This study reviews recent literatures on estimating reactive nitrogen (Nr) deposition using the satellite retrievals of NO_2 and NH_3, proposes a framework of using satellite data to estimate Nr deposition, and suggests a few research challenges. The topic of nitrogen deposition is important, and the compilation of recent literatures on reactive nitrogen deposition is useful to the research community. However, the manuscript mainly gives general descriptions of the previous results but lacks critical analysis and synthesis. The uncertainties in satellite measurements and chemical transport models, which are key to estimating Nr deposition based on satellite column measurements, are not addressed in detail. Overall, the scientific values of this work could be enhanced by more in-depth discussion of the advancement, challenges, and directions for future research.

Specific comments:

1. The authors highlight the advantages of satellite-based method compared to ground-based monitoring and ACTM simulation method. But there are significant uncertainties of satellite column measurements, especially for NH3. In addition, the satellite-based method strongly depends on the ACTM simulation. What are the key uncertainties of the ACTM related to deposition estimates? How do the uncertainties in satellite measurements and ACTM affect satellite-based estimation? What are recommendations to reduce these uncertainties?

2.The authors propose a framework for combining satellite data, ground-based monitoring and ACTM (Figure 1). But it is not clear if it is a new idea. It seems that the approach has already been used in previous studies as indicated in the literatures shown in sections after Figure 1.

3. The title contains "Nr concentration and deposition", but the introduction part and the framework only mentions "deposition". In my opinion, the estimation of Nr concentrations is just a part of the estimation of Nr depositions. There are many other studies which have offered more in-depth discussions of column concentrations of NO_2 and NH_3. I am not saying that concentrations cannot be shown but suggest framing the paper with a clearer focus on deposition.

4. Line 193-195: Why may this method lead to an underestimation of surface NO_2 concentration? In your proposed framework, the similar method has been used to estimate the surface NO_2 concentration. Why is there no large underestimation in your validation? While you use the Gaussian function to fit the vertical concentration profile, but for the surface layer, you still use the ACTM-derived the relationship between the NO_2 column and surface NO_2 concentration.

5. Line 405-409: The derived NO_2 columns from these satellites are quite different. Can you give some suggestions to the readers about which satellite data to use? Why do you choose OMI NO_2 in your estimation? What are the results if you use other satellite data?

6. Line 550-552: Can the similar method in equation 9 and 10 be used to estimate wet reduced Nr depositions? What are the different challenges for the estimations of wet reduced Nr depositions, compared with oxidized Nr?

7. Section 5: For the trend estimation of Nr concentrations and depositions, have you conducted

ACTM simulation for each year? The changes in emission and meteorology can significantly affect the Nr vertical profile and Nr species ratio, which are important in your satellite-based estimation.

8. Line 567-569: This statement needs to be modified. As mentioned above, the satellite-based method strongly depends on the ACTM simulation. The uncertainties in emission inventories and other parts of ACTM can also significantly affect the vertical distribution of pollutants and the ratios of NO_2 and other Nr species (e.g. HNO_3, NH_4^+).

9. Line 697: Are there any previous studies using a mechanism method to estimate Nr deposition?

Minor comments:

1. The authors should give the definition of reactive nitrogen (Nr). "Nr (such as NO_3^- and NH_4^+)" is mentioned in line 48, and "Nr (NOx and NH_3)" is mentioned in line 59. This is confusing.
2. Line 57, change "mineral energy" to "fossil energy".
3. Line 83, add "and" between the two words "accurate quantitative".
4. Line 145-146: "Tian et al." should be "Tan et al. (2018)".
5. Line 170: "Cheng et al. (Cheng et al., 2013)" should be "Cheng et al. (2013)". Please check the citation format throughout the manuscript.
6. Line 170-171: This sentence is not easy to understand. Please revise it.
7. Line 198-200: The study of Larkin et al., 2017 should be put in the previous paragraph discussing the method using the satellite data and statistical model. I think that the authors are discussing the method using the satellite data and ACTM-derived relationship in this paragraph.
8. Line 225-232: This information based on Jia et al. (2016) has been mentioned in line 176-184. They are repetitive.