Review on “AMO-like variations of Holocene sea surface temperatures in the North Atlantic Ocean”, by S. Feng, Q. HU, and R.J. Oglesby

The paper investigates the dominant pattern of Holocene SST variability and its similarity with the dominant mode of modern decadal SST variability in the Atlantic Ocean, which is referred as Atlantic Multidecadal Oscillation (AMO). They investigate also a possible role of the AMO on the 8.2 ka cold event and on the Medieval Warm Period (AD 800-1300). The paper is valuable because it proposes a new interpretation of the dominant pattern of the Holocene SST variability. However there are some points the authors should clarify to convince that the Holocene SST pattern resembles more the AMO-SST than NAO-SST like pattern.
I have several comments the authors may consider for improving their paper.

Comments

1. A stable pattern which appears in Fig. 3a, which is described also in the papers cited here, is the dipole between eastern Mediterranean/Northern Red Sea and western Mediterranean/eastern North Atlantic. Such a dipole does not appear in any seasonal AMO-SST patterns. (Fig. 1).
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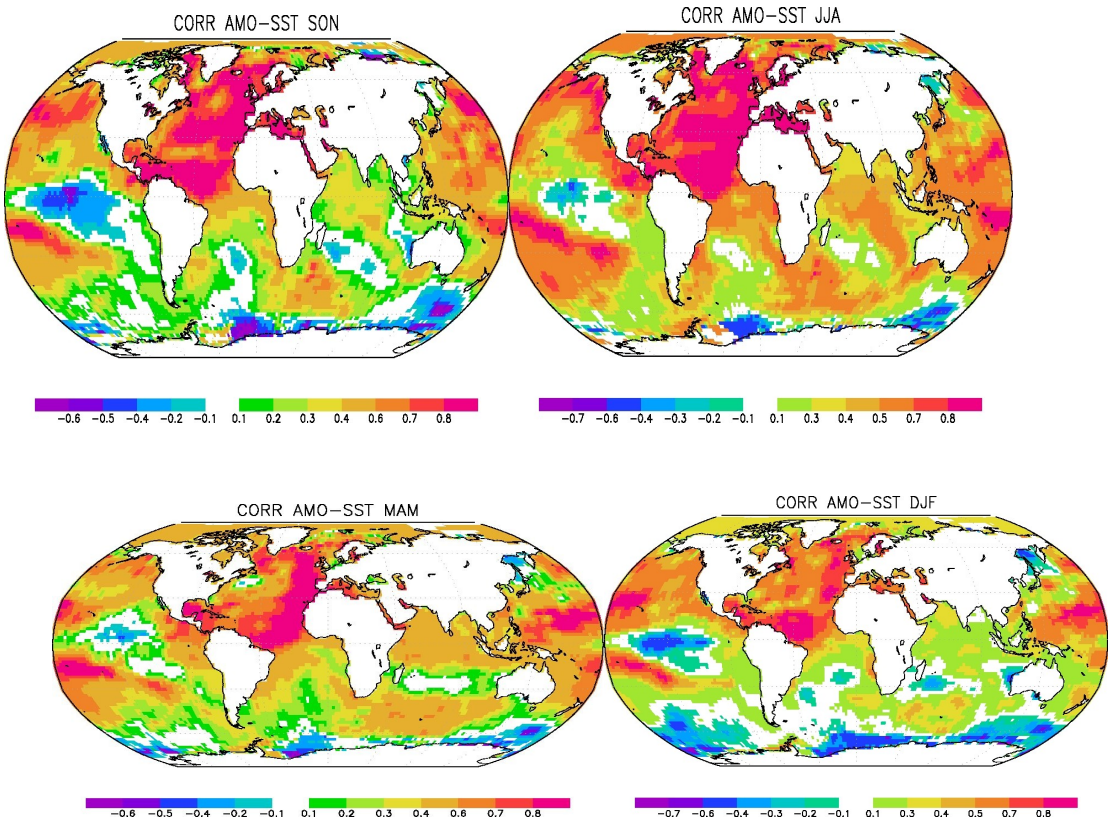

Figure 1. Correlation AMO-Index (Kaplan) with global SST (ERSST) for winter (DJF), spring (MAM), summer (JJA) and autumn (SON). The data (period 1856-2008) are detrended and smoothed with 21-year rm filter.

2. The Holocene SST dominant pattern (Fig. 3a) does not show a well defined dipole pattern in the Atlantic Ocean, which is a key element of AMO SST pattern identified in the observed SST field. In the South Atlantic there is only one core with anomaly opposite to those from the North Atlantic. The spatial resolution of the South Atlantic SST reconstruction should be improved to clearly emphasize the North-South Atlantic SST dipole.

In my opinion the spatial resolutions of the Holocene SST-data used in this and previous studies cited here are not high enough to conclude that the dominant mode of Holocene millennial and longer time scale SST-variability is similar to the modern AMO or NAO-SST patterns. This remains an open question until high resolution proxy data as well as simulations with high resolution climate models are available.

3. Is not very clear how the observed annual fields were filtered. In order to obtain AMO and related patterns the fields have to be linear detrended and filtered in order to isolate decadal variations. A more detailed description of statistics used to produce the observed and proxy patterns would improve the quality of the paper.

4. In this study only annual resolution observed fields are used to establish AMO pattern and related teleconnections. Although AMO is the dominant mode of decadal SST variability in all seasons the associated teleconnections may be seasonal dependent. A discussion of seasonal AMO teleconnections during observational period and during Holocene based on AMO reconstruction presented here would be valuable.

5. It is argued that basin-wide monopolar SST variations in the North Atlantic induces dipolar SLP variations in the Atlantic region. Such an atmospheric circulation pattern is similar to the NAO pattern (Fig. 7). However, the dipolar SLP pattern associated to the AMO does not produce dipolar SST pattern in the eastern North Atlantic/western Mediterranean and eastern Mediterranean/northern Red Sea but NAO does. This was the main reason that previous studies associate the dominant mode of Holocene SST-variability to the NAO.

6. It is argued that physical mechanisms that control SST variations at interannual time scales are different from those operating on decadal and longer time scales. This is true but it is not an argument to consider that processes operating at decadal time scales are the same with those operating at centennial, millennial or longer time scales. The monopolar SST structure in the North Atlantic during Holocene could be due to variations of THC like in the case of the AMO but could be induced by other mechanisms not related to the AMO. Only model experiments could clarify if THC variations or other causes are responsible for the monopolar structure of the dominant pattern of North Atlantic SST at centennial and longer time scales during the Holocene.

7. It is evident from Figure 5 that temperature anomaly in the Atlantic-Mediterranean region is monopolar during 8.2 ka cold event and during MWP event. It matches exactly the AMO pattern which does not show dipolar pattern in the eastern Mediterranean-Northern Red Sea and western Mediterranean and eastern North Atlantic like EOF01 (Fig. 3). Therefore the patterns in Fig 3 (EOF01) and those in Fig 5(temperature anomaly during MWP and 8.2 ka event) are not similar and the physical mechanisms behind them could be different.