

# ***Interactive comment on “Ice-supersaturation and the potential for contrail formation in a changing climate” by E. A. Irvine and K. P. Shine***

## **Anonymous Referee #1**

Received and published: 2 March 2015

### **1 General comments**

This is a very interesting paper for all those concerned with the climate impact of aviation, in particular due to persistent contrails. Such contrails only form in ice supersaturated regions and it is therefore important to know how the frequency of ice supersaturation will evolve in a future warming climate. Furthermore this is of interest for those concerned about the climate impacts and feedbacks of cirrus clouds since their formation needs substantial ice supersaturation as well. The latter topic is not touched upon in the paper, which is reasonable in view of the problems current climate models have to represent ice supersaturation at all. For the latter reason the authors had to use relative humidities above model-dependent threshold values as proxies for the

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presence of an ISSR. To my opinion this is justified. This paper is well written and easy to comprehend. The only thing I miss is a comment on the statistical significance of the observed changes. Otherwise I have only a couple of minor comments. I recommend publication of this paper.

## 2 Major issue

Nothing is said about the statistical significance of the observed changes. There is "considerable interannual variability" (page 329), thus the question on the significance of the results seems justified. You could include  $\pm\sigma$ -bars on the curves in figure 5 such that the reader gets a feeling of how far the curves deviate at 2100 from the historical values. T-tests or non-parametric tests on the 2D-fields could be performed to check significance. I see that the changes are quite substantial in the tropics, so it might be that they are beyond doubt. If so, please say so.

## 3 Minor issues

Although this paper is very well written, there are several instances where I found minor jumps in the logic. These can be fixed easily.

Page 319, line 22: Instead of "This study" please write "The present study". The word "This" otherwise leads back to Marquart et al., which is probably not meant.

P. 320, l. 21/22: Please rewrite the sentence in the following form: "The consensus is that under climate change there will be a decrease ... in the upper troposphere ...". (Otherwise I read that there is a consensus in the upper troposphere).

P. 321, l. 3: The sentence ending in "Marquart et al." talks about the tropics. As the

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next sentence talks immediately about the highest flight levels and the stratosphere, the reader is misled because one wonders why you are talking about the tropical stratosphere where air traffic is very low. Please clarify that you are now talking about the extratropics.

P. 322 (bottom)/323 (top): How are these monthly means computed? I assume you compute daily RH values and average them. Is this correct?

P. 328, sect. 3.2, 1st par.: You might add that the changes are substantial, namely about one third of current values.

P. 332, l. 11: temperatures are lower, not colder.

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Interactive comment on Earth Syst. Dynam. Discuss., 6, 317, 2015.

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