

## ***Interactive comment on “Tidal variability of nutrients in a coastal coral reef system influenced by groundwater” by Guizhi Wang et al.***

### **Anonymous Referee #2**

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The manuscript provides winter observations of dissolved nitrite, nitrate, phosphate, silicate,  $^{228}\text{Ra}$ , salinity, and water depth in the Luhuitou fringing reef at Sanya Bay in the South China Sea. The authors introduced that in their another paper for the same cruise (Wang et al., 2014), they concluded that: tidally-driven groundwater discharge affected the carbonate system in the Luhuitou fringing reef. In this reef system, groundwater discharge played a predominant role during the spring tide and biological activities (including photosynthesis/respiration and calcification/dissolution) dominated during the neap tide in regulating diurnal variations of the carbonate parameters. Then in this study, the authors use  $^{228}\text{Ra}$  as a tracer of groundwater discharge to address tidal variability of nutrients in the coral reef system influenced by groundwater. It is an interesting topic. The key point supporting this manuscript is from the previous paper:

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The time-series observation of salinity at Station CT suggests that more freshwater input into the reef system occurred during the ebb flow of the spring tide than during that of the neap tide, and the only source of freshwater at this site would be groundwater discharge (Wang et al., 2014). I have to say that I don't read such an important paper. However, based on the present presentation, the arguments provided throughout the discussion were speculative in nature. This manuscript needs major revision.

The key point to support this manuscript is that groundwater discharge played a predominant role during the spring tide in the fringing reef. The time-series observation was carried out at station CT, which is close to the coast, all the horizontal distribution plots do not cover the site, where water may source from terrigenous surface runoff, rainfall, water exchange with adjacent water, and groundwater discharge. Do the authors indicate that the groundwater discharge comes from the seabed or the coast? In general, nutrients at station CT were vertically mixed well. Is there any relation between nutrients distribution and groundwater discharge?

The authors propose that biological processes predominantly controlled the composition of nutrients in the reef system, but the impact was less due to groundwater discharge. To quantify the contribution of biological processes to the variations in the NO<sub>x</sub> and phosphate at Station CT, they took a closer look at the behaviors of nitrite, nitrate and phosphate with salinity during the falling and rising phases in the spring tide, in which only several data points were selected for the ebb flow and flood tide of the spring tide, the difference between nitrite and nitrate (or phosphate) during the flood tide was mainly due to the two points with higher salinity, the other sources or processes may affect nutrients distribution, such as nitrate and phosphate show unusual values at salinity between 33.60-33.65. Further, the authors used the relationship derived from the several data sets to estimate the consumption and then uptake rate of NO<sub>x</sub> and phosphate. In addition, what faster or slow speed of the tide means? I don't see any data support. The statements lack logic and evidence.

As for parameter measurements, the authors used 1-2% chloroform to store nutrient

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samples, and gave the detection limit of  $0.04 \mu\text{M}$  for nitrate and nitrite,  $0.08 \mu\text{M}$  for phosphate, and  $0.16 \mu\text{M}$  for silicate. I guess these values do not include water sample pretreatment and sample storage processes. As the concentrations of nutrients were low in the investigation and the variability was also low, the authors should also provide the blanks covering filtering, storage, and measurement processes.

The authors used the daily variance of water depth and salinity to separate neap tide from spring tide days (Fig. 2). In fact, the variations of water depth and salinity were not consistent. Salinity was low on Feb 6, increased on Feb 9, but dropped down on Feb 10. In addition, daily variance of water depth was shown to have unit of  $\text{m}^2$ , what daily variance of water depth means? Why the authors do not use tidal level data? Water depth observations have large uncertainties.

The authors used concentrations of nutrients against water depth to see the tidal effects. Why silicate disappeared in Fig 4? Why the concentration of silicate was not significantly correlated with the concentration of  $\text{NO}_x$  during the spring tide, while the concentration of silicate showed significant correlation with the concentration of  $\text{NO}_x$  during the neap tide?

The authors should pay much attention to the use of significant digit. Fig. 1b is not clear enough.

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