Calcareous nannofossils assemblages during Middle–Late Miocene to reconstruct Indian Ocean paleoproductivity (ODP Sites 707–752)

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The Indian Summer Monsoon (ISM) represents a dynamic system linked to seasonal (winter and summer) variations in surface winds direction. An atmospheric pressure gradient, created by high- and low-pressure cells located in the Indian Ocean, is responsible for the emplacement of cross-hemispheric near-surface winds (e.g., Findlater Jet; FJ). Thus, the strength and position of the southern hemisphere high-pressure cells strongly control the ISM system. In the western Arabian Sea, the FJ is strictly correlated with the upwelling system and the organic matter flux that can therefore be used to record FJ variability at different temporal resolutions.

However, the development and rate of the upwelling processes between Middle to Late Miocene is, so far, poorly understood. Thus, this study aims to: 1) test how the upwelling responded to ocean and atmospheric variations in the southern climatic belts between 8–15 Million years (Ma) ago; 2) test how to evaluate changes in the nutrient cycle; 3) determine if high latitude changes in ocean-atmospheric circulation control the hypothesized forcing mechanisms for changes in the upwelling conditions (e.g., intermediate water changes and monsoon winds). Moreover, we want to assess the role played by the abovementioned mechanisms in past and future dynamics of the organic pump; 4) obtain a data framework for Miocene ISM variability and compare it with independent records of monsoonal wind strength; 5) integrate the data for the investigated region with the Middle/Late Miocene paleoclimatology and paleoceanography previously established records.

We will use a multi-proxy analysis which combines micropaleontological and geochemical data to evaluate all these points. The study of nannoplankton and diatom assemblages (DSDP Site 266 and ODP Sites 707 and 752) will allow to record the primary productivity and its variations in the area. Furthermore, calcareous nannofossil biostratigraphy will be performed to generate a chronostratigraphic framework for the studied interval and to obtain an age-depth model to constrain sedimentation rates and paleoecological conditions of the nannoplankton community in the Indian Ocean during the Middle-Late Miocene. Ultimately, geochemical analyses based on carbon and nitrogen isotopes (δ13C and δ15N) will be conducted to understand the link between the surface communities and changes in productivity.