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The thermospheric auroral red line polarization: confirmation of detection and first quantitative analysis

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The thermospheric atomic oxygen red line is among the brightest in the auroral spectrum. Previous obser- vations in Longyearbyen, Svalbard indicated that it may be intrinsically polarized but a possible contamination by light pollution could not be ruled out. During the winter 2010 / 2011, the polarization of the red line was measured for the first time at the Polish Hornsund polar base without contam- ination. Two methods of data analysis are presented to com- pute the degree of linear polarization (DoLP) and angle of linear polarization (AoLP): one is based on averaging and the other one on filtering. Results are compared and are in qualitative agreement. For solar zenith angles (SZA) larger than 108[U+25E6] (with no contribution from Rayleigh scattering), the DoLP ranges between 2 and 7%. The AoLP is more or less aligned with the direction of the magnetic field line in agreement with the theoretical predictions of Bommier et al. (2010). However, the AoLP values range between $\pm$ 20[U+25E6] around this direction, depending on the auroral conditions. Correlations between the polarization parameters and the red line intensity I were considered. The DoLP decreases when I increases, confirming a trend observed during the obser- vations in Longyearbyen. However, for small values of I, DoLP varies within a large range of values, while for large values of I, DoLP is always small. The AoLP also varies with the red line intensity, slightly rotating around the mag- netic field line.
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