

***Interactive comment on* “Controls of Caribbean surface hydrology during the mid- to late Holocene: insights from monthly resolved coral records” by C. Girya et al.**

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According to referee #2, the history of sea surface hydrology has been successfully extracted. However, it is advised to address some aspects in order to improve the quality of the manuscript.

Referee #2 indicates that Sr/Ca variations of modern corals are too large to be explained by temperature changes only. This has been addressed in an earlier study (Girya et al., 2012) and attributed to inter-colony offset in coral Sr/Ca. Many factors can influence this geochemical composition. The observed inter-colony variations coral Sr/Ca from three modern corals leads to an uncertainty in reconstructing absolute coral

Sr/Ca-derived SST. In this earlier study, we considered this uncertainty and applied a well-established approach to quantitatively and carefully reconstruct past Sr/Ca-based SST (Cf. section 3.1.1 of Giry et al., 2012). With regards to coral d18O, since coral d18O is influenced by both temperature and salinity, quantifying the effect of each individual component is difficult here. As our aim is not to decipher the influence of these components, we decided not to do such integrated analysis. Nevertheless, the combined effect of uncertainties in proxy-based SST and derived-SSS is integrated in the reconstruction of Dd18O during the mid-to late Holocene (cf. section 4.2 and Figure 3). The large uncertainties in reconstructing d18Osw using well-established approach (Abram et al., 2009, Giry et al., 2012) leads to careful interpretation of our coral-based reconstruction. Note that we do not propose quantification of salinity variations due to further complications associated with calibrating d18Osw-derived-SSS.

Concerning the upwelling issue, referee #1 largely comment on that topic too and suggested to add some thoughts on that topic. In our reply to his comments we demonstrated that there is not direct influence of the upwelling on Bonaire. Moreover, referee #2 suggests to further indicate possible ways to support our interpretation of the coral data using others proxies. To do so one could analyse others proxies: Ba/Ca could be measured in order to investigate upwelled water masses recorded in our coral data and Delta14C for tracing the source of water masses reaching Bonaire (tropical/subtropical sources).

It was not so clear for the referee #2 that the new contribution and the aim of the study are to assess short-term variability (seasonal to multidecadal timescales) of sea surface hydrology for snapshots of the last 6ka. Several studies have investigated long-term changes in Caribbean climate, however, very little is known on its variability on shorter timescales. Referee #2 is right; this should be indicated more explicitly in the introduction.

The decade-long highly-resolved coral records used in this study enable us unique investigation of forcing mechanisms controlling short-term climate variability in the south-

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ern Caribbean for pre-industrial times. Such unique approach needs lots of geochemical coral data in order to assess simultaneously seasonality, interannual to multidecadal variability of sea surface hydrology with a long-term perspective. To do so, it is important to investigate all timescales in a single paper as it was done earlier in Giry et al., (2012). This allows centralising all data and corresponding interpretations. Unfortunately, this contributes to a long and extensive story. Further details on proxy-model comparison as well as other coral-based studies from other locations would definitely make the story even longer, so it is not worth extending the modelling part. Moreover, as referee #1 indicated with the following sentence “It would benefit the field if all authors did this as well“, the approach used to interpret sea surface hydrology from Bonaire coral records is innovative, so this means that there are not many other similar studies to discuss here.

References

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Giry, C., Felis, T., Kölling, M., Scholz, D., Wei, W., Lohmann, G., and Scheffers, S., (2012), Mid- to late Holocene changes in tropical Atlantic temperature seasonality and interannual to multidecadal variability documented in southern Caribbean corals, *Earth and Planetary Science Letters*, 331–332, 187-200, 2012.

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