We respond below to the comments raised by the reviewer, setting his words in *italics* with our response following below.

Response to Referee 1 (Volwerk)

> *This paper discusses a fundamental plasmaphysical phenomenon: the ion acoustic wave, specifically the electric current-driven ion acoustic wave. Here, the current is defined as a velocity difference between the ions and the electrons in the ion rest frame. The authors use the RPC data from one close flyby of Rosetta by comet 67P/CG. The find the waves from just before closest approach to the comet and during egress up to a certain point. The "sudden" start is due to instrument operations the end is because of a quenching of the instability. The authors try to use the data from the different RPC instruments to characterize the plasma environment, but find that, because of instrumental limitations (e.g. spacecraft charging) not all particle distribution functions can be obtained. After realistic assumptions on how to interpret the particle data, several different setups are made to calculate the dispersion relation of the ion acoustic waves. The authors show that one of the 7/2 scenarios works best to explain the observations.*
>
> *This paper is well written, with the minor "complaint" that everything is well described in detail, but the authors do not spend any time of introducing the instability itself, although there are several citations to various papers (also by the lead author). It would be nice, for the interested reader, if the authors would add one short section on the specific instability.*
>
> *However, I am not entirely sure how to interpret this paper, I have the feeling that there is more than just showing that the ion acoustic model can be described. Is it also the purpose of the authors to show that the observations of these waves can be a method to sample a parameter space of the plasma populations that cannot be measured by a charged spacecraft? If this is indeed the case (and it would be very useful) then this should be brought more forward, also in the abstract of the paper.*

We have included more discussion on how the combination of wave observations and theory supplements the other measurements in the discussion section and also in the abstract. We have put some information on the current-driven ion acoustic instability in the introduction – next to where ion acoustic waves are mentioned.

> *On line 169: "the wave frequency does not follow . . ." I would add here "of the observed waves" otherwise it reads a little confusing with the previous sentences talking about cyclotron waves.*

Changed as suggested. We also inserted a sentence giving specific numbers in response to the other referee.

> *On page 9 I am having trouble understanding the statement: "Cold ions are picked up by the electric field, moving along trajectories with a radius of curvature that is even larger." With the high density of the plasma that is measured*

by MIP, would this not mean that the spacecraft is in a pile-up region ($B \sim 30$ nT) and thus the solar wind has been braked significantly. How much slow down do the authors expect? With 30 vs 5 nT, the "solar wind velocity" would probably be a factor 6 slower. What would the expected gyro radius be, then?

Assuming an initial speed of 400 km/s, slowed down by a factor of 6, the gyro radius of an H_2O^+ ion in a 30 nT magnetic field would be 415 km, which is "even larger" than the 50 km found from the warm ion thermal speed.

Line 225: "found to similar to the difference" here "be" is missing.

Corrected.

Line234: "Examining the magnetic field in Fig. 2 we see no large scale change near 18:00, which means that there was no large scale current present." I am not sure that is correct. The magnetic field remains the same, if suddenly a large scale current would disappear (the one driving the IA waves) then would one not likely see a change in the magnetic field, like just before 21:00?

It seems this statement can be misunderstood. A change, as for example the disappearance of a large scale current, would indeed be seen in the magnetic field. We have replaced the sentence by the following (the first half of the original sentence still remains), which we think should be clearer:

"That the field remains constant, except for small fluctuations, while the spacecraft moves means that there is no large scale magnetic field gradient in this region and hence no large scale current either. "

Line 266: Here Fig. 8b is discussed, and it would be good if the authors would put in that that is for the outbound part of the orbit.

We have inserted the following clause at the beginning of the first sentence of the paragraph:

"For the outbound part of the spacecraft trajectory,"