# Holocene North Atlantic mid-depth gyre dynamics revisited

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The North Atlantic Ocean upper to mid-depth circulation plays a major role in the climate via the Meridional Overturning circulation (AMOC). The eastward extension and strength of the subpolar gyre (SPG) are determining components of temperature/salinity forming the upper limb of the AMOC. Moreover, the northward propagation of Mediterranean outflow waters and subtropical waters along the west European slope current could be a significant players in the North Atlantic salinity budget.

In 2010, Colin *et al.* [1] demonstrated the Holocene dynamic of the competing subpolar and subtropical gyres via εNd measurements of cold-water corals (CWC) from Rockall Bank, because of the contrasted signature of water masses originating from the SPG (≈ -15) and the subtropics (≈ -10). Here, we revisit Rockall Bank and present further evidence on the Holocene water mass competition providing further tracer results (εNd, Li/Mg temperatures, and $^{14}C$) recorded in CWC. The middle Holocene, from 7 to 5 ka, is marked by a major change in mid-depth circulation toward a stronger influence of subtropical water. The first step of this transition occurred rapidly, around 7 ka and is possibly linked with the onset of deep-water formation in the Labrador Sea. Then, we confirm previous results but demonstrate high-frequency variability of εNd. During the last 5 ka, the Rockall trough was invaded at intervals by subpolar water involving on first order stronger SPG eastward circulation. Finally, while the water mass sensitive tracer εNd reveals short but large amplitude variations, the corals Li/Mg indicate fairly constant thermocline temperatures over the Holocene of average 8°C, identical to the present day value. This contrasts observations from the Iceland basin thermocline water [2], and suggests a salinity like behavior of εNd within Rockall Trough.

[1] Colin, Frank, Copard & Douville (2010), Quat.Sci.Rev. **29**, 2509-2517. [2] Thornalley, Elderfield & McCave1 (2009), Nature **457**, 711-714.