Reply to Referee #1 concerning GI-manuscript gi-2015-33

("Forecasting auroras from regional…" by Kauristie et al.,)

We thank the Referee for constructive comments. Below are our replies and suggestions for some modifications in the manuscript:

Predicting auroras during ambient solar wind conditions:

Like the Referee correctly points out, our approach is not useful in the attempts to forecast auroras at high latitudes during non-storm times. Statistical analysis of FMI all-sky camera data shows that during the best years of auroral activity (some 2-3 years after sunspot maxima) the occurrence rates are 60-75% at stations under the auroral oval (i.e. at magnetic latitudes 64-75, stations SOD and LYR, in Fig.1 below). Comparing these values to the threshold which we use in RAF for enhanced auroral activity (occurrence probability >50%) reveals that cloudiness forecasts provide at auroral latitudes more useful information for auroral spotting than RAF statistics. At sub-auroral latitudes an announcement of enhanced probability by RAF can be interpreted to represent conditions which prevail at auroral latitudes during the most favorable years in solar cycle. With the latitudinal coverage of FMI all-sky and magnetometer observations we conclude that the auroral oval latitudes in this context correspond roughly to magnetic latitudes 64-75, while latitudes below MLAT 61 represent clearly sub-auroral regions.

An older version of the Fig. 1 below has been presented by Pulkkinen et al. (2011). We suggest to add the updated version of this Figure to our manuscript with some discussion along the lines given above.

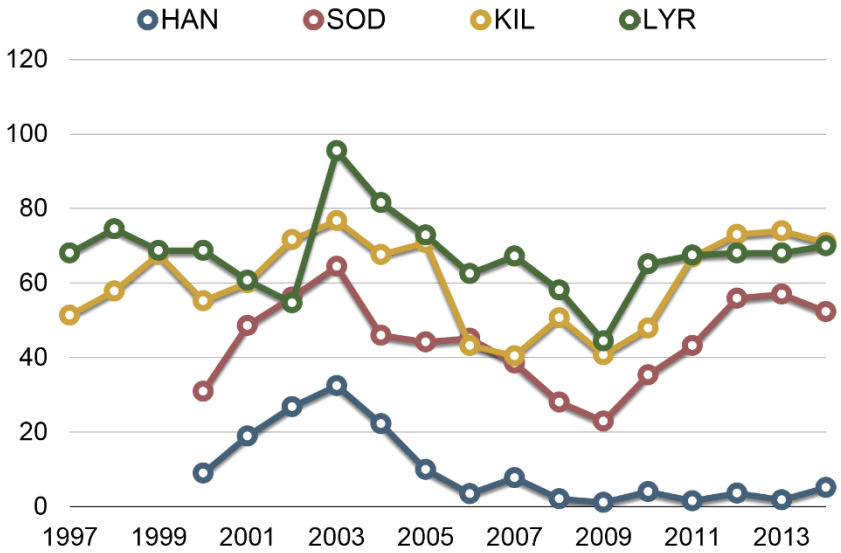

Figure 1: Occurrence probability of auroras at FMI stations with the following magnetic latitudes: HAN 59; SOD 64; KIL 66; LYR 75. Probabilities are based on visual inspections of quick look data (keograms, one image per night). The annual number of nights with auroras have been normalized with the number of nights when the camera has been operational.

Potential problems due to usage of Wing model for Kp:

Bala and Reiff (2014) have tested the performance of Wing Kp 1-hour forecast with real-time output values collected during a test period of 22 months (April 2011 – February 2013). This study shows that the Wing Kp approach has some tendency to overestimate Kp values during enhanced activity. In the test data set of 15960 time instants the Wing approach claimed the Kp to be equal or more than 4 in 1222 cases. Checking against the official Kp values reveals that 335 of these were false alarms (i.e. the real Kp was <4). We will add this remark to the next version of our manuscript.

Additional references:

Yes, certainly the NOAA Ovation service and the identification method of auroral electrojet boundaries by Johnsen (2013) should be mentioned in our discussion.

Minor comment:

We mean early 2000s.

References:

Bala, R., and P. Reiff, Validating the Rice neural network and the Wing Kp real-time models, Space Weather, 12, 417-425, doi:10.1002/2014SW001075, 2014.

Johnsen, M.G., Real-time determination and monitoring of the auroral electrojet boundaries, J. Space Weather Space Clim., 3, A28, doi:10.1051/swsc/2013050, 2013.

Pulkkinen, T.I., E.I. Tanskanen, A. Viljanen, N. Partamies and K. Kauristie, Auroral electrojets during deep solar minimum at the end of solar cycle 23, J. Geophys. Res., 116, A04207, doi:10.1029/2010JA016098, 2011.