Towards a Biostratigraphic-Controlled Chronostratigraphic Framework for the Aegean Sea (Eastern Mediterranean)

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The last half-century considerable interest has developed on the role of the (sub) tropical oceans in climate change, and in particular, oceanic sub-basins and marginal seas that are often more responsive to paleoceanographic and paleoclimatic changes than broader global ocean basins, because of their smaller size and partial isolation (Kontakiotis, 2016; Kontakiotis *et al*., 2013; Marino *et al*., 2009; Antonarakou *et al.*, 2015, 2019). As an example, the small volume of the Mediterranean Sea, compared with ocean basins, causes changes in its climatic forcing to be recorded virtually instantaneously in palaeoceanographic proxy data, such as stable isotope and other geochemical ratios, and microfossil abundances. The basin's limited communication with the open ocean implies that any climatic signals will be recorded in an amplified fashion in Mediterranean properties, such as temperature, salinity and specific elemental concentrations (Kontakiotis, 2012). Especially the eastern Mediterranean is ideal for addressing proposed forcing mechanisms of tropical climate variability (Kontakiotis, 2016; Casford *et al*., 2007) due to its intermediate position between the higher-latitude (i.e. North Atlantic-influenced) and lower-latitude (i.e. monsoonally influenced) climate systems. This heightened sensitivity to the effects of climate variations seems to be especially true for the Aegean Sea, because of the combination of its semi-isolation from the rest of the Mediterranean Sea, its small size, large topographic contrasts acting as specific boundary conditions, the abundance of local freshwater inputs and the regional climate.

To better understand the impact of these parameters on the regional climate, a number of studies has focused on the paleoceanographic evolution of the basin during the late Quaternary (e.g., Drinia *et al*., 2016; Kontakiotis, 2016; Koutrouli *et al*., 2018). However, the reconstruction of the variability of late Quaternary climate needs a detailed chronostratigraphic control. In this respect, a notable contribution is particularly required by micropaleontological, biogeochemical, and sedimentological studies. In particular, morphological and compositional changes in the planktonic foraminiferal assemblages recorded in marine sediments and/or the water column provide detailed information on the physical and chemical properties of the surrounding water masses and their relationships with climatic variability (Antonarakou *et al*., 2015; Kontakiotis, 2016; Zarkogiannis *et al*., 2019). They also allow the definition of a detailed sequence of regional eco-bioevents for the late Quaternary, reflecting the climatic oscillations that represent an important tool for an accurate subdivision of the late Quaternary stratigraphic record and facilitate correlations between sites in the different sub-basins (Casford *et al*., 2007; Budillon *et al*., 2009; Triantaphyllou *et al*., 2009; Siani *et al*., 2010; Lirer *et al*., 2013; Antonarakou *et al*., 2019).

This study aimed at achieving high resolution sediment cores at sub-centennial to centennial scale, and therefore highlights the planktonic foraminiferal abundance variations during the last glacial cycle from two gravity cores (M-22-67and NS-18) along the Aegean Sea. In particular, the relative abundance of selected climate-sensitive planktonic foraminiferal species have led us to identify several eco-bioevents in *G. ruber alba, G. ruber rosea, G. bulloides, G. inflata, T.quinqueloba, N. pachyderma, N durtertrei, O. universa, G. sihonifera, G. trilobus, G. scitula, G. rubescens, G. glutinata*, and *G. trucatulinoides*. All faunal events have been defined by morphospecies evolution, first local occurrences and disappearances of a given species, prominent changes in coiling direction, frequency shifts and strong inflections in the faunal record, with reference to the pioneer work of Casford *et al*. (2007). The similarity between the two north and south Aegean records underlines the utility to support conventional dating methodologies with different constraints, and further reveals a powerful tool for reliably correlating marine records between comparable deep-sea marginal settings and/or an original dating tool for coeval sequences of this region. Overall, the bioevents chronology combined with ^{14}C-AMS data could be used to define an updated and comprehensive age model that can be considered as a useful paleoclimatic and stratigraphic reference record for the entire eastern Mediterranean Sea.

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