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The link between flourishing cold-water corals and the interaction of water mass boundary and tidal activity at the Eastern Atlantic transect

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Cold-water corals (CWCs) form important benthic habitats, but the hydrodynamic control of their distribution and health is understudied. In order to study this link, we deployed landers recording with high temporal resolution the ocean currents and hydrography on eight *Lophelia pertusa* dominant CWC sites across the eastern Atlantic continental shelf. The CWC sites selected differ in health status from flourishing to historical corals. The deployment time for each site varied from days up to a year and the data was collected during the years 2004-2017.

We found a link between the health status of CWCs and tidal activity and the near seabed density gradient linked to water mass boundaries. The flourishing CWC sites have anisotropic current field with strong tidal activity and the maximum density gradient over 0.05 kgm $^{-3}$/10m. These features weaken until the flow is isotropic and the maximum density gradient is less than 0.02 kgm $^{-3}$/10m. Under these conditions, only paleo CWCs or no CWCs are found.

The complex seabed topography exerts a physical control on the deep current regime such as density-driven convection and current acceleration. Together with the near seabed water mass boundary the current field creates ideal conditions for both lateral and vertical transports of food particles to CWCs. This new insight into processes controlling CWC ecosystems helps us to explain the global distribution of CWCs and map the potential CWC sites.