**Objective:** The main objective of ALTIDEP was to test the feasibility of collecting samples for dissolved Aluminium (Al) and Titanium (Ti) during opportunity cruises without using “Trace metal clean” techniques. In addition to this “technical” objective, ALTIDEP goals were: (1) to document the Al and Ti concentrations in the western Mediterranean Sea and (2) to evaluate the suitability of using “high” spatial resolution Al and Ti surface concentration to estimate the flux of dust deposition to the Mediterranean Sea (MS).

**Main work achieved:** In June-July 2013, 270 samples were collected with “classical” Niskin bottles during the MOOSE-GE-2013 cruise on 20 vertical profiles and 55 surface samples. The analysis of all the MOOSE-GE samples has been achieved at the end of February 2014. During two short cruises on board the ANTEDON R/V (December 2013 and March 2014) in the bay of Marseille, samples have been collected with a “Trace metal Clean” GO-FLO bottle and a “classical” Niskin bottle for comparison. The analysis of all the ANTEDON samples has been achieved at the end of May 2014.

**Main results:** No significant differences were measured for both elements between “GO-FLO” and “Niskin” samples in the bay of Marseille during the two cruises on board the ANTEDON (Figure 1). Moreover, the Al concentrations during the MOOSE-GE cruise are in good agreement with former studies in the Mediterranean Sea. Therefore, **sampling from classical “Niskin bottles” is suitable for the study of Al and Ti concentrations in the Mediterranean Sea.**

ALTIDEP has allowed to significantly increase the number of Al and Ti concentrations profiles in the North Western MS. The obtained vertical profiles are only the second data set for Titanium in the MS. The vertical profiles show marked differences between Al and Ti concentrations in the water column (Figure 2): in particular, a maximum in Ti concentration is observed at the salinity maximum which is not observed for Al. This marked Ti maximum has not (to the best of our knowledge) been documented in other oceanic regions and could be characteristic of the Levantine Intermediate Waters. The fact that the Al concentrations do not show the same maximum could be linked to differences in scavenging of the two metals in the water column.

The “high” spatial resolution data set shows high Al and Ti concentrations close to the coast (mostly related to riverine discharge) which rapidly decrease towards the open MS. This result would support the potential to use surface concentrations to estimate dust deposition to the open MS. However, the variability of Al and Ti surface concentrations was not linked by a linear model to dust deposition fluxes (based on modeled dust deposition [Jickells et al. 2005]). The Al and Ti variability at the studied scale would be mostly impacted by local surface circulation. This indicates that, in the Mediterranean Sea, the use of “high” spatial resolution data of Al and Ti concentration to estimate regional dust deposition fluxes is not as straightforward as it has been proposed at the global scale (e.g. Measures and Vink 2000).
On the left panel (Figure 1): Scatter-plot of Al and Ti concentrations collected with “Trace Metal clean” GO-FLO bottle and “Classical” Niskin bottle during the two ANTEDON cruises in the bay of Marseille.

On the right panel (Figure 2): Vertical profiles of Ti (in red) and Al (in blue) concentrations at DYFAMED station. The salinity profile is shown in grey. Marked differences between both elements are observed: in particular, a maximum in Ti is observed at the salinity maximum (Levantine Intermediate Water) which is not observed for Al.

Future of the project: We could not prove that the higher spatial resolution of the surface concentrations could be useful for a better estimation of dust deposition fluxes. However, this could be due to the use of global dust deposition fluxes from a composite of model [Jickells et al. 2005], which has a coarse resolution and may not catch the regional variability in dust fluxes. Further test should be performed in the future with higher resolution dust deposition models specific to the MS.

The vertical distribution of Al and Ti in the water column was an unexpected result of the project. The remaining chemicals and material acquired with the ALTIDEP project has allowed to collect samples on vertical profiles during the MOOSE-GE-2014 cruise (10 profiles) and the BIOARGOMED 2015 cruise (6 Profiles). The BIOARGOMED cruise covered the entire Mediterranean sea and will certainly help to document the link between Ti vertical maximum and the LIW. These samples (out of project) will be soon analyzed and will perhaps serve as a basis for new research activities on the use of Ti concentration to trace water masses in the Mediterranean Sea.

Publication: None

One publication with all the MOOSE-GE 2013 and 2014 and BIOARGOMED vertical profiles is planned. The results of the MOOSE-GE 2013 have been presented at the “Journée du MIO” in June 2014.