INFLUENCE OF SEAFLOOR TOPOGRAPHY ON BENTHIC NUTRIENT FLUXES IN DEEP-SEA SEDIMENTS OF THE NORTH ATLANTIC (MSM96)

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INTRODUCTION

- Nutrients like nitrate, phosphate and silicate are consumed by primary producing organisms in the surface ocean
- The majority is recycled in the water column or surface sediments and only a small portion is permanently buried at the seafloor (Berger & Wefer, 1990)
- It is generally assumed that benthic nutrient fluxes are similar across vast areas of the deep ocean, which is questionable because of heterogeneous topography that leads to unequal sedimentation rates
- It is already known that water depth is a crucial factor for different nutrient concentrations and fluxes (Suess, 1980)
- **Exact influence of the seafloor topography on diffusive benthic nutrient fluxes not studied yet**

METHODS

- Measurements of bottom water and pore water nutrient concentrations from regions with topographical differences of 50-500 m
- Sediment cores were taken with a multiple corer
- Four samples per topography type (hill, valley, plain) for each working area (PAP, SWIAP, see figure 1)
- Pore water was extracted, filtered and frozen until analysis of nutrient concentrations using an autoanalyzer at GEOMAR after the cruise
- The diffusive fluxes across the sediment-water interface were calculated from the concentration difference between bottom water and uppermost pore water (0-1 cm) sample according to Fick's first law

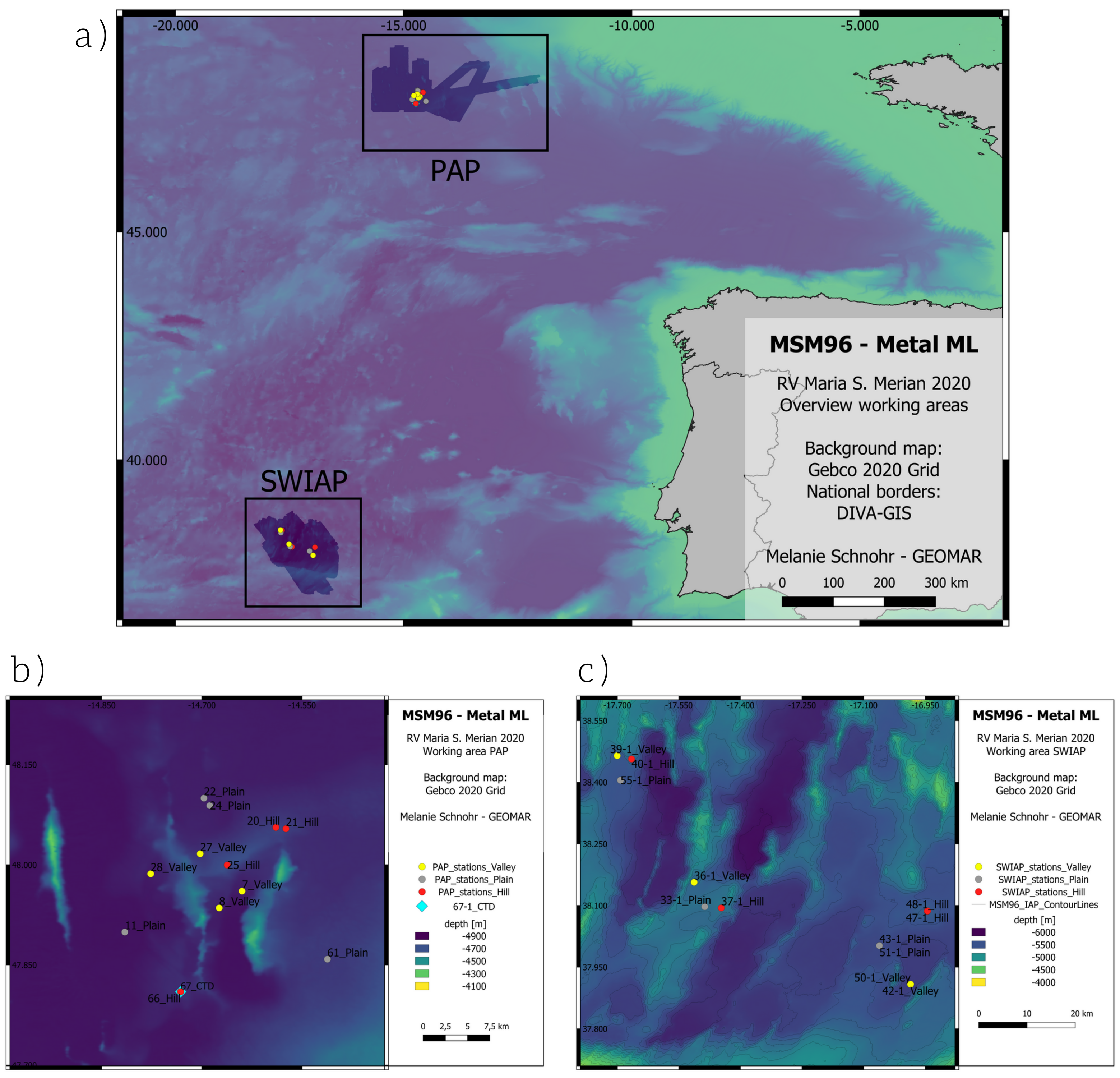
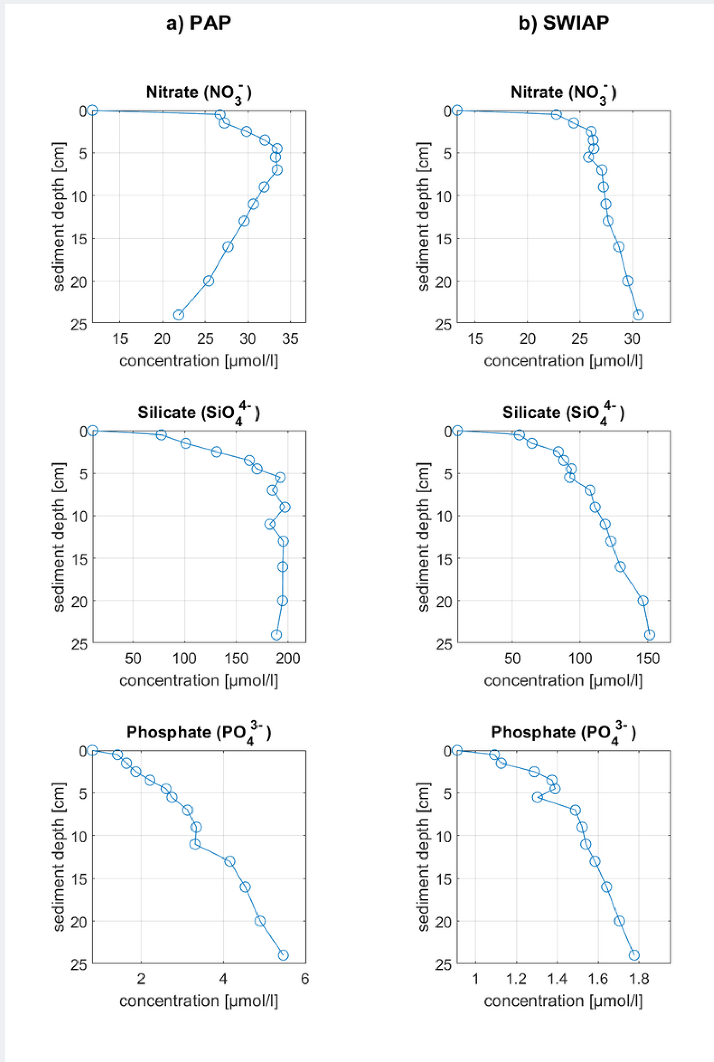


Figure 1: Location of the working areas (a) overview, (b) Porcupine Abyssal Plain (PAP), (c) South Western Iberian Abyssal Plain (SWIAP) (Mohrmann et al, 2021).

RESULTS

Differences in nutrient profiles between the working areas (figure 2):



- PAP: Decrease downcore from roughly 5cm
- SWIAP: Slight increase

- PAP: Relatively constant below 5cm
- SWIAP: Further increase

- Higher concentrations in the PAP

Figure 2: Nutrient profiles in the working areas (a) PAP (28MUC) and (b) SWIAP (37MUC).

Differences in nutrient fluxes between topography types (figure 3):

- Flux calculations with average bottom water concentrations for the working areas because of a high variation between the stations
- Higher mean fluxes in the SWIAP than in the PAP
- Higher mean fluxes in valleys than hills

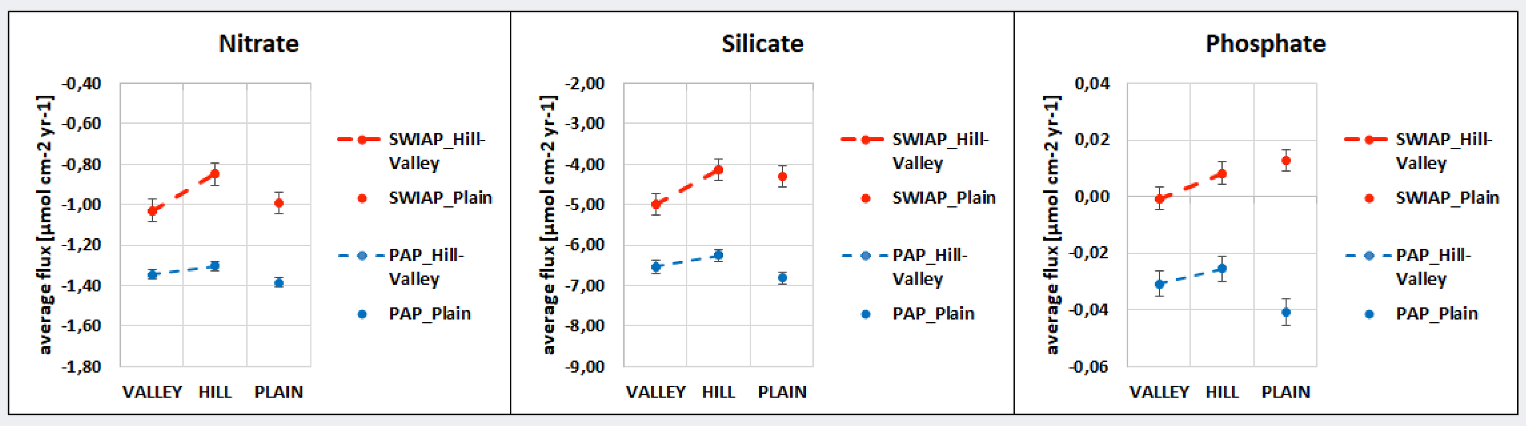


Figure 3: Average nutrient fluxes in both working areas shown separately for different topography types.

DISCUSSION

- Higher fluxes in valleys and lower fluxes in hills in both working areas
  → Higher organic matter accumulation in the valleys compared to the hills (fine-grained organic material is focused into the deeper areas)
- This trend is more pronounced in the working area with greater topographic variability (SWIAP)

References

Berger, W., & Wefer, G. (1990). Global and Planetary Change, 3(3), 245-254.
Suess, E. (1980). Nature, 288(5788), 260-263.
Mohrmann, J., Gazis, I.-Z., Schoening, T., & Wölfl, A.-C. (2021). https://doi.pangaea.de/10.1594/PANGAEA.930063

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