- Slovenia
- Turkey
- Turkmenistan
- Ukraine
- Uzbekistan



Thank you for your attention.

