

Interactive comment on “Latitudinal distribution of *Trichodesmium* spp. and N₂ fixation in the Atlantic Ocean” by A. Fernández et al.

Anonymous Referee #1

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We thank this reviewer for his/her comments, which have helped us in improving our manuscript.

This is a well written and interesting paper focused on the latitudinal variation in *Trichodesmium* abundance and rates of nitrogen fixation in the north, equatorial and south Atlantic (sub) tropical ocean. The data presented supplements growing evidence for low but consistent rates of nitrogen fixation in the south Atlantic, and substantial rates of nitrogen fixation in the equatorial region. A few details are missing from the paper:

1. The authors extrapolate N₂ fixation data from two transects to the north and south Atlantic basins but did not include the assumptions used in their calculations; (a) did the authors assume that nitrogen fixation occurs over 365 days per year, (b) what longitudinal limits were used to scale to the basin. Please include these details.

We did assume that N₂ fixation occurs every day of the year. The longitudinal limits were given by the geographical location of the continental shelf. We have modified the relevant sentence in the manuscript to include these additional details.

2. Did the authors compare counts of *Trichodesmium* from the underway to samples captured using a Niskin bottle or bucket? The method of collecting *Trichodesmium* filaments (i.e. filtering 50 to 130L of seawater from the underway seawater supply through a 40um mesh) seems a little odd. Did the authors check if filaments were destroyed during this process. What diameter was the 40um mesh?

We did not carry out this comparison. The 40 um mesh was 15 cm in diameter, and filtration was done by gravity. We did examine regularly, under the microscope, samples collected both with the underway water supply and with Niskin bottles, and found that the filaments' shape and length were similar. We did not detect the presence of broken or damaged filaments. Also, when crossing *Trichodesmium*-rich waters, we found intact colonies in the samples from the continuous water supply. Finally, the abundances we obtained for *Trichodesmium* filaments in the *Trichodesmium*-rich region between the Equator and 20°N coincide with previous reports based on filament counts in samples collected with Niskin bottles (e.g. Tyrrell et al. 2004, Moore et al 2009). We therefore conclude that our sampling method for collecting *Trichodesmium* resulted in reliable estimates of *Trichodesmium* filament abundance.

The use of the continuous water supply to obtain samples for *Trichodesmium* counts was motivated by our interest in obtaining relatively high-resolution data on *Trichodesmium* latitudinal distribution. Due to logistical constraints, the ship could stop only once a day for station work, which means that the distance between consecutive stations was >300 km. By using the continuous water supply, we were able to obtain samples at much shorter intervals (50-70 km). The resulting latitudinal patterns that we report are therefore more robust.

3. What was the precision of the N isotope analysis? It would be useful to report the precision considering the authors are reporting very low rates of nitrogen fixation which relies on being able to detect a small change in the ^{15}N content between the Tzero and Tfinal filters.

The precision of the analysis, expressed as the standard deviation of the ‰ ^{15}N values of a series of standards, was 0.15‰ (n=10). This information has been added to the Methods section.

The manuscript is a little repetitive at times, e.g. on page 2205 and twice on page 2206, the authors repeat that iron controls the distribution of nitrogen fixation in the Atlantic, yet this is not the main focus on this manuscript. The authors appear to have focused on the iron story, a finding that has been published elsewhere, and not their own findings, which appear to be that nitrogen fixation was highest in the equatorial region, a region where new N is traditionally thought to be supplied via upwelling, or in the south Atlantic, where there is only a handful of published rates of nitrogen fixation.

These two references to iron are made in different contexts. On page 2205, iron is discussed in relation to *Trichodesmium* distribution. On page 2206, it is discussed in connection with the latitudinal variability of N_2 fixation. Of course these two topics are closely related, but for clarity we decided to discuss *Trichodesmium* abundance and N_2 fixation rates in different sections.