

## ***Interactive comment on “Contiguous polarisation spectra of the Earth from 300–850 nm measured by GOME-2 onboard MetOp-A” by L. G. Tilstra et al.***

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### General Comments:

The paper presents high spectral resolution polarization measurements from satellite with the instrument GOME-2. For the first time those kind of data are presented, compared to radiative transfer simulations and discussed in detail. Three cases with cloud free scenes, special polarization geometries and the Earth polarization for a variety of scenes are studied. The authors compare a parametrization of the UV polarization using a generalized distribution function (GDF) to measurements and conclude that

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the GOME-2 PMD RAW measurements can provide high-quality, high resolution Earth polarization spectra and may be useful to the validation of polarized radiative models.

This paper assumes in some cases a deep pre knowledge or an in depth search thru the references. This could be improved by a view additional formulas, explanations and a list of abbreviations. The results suggest a good agreement with the models, but the differences and possible explanations are not discussed in very detail. It would be helpful to have some quantitative formulas and the real calculation of the stokes fractions with error assumptions. For example, I did not find any information about the correction of spectral band differences between the PMD-s and PMD-p channels. It might be negligible for PMD band integration, but in high resolution mode it could lead to false Stokes fractions and might be important in the absorbing regions in the NIR and maybe in the UV as well. Another point might be if the calculation takes the mispointing angles of the satellite inertial reference system into account. This would change the observation geometries and changes in scattering angle assumptions. However, this interesting, well written and structured paper shows for the first time how valuable this kind of measurement are and the examples suggest new applications in future.

Detailed comments: 18: The GDF was not mentioned or proposed before. The reader does not know about it until he reads the full paper. 94-100: The formulas represent an ideal case. What about errors of the angles relative to the reference frame definition. 126: Could not find the calculation and the value of the depolarization factor in the reference (Bates 1984). In comparison to the description of Tilstra 2003 its not very helpful. A good description is given by a more recent publication of Rosanov 2014, JQRST. 135: I suggest to move the orbit description from below (144) upwards. 140: What is the pixel wavelength resolution and the FWHM? What is the FOV of one pixel and how many pixel has one track? 174: The reference was not available. 185: The description of the spectral bands is not very specific. Better descriptions are given in the reports GOME-2 polarization study B + C/D. 202-208: The reference and the description is unclear. 220: surface LER? Please name it at least one time (Lambertian

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Equivalent Reflectivities) 282: I would not use such abbreviation in a written publication. 303: Here it came into my mind to check the calculation of  $Q/I$  in more detail, but unfortunately I could not find a proper description. Please check if this can be described in more detail. 381: See 282 Fig.1 A table with numbers would be better or a graph with the spectral sensitivity. The position within the references is not correct. Fig.2: LER see above Fig.3: I would suggest to mention the FWHM (Full width half maximum) spectral resolution range (3-35nm). Fig.4: (in red) is somehow misleading, because there is some red in Fig.2 but makes no sense. Fig.6: What special geometries? You may provide a short description. Fig.9: I suggest to mention the chlorophyll and red edge peak.

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