Review of "Decrease in tropospheric O3 levels of the Northern Hemisphere observed by IASI" by Wespes et al.

In the revision the authors have added discussion of a downward "jump" in tropospheric ozone measurements around September 2010 for IASI which they mention causes an artificial overall downward trend or drift of about -2.8 DU/decade in the NH. This is new to the revision which mentions this jump several times including the Conclusions section as possibly affecting the calculated trends.

In an effort to account for this jump the authors have modified their regression trend model by including two different constants in the regression for the two separate time periods, before and after September 2010. An argument is made that the jump-related drift of -2.8 DU does not explain the larger negative trends in summer of ~-5 DU/decade measured by IASI.

The authors state that the reason for the downward jump in tropospheric ozone from IASI is not clear. The reference list includes Keppens et al. and Boynard et al. papers that discuss a detected negative drift in IASI tropospheric ozone. Both are related papers using IASI and are in preparation/under review for this same issue; the two papers are mentioned specifically in the revision in regards to the drift/jump in IASI ozone. The revision states that Boynard et al. (this issue) describes the IASI drift as being caused largely by a downward discontinuity "jump" in the IASI data around September 2010. An earlier paper published by Boynard et al. (2016) shows in their Figure 15 evidence of this jump and a persistent downward drift/trend in IASI tropospheric ozone relative to ozonesondes in both the NH and SH extra-tropics. The downward drift (including jump) for IASI tropospheric ozone relative to the ozonesondes indicated by Boynard et al. (2016) was never discussed in their 2016 paper. The current revision references the Boynard and Keppens papers that are under review for this same special issue regarding the IASI jump/drift.

The authors state that tropospheric ozone for IASI has one piece of information that corresponds to ground-to-300 hPa. The authors define this as middle-low troposphere (MLT) ozone. They mention that the upper level 300 hPa tends to minimize influence from stratospheric ozone in the retrievals. The revision still states that the significant negative trends in the SH are hard to explain, and mention that stratospheric ozone influence may be a large reason for this band structure of negative MLT trends throughout the SH year-round. There will be questions from readers regarding the very nature of IASI nadir retrievals in resolving tropospheric ozone, especially how much tailing influence from ozone above 300 hPa (including stratosphere) there is in the MLT measurements, especially in the extra-tropics.

Papers listed in my first review describing zero or positive trends measured in extra-tropical tropospheric ozone are not included in the revision. There are several reasons stated for not referencing them in the revision such as issues of MLT versus UT or differences in the vertical resolution of the measurements. The author's response is that including reference to these is beyond the scope of the present paper. The Petetin et al. (2016) paper (the diurnal cycle paper) that I mentioned in my first review used MOZAIC+IAGOS aircraft measurements over Frankfurt and showed statistically significant increases in ozone throughout the troposphere from ground to 300 hPa (i.e., MLT). Regarding the TOAR, another basic issue for the satellite measurements

including IASI is their short records for doing trend analyses and that their time periods are generally quite different.

There appears to be some questions regarding the IASI MLT ozone measurements themselves for evaluating trends. The drift for IASI tropospheric ozone is a bit disturbing as it is rather large and not explainable from either the current study or those of Keppens et al. or Boynard et al. that are related IASI papers also in review in this same issue. The negative trends throughout much of the NH and SH for IASI MLT ozone appear to be in contradiction to zero or positive trends measured from other independent data sources (aircraft, ozonesonde, satellite), albeit of differing (usually longer) time records and not specifically calculated for ground-to-300hPa as IASI. The authors attribute negative trends in the NH as possibly due to reductions in emissions in recent years, particularly over N. America and Europe. The authors state that the negative trends in the SH are hard to explain, but possibly of stratospheric origin.

Given over 9 years of measurements from IASI for detecting decadal changes in global tropospheric ozone (main theme of the paper), it would seem important to compare decadal changes in IASI MLT ozone directly with decadal changes in other independent data products in the paper such as station ozonesondes or IAGOS aircraft ozone. This paper is going to raise some doubts with readers as to the IASI trend results given the current unknowns with the data. There is really not enough 1-1 comparison evidence presented from other independent measurements to test validity of the IASI trend results.

Overall the authors have done a goodly amount of change to the paper as the marked revision shows. The paper is well written and with current figures that are both legible and concise for the paper. The revision now includes discussion in various places of the jump/drift with IASI that was not in the original draft. They have also re-done their trend analyses in accordance to this jump/drift in IASI.

The paper should probably be published, but only after careful decision by the editor in line with the comment responses from the other reviewer that may be either more negative or more positive as mine. The other reviewer raised quite a lot of questions for the first review that may not have been adequately answered in the revision. The revision seems to have covered most of my previous concerns although perhaps adding some more references regarding measured trends in the extra-tropics wouldn't hurt the paper, even if in some ways contrary to the IASI trends. One can argue that these other measurements are of different time periods and are generally not measuring the same MLT column in the troposphere.