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A new spectropolarimeter to measure the polarization of thermospheric auroral emission lines.

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The thermospheric auroral red emission line at 630 nm has long been considered as unpolarized. However, recent observations (e.g. Lilensten et al 2013) and theoretical considerations (Bommier et al 2011) indicate that the red emission line can be polarized by collisional excitation with magnetospheric electrons precipitating along geomagnetic field lines. The observations have been carried out with a photo-multiplier equipped with a rotating polarizing filter and a one nanometer width interference filter centered at 630 nm.
Although theoretical calculations have not yet been developed, in principle, other thermospheric emission lines could also be polarized by collisions with precipitating electrons (e.g. the blue line N2+ 1NG at 427.8 nm) or protons (e.g. the Balmer alpha line at 656.3 nm). BISA and IPAG are currently working together to develop a spectropolarimeter to investigate the polarization of thermospheric emission lines between approximately 400 and 700 nm. The design of the spectropolarimeter will be shown in detail with characteristics of the telescope, spectrograph and polarizing devices (Wollaston prism and half-wave plate). Expected performances and limitations (e.g. time resolution), calibration tests strategy and possible future location of the instrument will be discussed.

- Lilensten et al., The thermospheric auroral red line polarization: confirmation and first quantitative analysis., Journal of Space Weather and Space Climate, 2013, in press.
- Bommier et al., The theoretical impact polarization of the O I 6300 Å red line of the Earth aurorae, Ann. Geoph., 29, 71–79, 2010.