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Theoretical value of the linear polarization of the Earth aurorae red line and possible diagnostics

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The theoretical value of the impact polarization of the Oxygen forbidden red line at 6300 Å was established by Bommier et al. (2011), while linear polarization was detected and measured in this line of Earth aurorae by Lilensten et al. (2008) and Barthélemy et al. (2011). In this work, we solve the statistical equilibrium of the line level population and alignment (responsible for the linear polarization), taking into account all the processes entering the line formation. We use production rates resulting from the TRANSSOLO model (Lilensten et al., 2007) applied in the particular conditions of the observations. The resulting theoretical polarization is found having order of magnitude in agreement with observations, and depends on both the density and the velocity of the non-thermal electrons. This would enable the diagnostic of one of these quantities via linear polarization degree measurement. As for it, the linear polarization direction provides the aurorae magnetic field direction.

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