

## SCAR Fellowship Report 2010/2011

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### Host

Prof. Antoni Rosell-Mele

Institute of Environmental Science and Technology (ICTA), Autonomous University of Barcelona, Bellaterra, Spain.

### Duration

October 2010 – May 2011 (10 weeks stay for laboratory work, followed by short visits for data discussion)

### Work conducted during the scientific stay

Sediments core tops samples collected during the AWI expedition in the South Pacific, ANT26 on board German research vessel R/V Polarstern were analyzed. The total lipids were separated into 3 fractions containing the desired compounds, namely the n-alkanes (will be incorporated into the publication of Hambach concerning the dust input in the Southern Ocean), the alkenones and the glycerol dialkyl glycerol tetraethers (GDGTs) for the calibration study of these compounds as a proxy for sea surface temperature (SST) in the polar regions. Additional compounds analyzed include the branched GDGTs and the OH-GDGTs.

The GDGTs data have been presented at an international conference, i.e. the Goldschmidt Conference in Prague, August 2011. We are currently working on the publication of these data, as a compilation study which includes more than 150 data in the polar regions from several collaborators from AWI and ICTA. In the most general sense, we found that GDGT based SST proxy, i.e. TEX<sub>86</sub>, does not show a strong linear relationship with the SST in the polar regions, especially in the Arctic Ocean. At this stage it is unclear what are the underlying causes for the substantial scatter in the data set, some potential culprits include allochthonous input, GDGTs originate from mid water depths, and contribution from different archaeal community.

There is also plan to prepare a publication on the calibration study of alkenone paleothermometry in the Southern Ocean, with an emphasis on the comparison of the applicability of two alkenones indices, namely the U<sup>K</sup><sub>37</sub> and the simplified version U<sup>K</sup>'<sub>37</sub>. Although alkenone paleothermometry has been thoroughly studied in the past 2 decades, surprisingly there are only very few studies in the Southern Ocean. From our yet unpublished

downcore reconstruction work, we observed that the original index,  $U_{37}^K$  seems to fare better in the polar regions. We would like to confirm this finding using the sediment core tops. Unfortunately, we did not find alkenones in more than half of the samples we analyzed due to their very southern locations (the source organism of the alkenones do not thrive in cold polar waters). Therefore we could not, based on the core tops alkenones data, conclusively confirm the observation in the downcore reconstruction. More samples are needed for this calibration study.

### Financial Statement

| Items                                  | Costs            |
|--|------------------|
| Transportation (3 round trips flights) | 574 Euro         |
| Accommodation                          | 1208 Euro        |
| Living expenses and miscellaneous      | 2135 Euro        |
| <b>Total</b>                           | <b>4117 Euro</b> |

### Talks

Ho, S.L., Fietz, S., Rueda, G., Meheust, M., Martinez-Garcia, A., Mollenhauer, G., Rosell-Mele, A., Lamy, F., and Tiedemann, R. (2011) Is  $TEX_{86}$  paleothermometry applicable in the (sub)polar regions?, Goldschmidt Conference, Prague, Czech Republic.

Fietz., S., Martinez-Garcia, A., Hambach, B., Ho, S.L., Lamy, F., Geibert, W., and Rosell-Mele, A. (2011) Organic aerosol transport and deposition over the Southern Ocean, International Meeting of Organic Geochemistry, Interlaken, Switzerland.

### Acknowledgments

First and foremost, I would like to thank the SCAR for awarding me this fellowship to carry out the collaborative work with our colleagues in the ICTA, Barcelona. I found out that the most efficient way to learn and interpret data is via regular discussion and idea exchange with experienced scientists in the field. I also met some postdoctoral fellows whom could be future collaborators. I was able to witness the differences between the different systems in the laboratory here in Germany and in Spain, and hopefully this experience would come into handy in future if I would have the opportunity to set up a laboratory in my career. I owe many thanks to scientist and colleagues who made this scientific stay possible: the host Prof. Antoni Rosell-Mele; my supervisors Prof. Ralf Tiedemann, Prof. Gesine Mollenhauer, Dr. Frank Lamy; friendly people at ICTA i.e. Dr. Susanne Fietz, Dr. Carme Huguet, Dr. Alfredo Martinez-Garcia, Gemma Rueda, Bastian Hambach, Anna Barreras; my colleagues at AWI especially Dr. David Naafs; and the chief scientist of expedition ANT26 Dr. Rainer Gersonde.