Interactive comment on "Environment Gradient related Dissimilatory Nitrate Reduction to Ammonium in Huangmao Sea Estuary: Rates and Community Diversity" *by* Ran Jiang et al.

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C1: The first issue is a lack of strong research motivations. While the Introduction briefly reviews the background about DNRA and previous work, it lacks a rational development of research questions, motivations, or working hypotheses. The authors should stress more in the Introduction on what the key unaddressed questions are after reviewing the previous work (e.g., page 2, lines 13-30; page 3, lines 3-7), why they are important, and how the results from the HSE/PRE region would help resolve these unknowns. One way to improve is to start off with a bigger picture of N cycle/unknowns (rather than a description of the HSE region), followed by an overview of previous work

on DRNA that subsequently leads to major research questions, and then justification on the choice of PRE sites (not just because "there is lack of study : : : from PRE"). Note that the fact that there hasn't been any study in the PRE region is by itself not an attractive incentive because most audiences would probably not be familiar or interested in PRE or HSE region in particular, unless such environment is unique for this kind of research and can provide new insights.

R1: Thanks for the reviewer's comment. We have made a significant modification on the Introduction, to address the rational development of research questions, motivations, or working hypotheses, in the revised manuscript. See page 1,2, introduction please.

C2: The second major issue is the presentation of data. The manuscript is written in a data-reporting style with very little discussion on the data. The authors are expected to place their results in the context of the existing literature and synthesize their findings into lucid scientific story that advances our understanding of N cycle in a broader sense (i.e., not just for the PRE region). A "real" Discussion section is currently missing from the manuscript. Another issue with data presentation is that most figures are of low quality and it is very difficult to read the number, text, or color (e.g., Figs. 2, 3, 4, 5, 7,8).

R2: More discussion on the data has been provided in the revised manuscript, including 3.1 Environmental Gradients of the Estuary, 3.2 The potential rates of DNRA, 3.3 DNRA rates and nrfA gene abundance, 3.4 Spatial Distribution Patterns in the Sediment. The figures mentioned by the reviewer have been modified to improve their quality. Fig 3,5 have been remake by Arcgis soft. Fig 7 was still difficulty to show the minor number of bacteria. Fig 8 is hard to modified.

C3: The last issue is the frequent improper uses of English and language that need to be checked thoroughly throughout the manuscript. A few examples are given below.

Line 17: English. I would suggest replacing "accordingly" with "the corresponding"

throughout the manuscript. Line 25: English. Insert "in" after "located" Line 27: English. "As the marine: : :" This sentence has grammatical issues; please rephrase. Page 2 Line 2: English. "From which the good: : :". This should be a clause that follows the previous sentence; please check the grammar. Line 5: English suggestion: change "forming" to "converted to" Line 13: English. Delete "of" and "were" Page 3 Line 7: English. Remove "the" from "there are the" Line 19: English. Insert "is" before "refereed" Line 24: English. Insert "in" after "located" Page 4 Line 1: English. Replace "transported" with "transport" Line 12: "and so on". Please list all the sampling time points. Page 6 Line 12: Please specify the "sea water quality standards, GB3097-1997". Line 14: What are "the standard four level" and "80% datas"? Line 22: English. "rates significantly among". Please check the grammar. Line 23: English. "locate" should be in past tense. R3: All these mistakes have been corrected and revised C4: Line 8: The authors could elaborate the geographic and climatic differences between HSE and other study sites (ECS and YRE); that will help justify the choice of the HSE for this study. Page 7 Line 2: "17000 cl-1 mg/L". Please use the more common unit for salinity (e.g., Practical Salinity Unit) in the manuscript. Lines 3-26: The presentation is quite descriptive. Same issue is found on page 8. It's partially because the presentation of data is frequently referred to specific sites (e.g., C1, C7, C11), which have limited meanings to the general audience. Just as an example, a description of "higher XX rates were found at Stns 1, 2, 3: : :" is less interesting/ meaningful than a description of "higher XX rates were found in lower-salinity regions (such as Stn1, Stn2, Stn3)". I strongly suggest to separate the Results section from the Discussion section.

R4: All these comments have been considered and revisions have been made.

C3

Environment Gradient related Dissimilatory Nitrate Reduction to Ammonium in Huangmao Sea Estuary: Rates and Community Diversity

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Abstract. The potential rates of dissimilatory nitrate reduction to ammonium (DNRA) in the sediments collected from Huangmao Sea Estuary (HSE), one of Pearl River Estuaries in China, were investigated. It was based on the ^{15}N isotope and molecular biology analysis at 20 sites of HSE in one-year period. The results showed that the environment gradients of
15 nitrogen pollutants decreased from the estuary to the sea, and the characteristics of terrestrial pollutant export were obvious. $^{15}NH_4^+$ was detected in all sites in continuous-flow systems, which indicated the presence of DNRA pathway in HSE. Both the highest DNRA rate and *nrfA* gene fragments were found in the site located near coastal pollution zone. While the lower DNRA rates were measured in the sediment samples from sites near the White Dolphin National Nature Reserve, which were less than 3 ug/L.h in 72 hours. Principal components analysis (PCA) based on the community composition at genus
20 level was performed , and nine samples formed three distinct clusters, corresponding to their geographical locations, which suggested that the salinity was likely to affect the selection of the *nrfA* bacterial populations. This study provides a better understanding of the DNRA in the Pearl River Estuary.
Key word: DNRA; Sediment; Rate; Distribution pattern

25 **1 Introduction**

The Pearl River Estuary (PRE) is one of the most complex estuarine systems in the world, forming a transition zone between the Pearl River and the South China Sea (Pan et al. 2014). Many environmental issues have subsequently emerged, such as overloading of reactive nitrogen and hypoxic zones (Dai et al. 2008). Huangmao Sea Estuary (HSE) is one of the estuaries located in the western part of PRE (as shown in Fig. 1), a fastest growing economic area in the southern
30 China. According to the marine quality bulletin of Jiangmen city, the active nitrogen (including NO_3^-, NH_4^+ and NO_2^-) was

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Fig. 1.

C4