Interactive comment on "Remote Sensing of *Trichodesmium* spp. mats in the Western Tropical South Pacific" *by* Guillaume Rousset et al.

Anonymous Referee #2

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The study aims at improving the detection of Trichodesmium mats from space with the Ocean Color Sensor MODIS in the South Pacific, in relation with the 2015 OUTPACE campaign. The improvements are sought in the refinement of the two previously published algorithms of McKinna et al. (2011) and Hu et al. (2010). The authors first analyse the relevance of using Rayleigh corrected radiances Rrc instead of aerosol corrected radiances Rrs. They then adjust empirically the spectral criteria and thresholds of the two algorithms. A collection of closely-matching pairs of satellite detection and in situ sightings or measurements are uses to quantify the performance. The set of adjusted criteria constitutes the new algorithm (as for the previous ones). The matching of the MODIS detection with the in situ detection is statistically satisfying. The new algorithm works better that the previous ones in the vicinity of clouds and leads to fewer

false detections. The authors regret the absence of spectra adquired in situ that could have been compared to the remote sensed spectra in order to explicit the functioning of the new algorithm. The authors acknowledge the possible variation of mat immersion depths as an obstacle to successful detection.

The study is interesting and it is undoubtfully worth improving the detection of this peculiar plankton specie, the abundance of which might increase in a changing ocean. The empirical approach followed is well suited to a very complex remote sensing situation where radiative transfer constrained by (few) spectral measurements can hardly be set up. A considerable amount of work has been done to make the best of an incomplete set of data. A quantification of the performance of the algorithm has been achieved. The relevant litterature is quoted seriously enough.

The study is very worth publishing. The paper itself could however be (formally) improved: - the descriptions of the algorithms and in particular of the new one (will it be given a proper name?) in §3.4 are a bit fastidious and unclear too much. A multi spectral axis diagram could help? - how the tuning was performed? a simple trial and error? - the question of the spectral resolution, which differs from one MODIS band to the other must be explained with more precision and rigor. This should also increase the interest of the comments about the mesoscale spatial structuring of the mats. - the authors might force themselves to split in two as many as possible of their sentences. Beside the gain in fluidity, most of the rather numerous illogicisms should disappear in the process.

Questions:

- The authors write several times that wind mixing could be responsible of the non detection of Tricho. mats. Did they actually met a situation where detection disappeared after a wind event?

- How the immersion effect could be unmixed from the effect of a varying abundance?

A couple of remarks to illustrate style default or lack of precision:

line 31-32 page 6: the sentence does not make sense/ 709 nm instead of 700 nm ? and MERIS instead of SeaWiFS ?

line 15-23 page 12: "MODIS-Terra and MODIS-Aqua satellite sensors are acquiring data since 2000 and 2002 respectively. However, the data quality of these sensors is becoming more and more uncertain with time going by, as their mission was not expected to last more than 6 years. " » mainly the older TERRA is affected. did the authors meet difficulties with AQUA?

" The new algorithm could be adapted to other satellite instruments with similar spectral bands, for example VIIRS onboard NPP and NOAA-20 (1 km resolution) and OLCI onboard Sentinel-3 " » OLCI inherited from MERIS the 709 nm band on which the Gower MCI is based. Are the authors sure that their new algorithm would improve on OLCI-MCI ?

" (300 m spatial sampling), but the spatial 20 resolution remains a problem as we observed that 250 m was already to coarse a resolution to understand the thinner mat dynamics. A study with a better spectral and spatial resolution may lead to better performances and to a new and better algorithm, and this may be possible, at least regarding spatial resolution, with MSI onboard the Sentinel-2 series (10 to 60 m resolution). " » is not the spatial resolution first a problem for the interpretation of the detection itself? (fractional coverage of a pixel by an heterogeneous distribution of algae)