Brewer direct irradiance measurements: polarization effects

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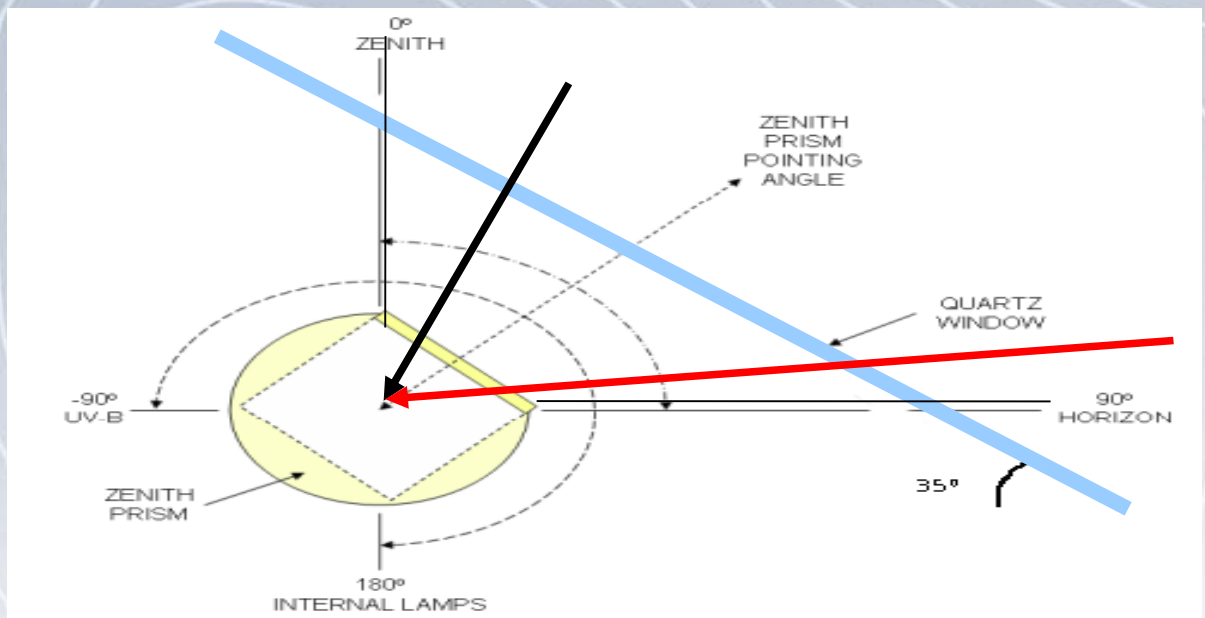## Outline

Introduction. Problem description

Measurement method

Results: Field measurements

Work in progress

Introduction

The sensitivity of direct-sun measurements from Brewer spectrophotometers changes with the solar zenith angle(SZA)

The combination of **the effect of the flat quartz window** and the effect of the diffraction grating produce a remarkable sensitivity decrease at high SZAs when measuring absolute irradiances by the Brewer.

(Cede et al., 2004 and 2006)

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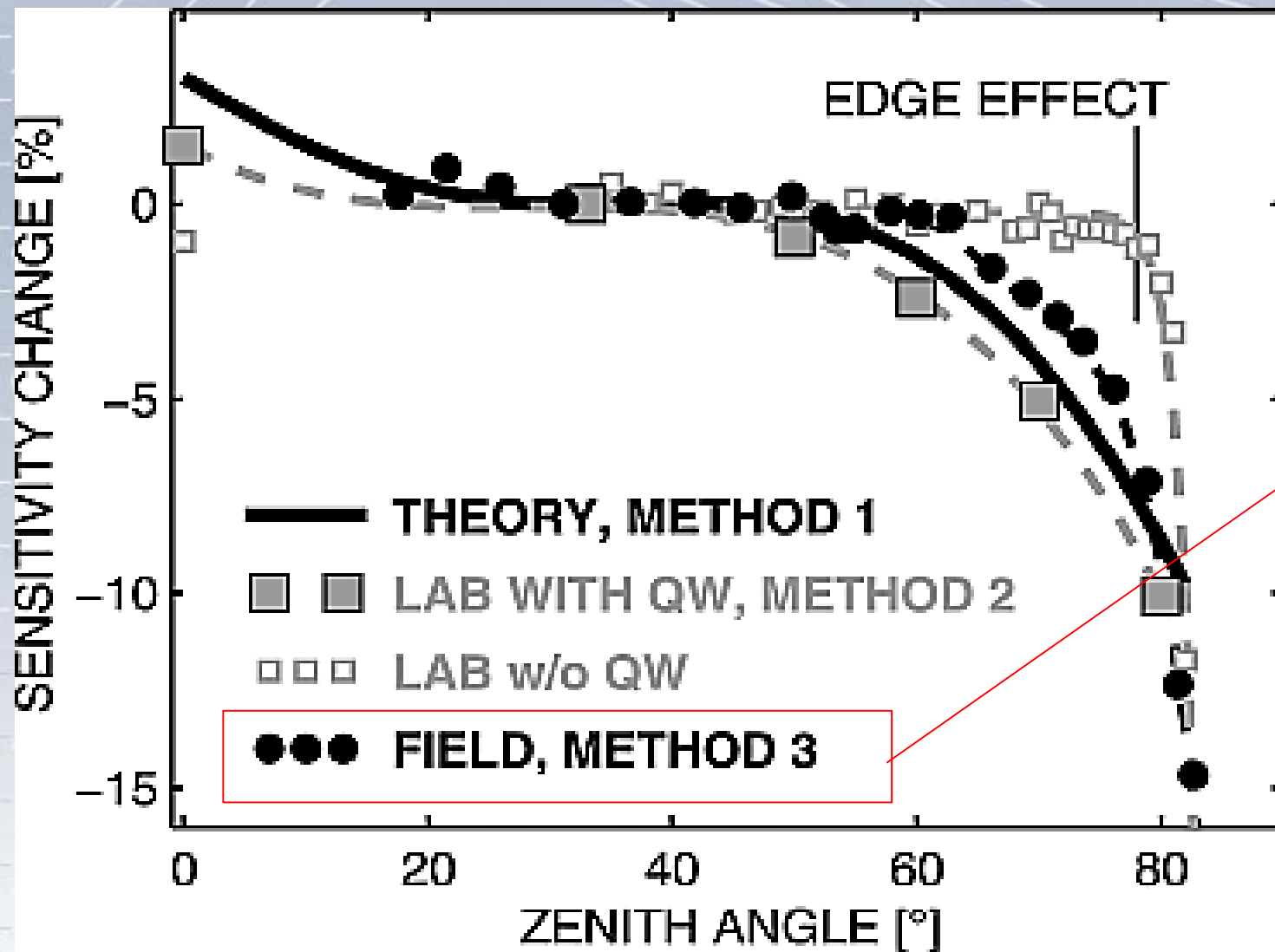
Measurement method

We measured at different SZAs with/without the window (more resolution in the interest zones), then, calculated the ratios and compared them to the ratio at 35⁰ SZA (beam perpendicular to the window and no Fresnel effects) (Cede et al., 2006)

The ratio of the measurements with and without QW at SZA = 35° represent the transmission of the QW for normal incidence

Data reduction

- Extraction of the experiment raw data from the B file.
- Calculate the count rates

$$F_i = \frac{F_i - F_1}{CYxIT} \quad i = 0,2\ldots6$$

- Adjust for Dead time.
- No temperature correction needed.
- Calculate the ratios Window/No window.

Data reduction II

- Make sure that there are no measurements with filter change, and discard this measurements in case there is any occurrence.

- We have to interpolate to calculate the ratio with/without window at the same time. A simple time interpolation would introduce spectral dependence (1)
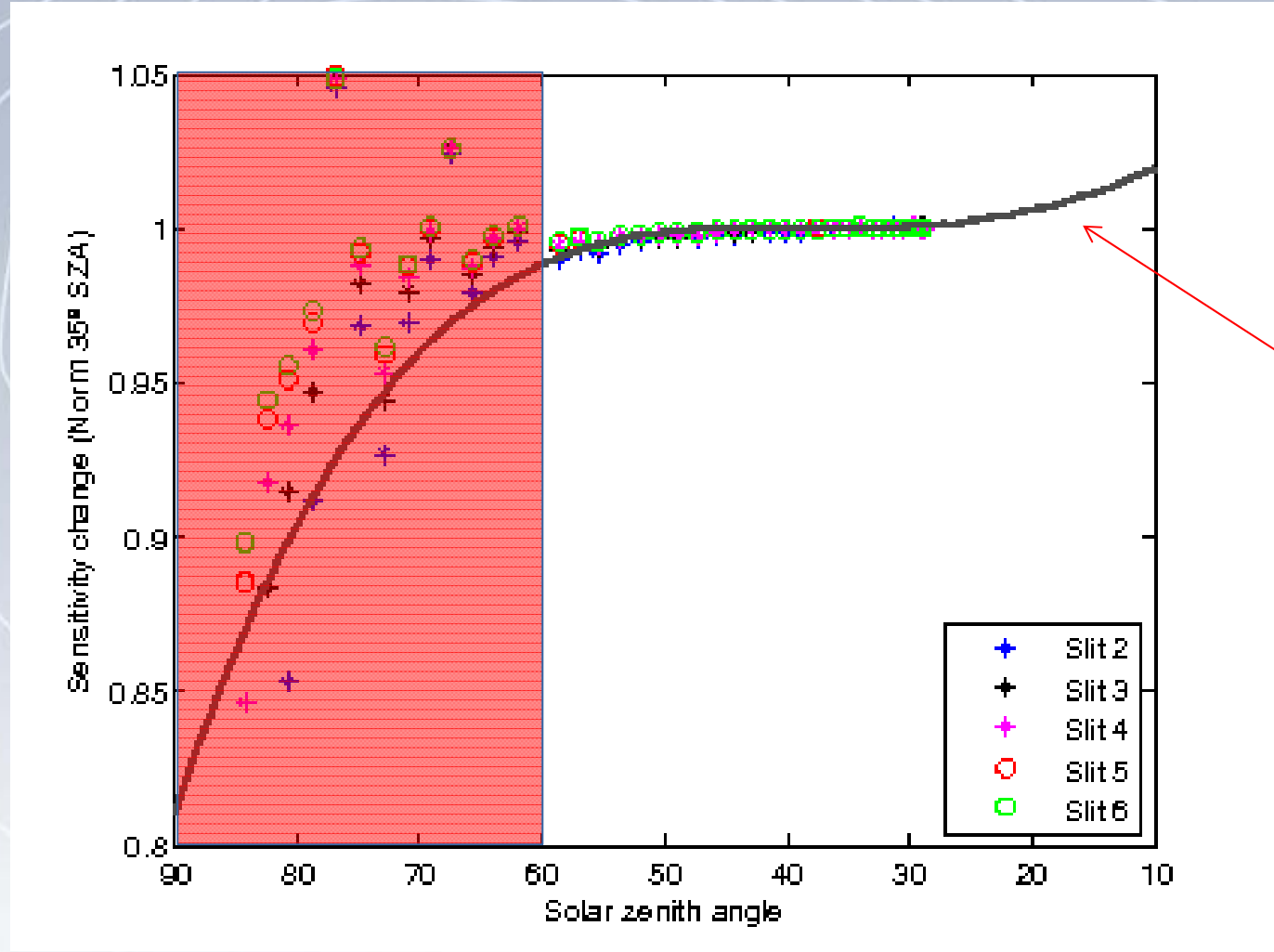
Better solution…

- Physical law (i.e., Bouguer-Lambert-Beer law): linear interpolation of log(I) vs ozone airmass, removing the Rayleigh contribution before the regression, then reintroducing it (1)

(1) Dr. H. Diemoz presentation during the Cost Action 1207 meeting, El Arenosillo, Huelva, Spain, 25th – 26th May 2015
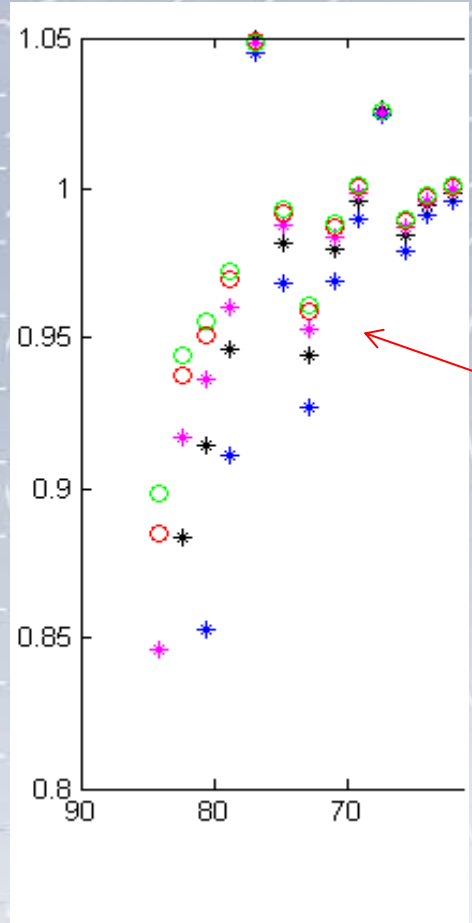
Field measurements

Theoretical curve, 100% horizontal polarizer

Until 60º SZA...

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For the rest of the winter
we have had a very
beautiful set of clouds...
but not good for our
purposes...

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Results

Using the measurements we took during the last RBCC-E campaign at Huelva and processed by Dr. Henri Diemoz.

BREWER #186 (MkIII)

Results

BREWER #070 (MkIV)

Results

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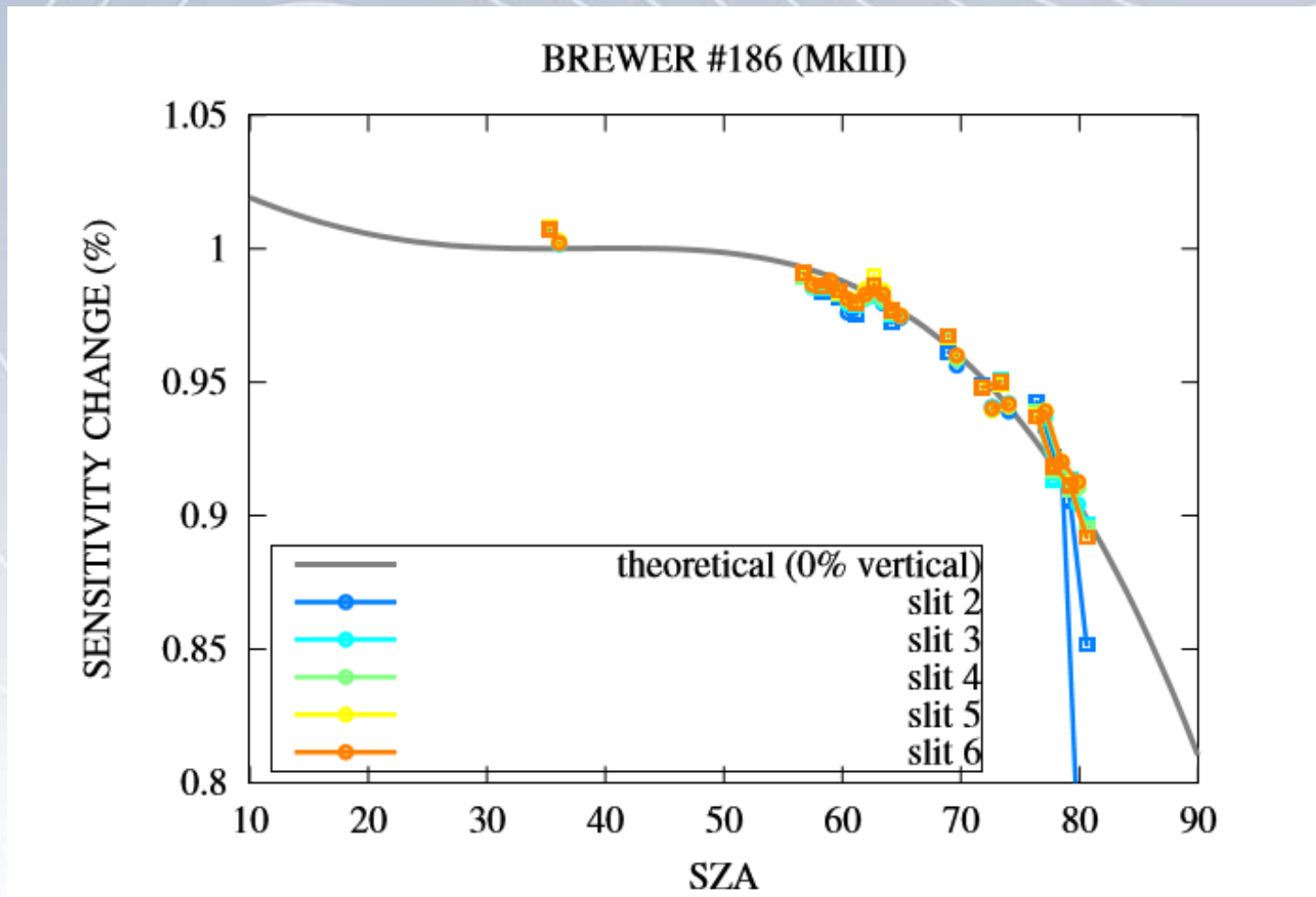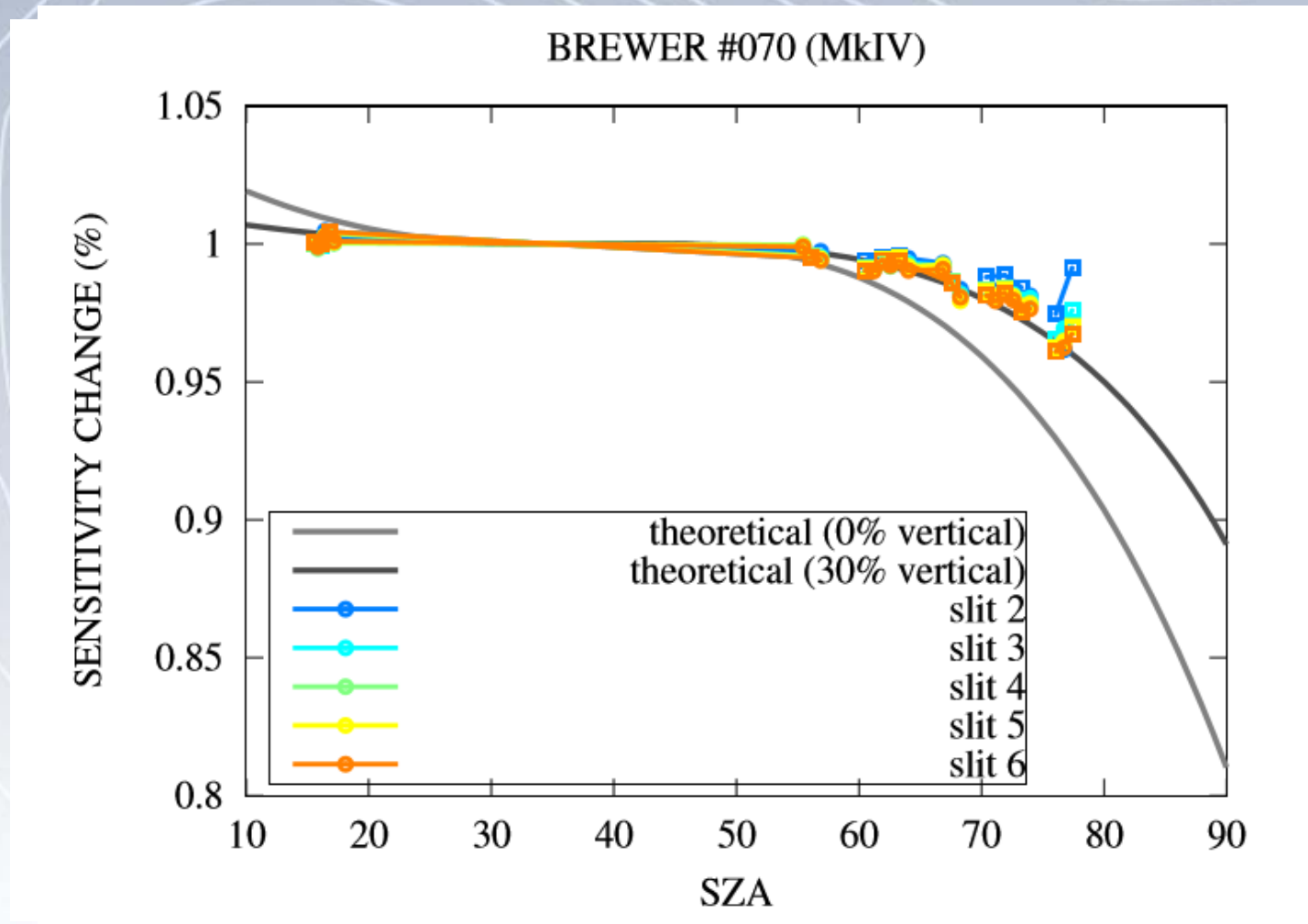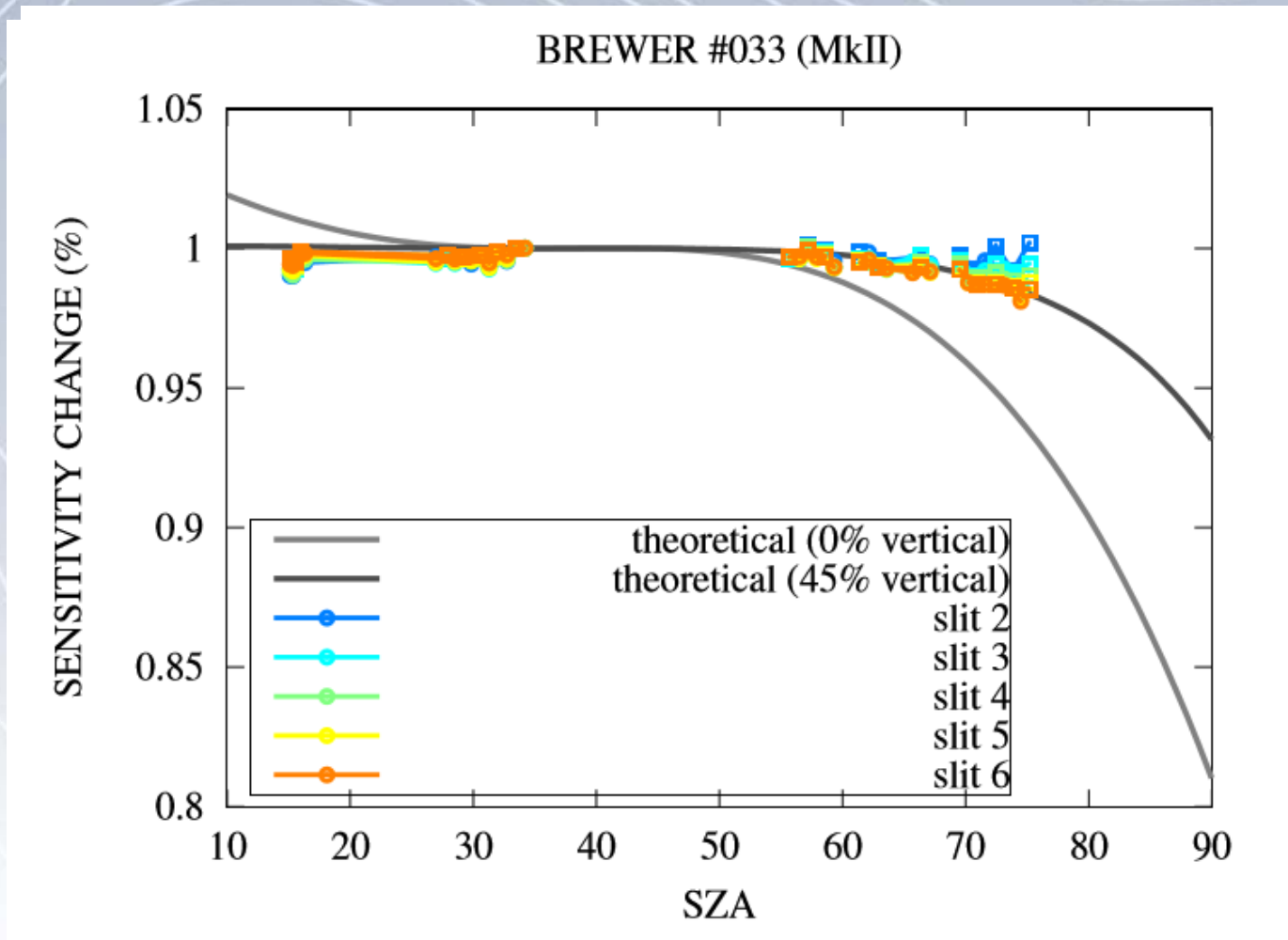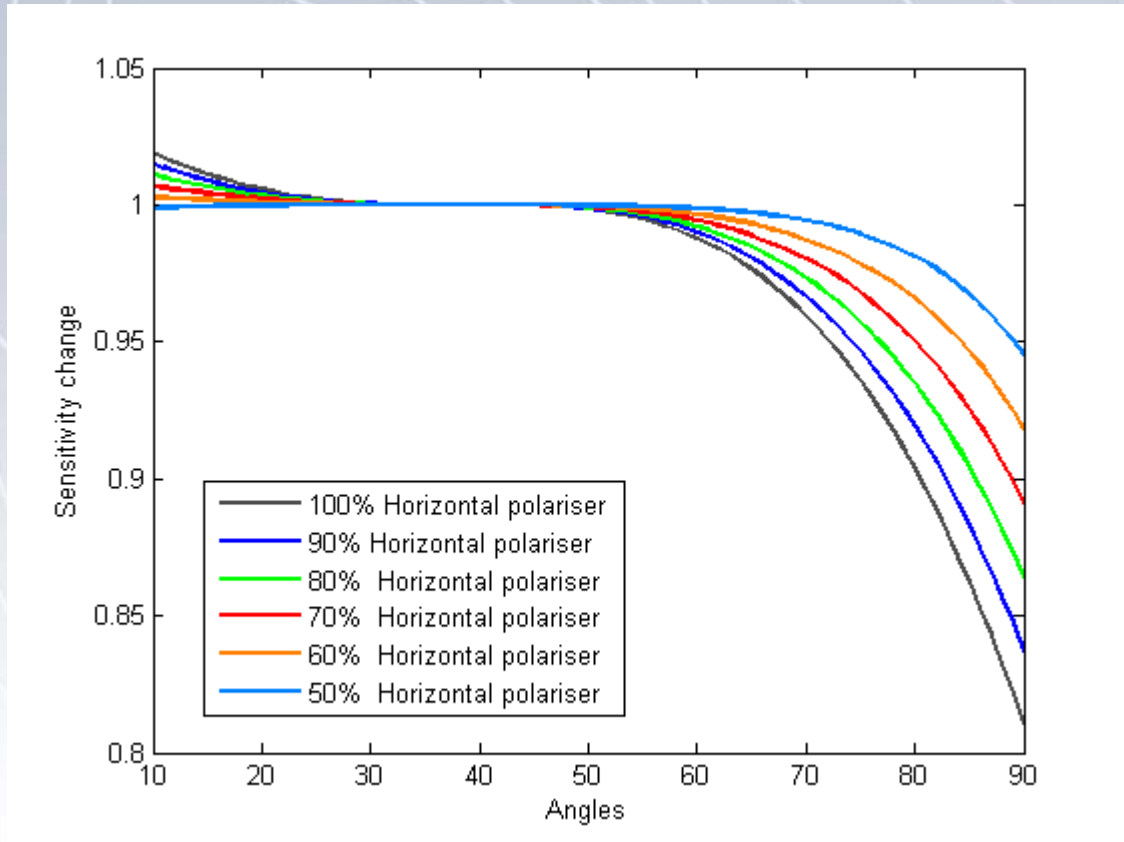Y MEDIO AMBIENTE

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Results

The difference in the curvature from the theoretical curve can be explained by the fact that diffraction gratings are not necessarily linear polarisers

Ongoing work

- Repeat the experiment with the correct weather conditions.

- Calculate a correction for the direct measurements.... important for absolute Langleys and AOD measurements.

- Measure at least with two different brewers to ensure that the same correction can be used in all the brewers of the same kind.

Thank you for your attention !

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