Anonymous Referee #1

This paper represents an important contribution to our understanding of the capabilities to detect high ice water conditions that present a hazard to aviation operations. The authors demonstrate the use of SEVIRI satellite products combined to identify HIWC areas, and quantify the performance of their HIWC Mask product. Their methods are scientifically sound, and the paper explains their methods and results in a clear and logical way.

General comments are as follows:

1. What is the purpose of the MSG-CPP comparison with DARDAR described in Section 3.2? It is explained later in the paper that thresholds for the HIWC Mask product are optimized using DARDAR paper, but it isn't clear how the results of the comparison are used for this purpose.

It is important to realize that this is the first time that a dedicated satellite-based High IWC product is presented. High Altitude Ice Crystals as a research topic is fairly new, and only emerged as a possible aviation hazard in the late 1990s and early 2000s.

Furthermore, research, results and understanding have grown organically within the HAIC project and the dedicated work packages on satellite measurements and detection of High IWC environments.

The SEVIRI CPP High IWC mask thus is a totally new product, and readers may not have general knowledge about for example DARDAR. We felt that introducing DARDAR without much more than a reference to other papers would be rather meager for those readers, so to speak.

Similarly, only during the last couple of years some intercomparison studies have appeared that compared measurements of cloud properties from passive (like SEVIRI) and active sensors (like DARDAR). Much of the work on identifying agreement and differences between those measurements is still work in progress, and often performed within the context of specific applications.

Because of these reasons, we thought it useful to spend some time on introducing DARDAR and presenting some general results about how DARDAR compares to SEVIRI-CPP. Like we similarly felt that it would be useful to also present the results on how the CPP High IWC mask v1 was constructed, which can be found in the SI.

***[SUGGESTION]:** we would be willing to consider putting section 3.2 in the SI, rather than in the main body, and only briefly discuss results, like now is done for the SEVIRI-CPP High IWC mask v1. With the notion that we prefer to keep section 3.2 in the main text.*

2. The impact of the height of the Cloud high IWC maximum on the HIWC Mask is mentioned on p.19 (line 389-391) and again on p. 21 (line 436-439). These two statements appear to be somewhat contradictory. Can you clarify?

The discussion on p.19 (table 3) refers to CPP parameter threshold combinations with a CSI > 0.35, the discussion on p.21 to the performance of the mask itself. Reason for table 3 was to check if the highest CSI values somehow might show some (in) consistency among the parameter threshold values.

We removed table 3, as it is difficult to interpret, and simply note that different CPP parameter threshold combinations yield similar CSI performance statistics, and that we chose a set of CPP parameter thresholds that are most inclusive (= at the 'conservative' end of each CPP parameter threshold).

That way, the only location where the height is discussed is in the sensitivity of the performance of the High IWC mask to the actual height of the maximum IWC (p21).

3. Regarding the HIWC Mask comparison with RDT, it is concluded that the larger the cell, the larger the fraction of pixels identified. On how many cases is this conclusion based?

There turn out to be 12,416 such cases.

Number added to caption of figure 11.

4. It would be interesting to include some discussion of how the HIWC Mask product might be used in an operational environment. Could you comment on the types of users who might benefit, the timeliness of the product versus the time scale of the physical processes, and the impact of the current level of uncertainty, for example?

Although understandably it is an interesting point to discuss how the mask could be used (we are talking about a potentially hazardous environment for aviation), we are reluctant to discuss such application WITHIN the paper, in part because there appears to be disagreement about its operational usefulness.

Nevertheless, we can address some issues here:

- *Currently the mask is provided in near-real-time by KNMI for the SEVIRI (Meteosat-10) domain (Europa, Africa).*
- *The mask has been successfully tested operationally for HIMAWARI (East Asia, Australia) as part of support for a HAIC 2016 field campaign in Australia, but it is currently not online as there are no immediate users.*
- *The mask can be easily applied to SEVIRI on Meteosat-8, which has been relocated to the Indian Ocean. We expect to be able to soon test CPP and thus the mask on GOES-R (Americas) in 2017.*

In terms of operational use:

- *Latency of SEVIRI (Meteosat10) mask is 15-30 minutes*
- *Latency could be shortened by parallel processing.*
- *Latency could be improved by applying motion vectors to make short-term forecasts (test will be performed in 2017). Reliability of motion vectors up to 60 minutes ahead of time is sufficient.*
- *Strategical use of mask by pre-plan flights around potentially hazardous areas*
- *Tactical use of mask by in-flight modifications of flight plan according to latest developments*

For the last two applications we are part of a project proposal (2017) for a field test of in-flight guidance and route dynamic planning system, which should help to gain experience in providing CPP data (incl. the High IWC mask) to pilots.

We also started discussions with the Dutch KLM airliner about improved or new services for their daily operations, which the mask could be part of.

In the end, like with convection, the aviation authorities have to decide on what is acceptable and what is not. Current aviation regulations for thunderstorms show that there are no absolute restrictions – although there are clear recommendations how to handle thunderstorms. Airliners have considerable room to decide for themselves, and their decisions depend on safety, cost, and comfort. A High IWC mask – like many other environmental parameters - would be just one of the many parameters for them to consider. But it could easily become a part of a dynamical time-dependent 3D flight planning/guidance tool.

Future discussions, projects, and tests, with commercial aviation partners will show its true value.

Specific comments:

1. It's rather difficult to distinguish the blue outlines and orange dots in Figure 10.

Removed the orange dots, increase the thickness of blue contours.

2. Line 40, replace "detection" with "detecting"

Changed

3. Line 42, replace "lack of detailed understanding what causes..." with "lack of detailed understanding of what causes..."

Changed