

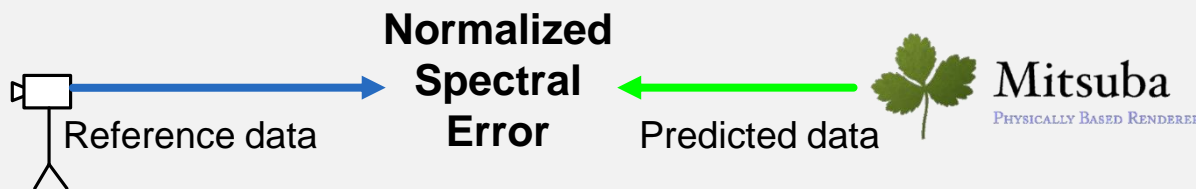
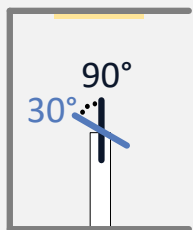
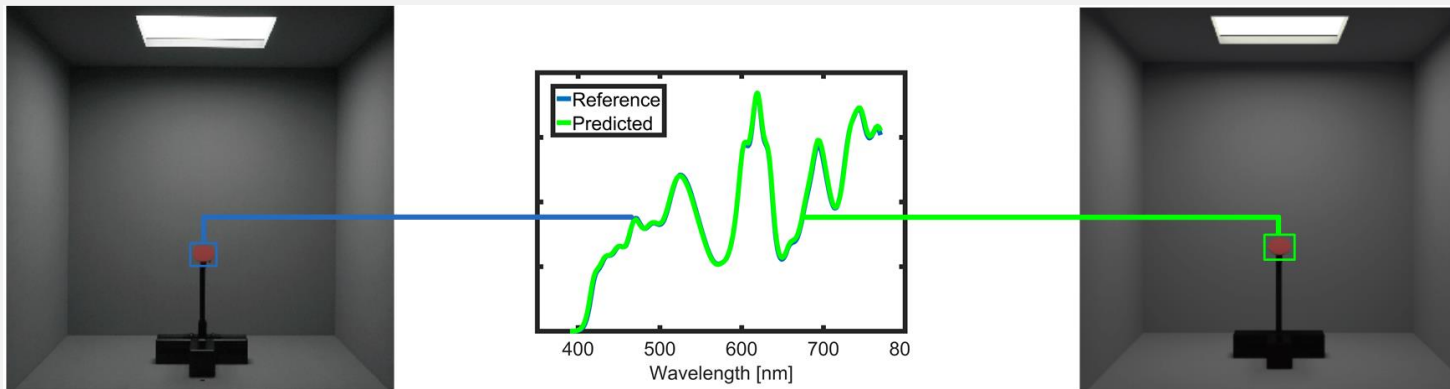
Rendered with Mitsuba [Jakob 2010] and Material Database [Dupuy et al. 2018]

# ***What is the Reddening Effect and does it really exist?***

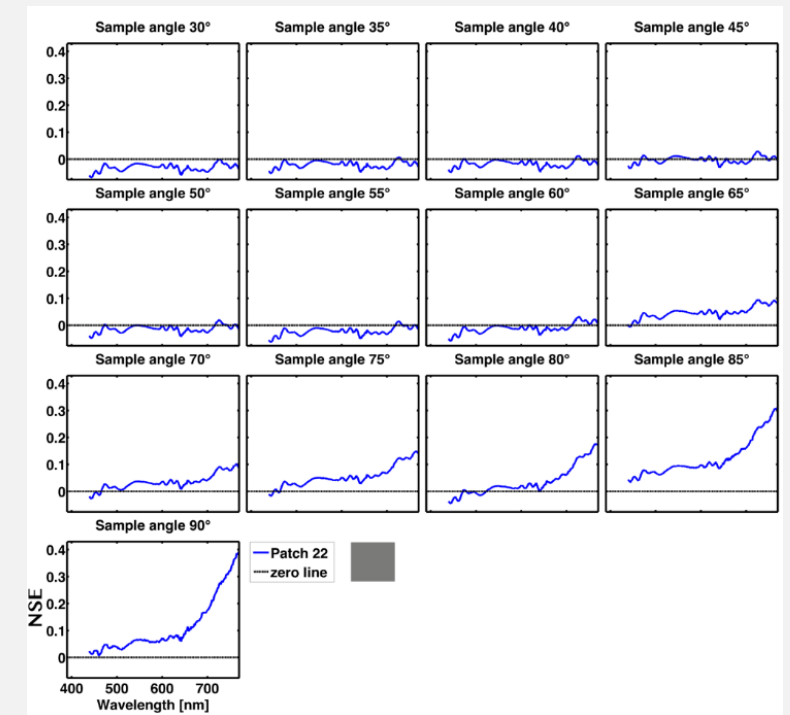
O. Clausen<sup>1,3</sup> R. Marroquim<sup>2</sup> A. Fuhrmann<sup>1</sup> and Holger Weigand<sup>1</sup>

# Spectral Comparison between real and simulated scene [Clausen et al. 2018]

## Spectral Comparison



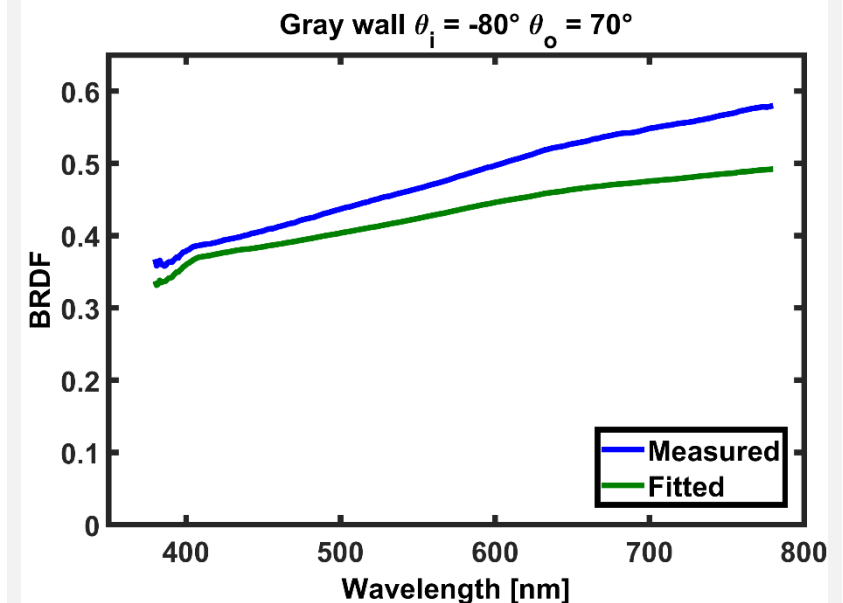
## Normalized Spectral Error



# Fitting error of the grey wall BRDF

- Fitting error high at specular reflection at grazing angles
- Reflectance spectrum is tilted at specular reflection
- Used Cook-Torrance BRDF cannot fit well this linear wavelengths dependency
- We are not aware of any BRDF model including this scattering phenomena

Specular reflection at grazing angles



# Motivation

- **Related Works:**

- Levesque et al. [[Levesque et al. 2018](#)] observed the same scattering phenomena

- **Reddening Effect:**

- Notable on rough surfaces especially in the specular reflection
- Tilting of the reflectance spectrum, which increases with the incident angle

- **Assumption by Levesque et al.:**

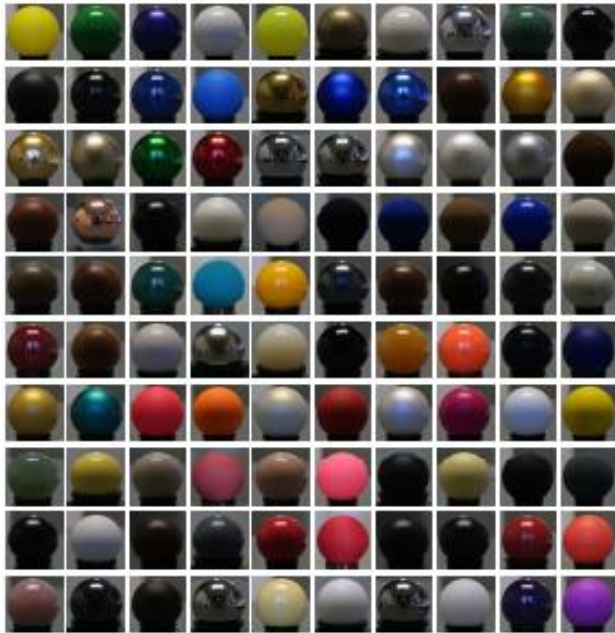
- Reddening effect is caused by Rayleigh scattering on the surface

- **Problem:**

- Rayleigh scattering depends on  $\frac{1}{\lambda^4}$ , thus it is nonlinear

# BRDF Databases

## RGB

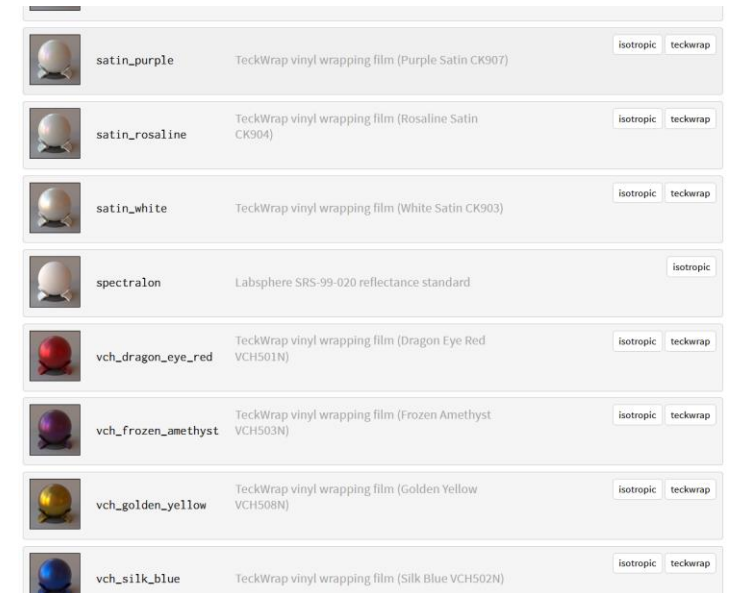


MERL Database  
[Matusik et al. 2003]



UTIA Database  
[Filip et al. 2014a, Filip et al. 2014b]

## Spectral



Material Database  
[Dupuy et al. 2018]



# BRDF Databases

## RGB



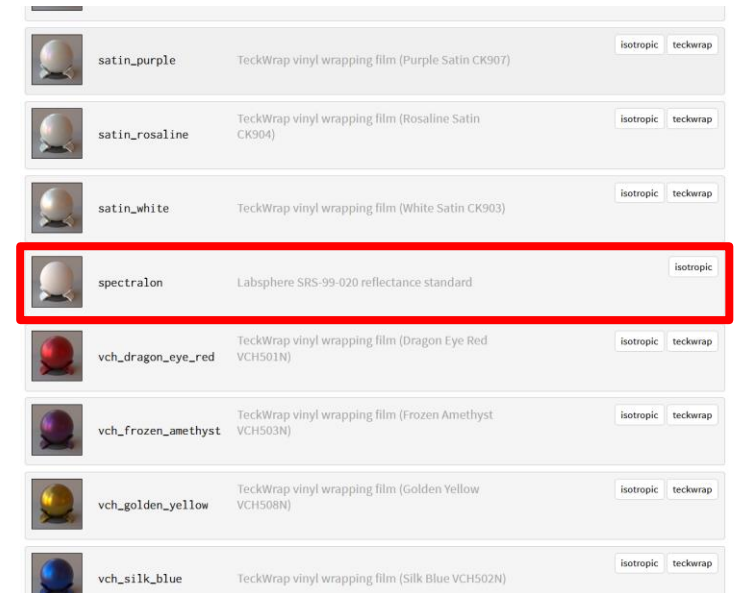
MERL Database  
[Matusik et al. 2003]



UTIA Database  
[Filip et al. 2014, Filip et al. 2014.2]



## Spectral



Material Database  
[Dupuy et al. 2018]



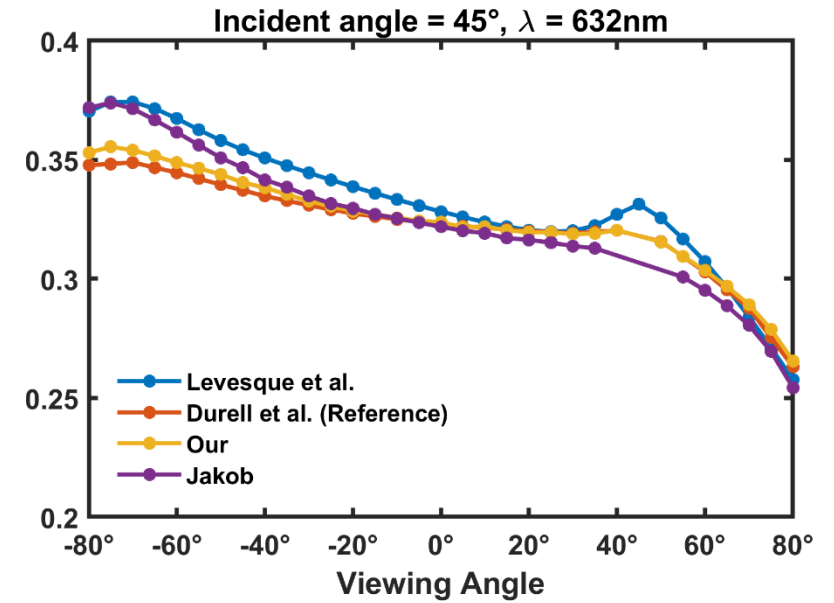
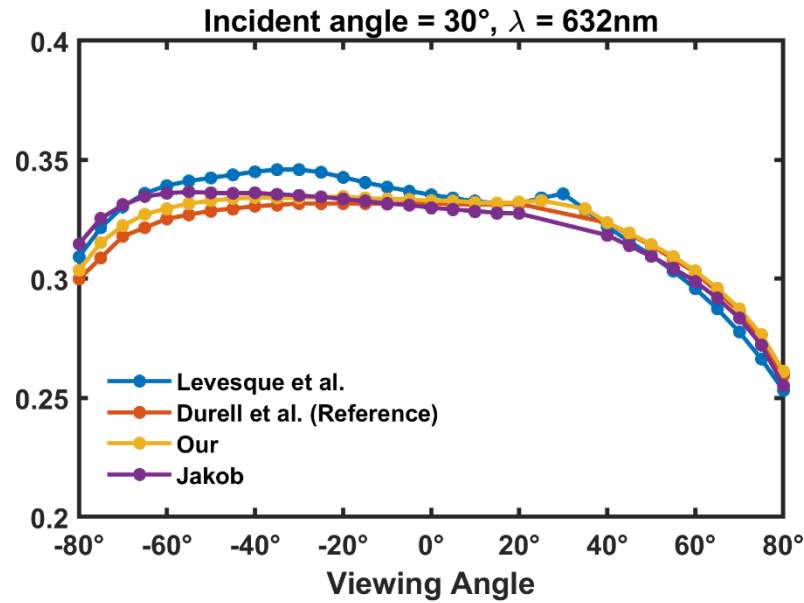
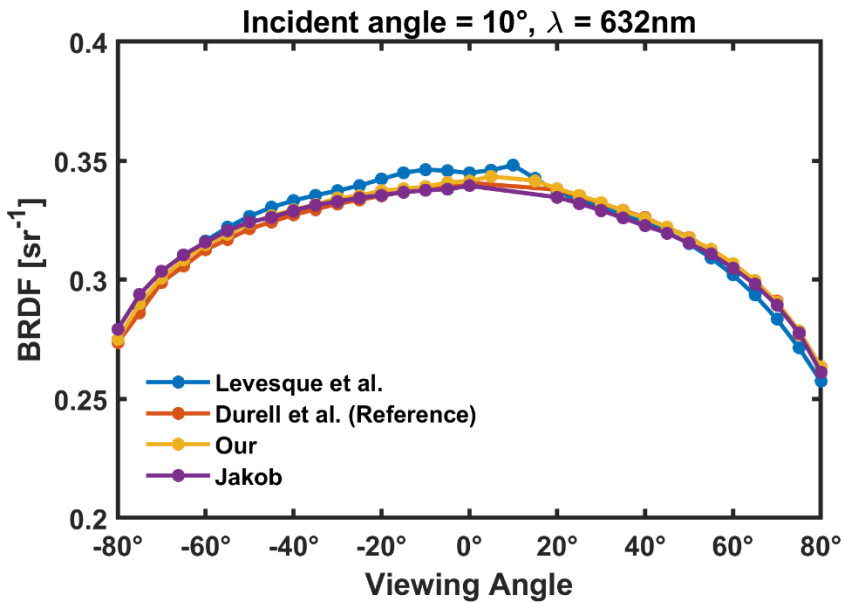
# Spectralon BRDF

- **Durell et al.** [[Durell et al. 2015](#)]
  - Round robin test with 4 laboratories
  - Two laboratories measured the same Spectralon BRDF
- **Levesque et al.** [[Levesque et al. 2018](#)]
  - In-plane BRDF of Spectralon with polarization
- **Our**
  - In-plane BRDF of Spectralon without polarization
- **Jakob**
  - Wenzel Jakob provided us raw Spectralon BRDF to avoid any chances of error introduced by processing

- Reference BRDF at 3 incident angles and two wavelengths  
-> **Evaluate setup**

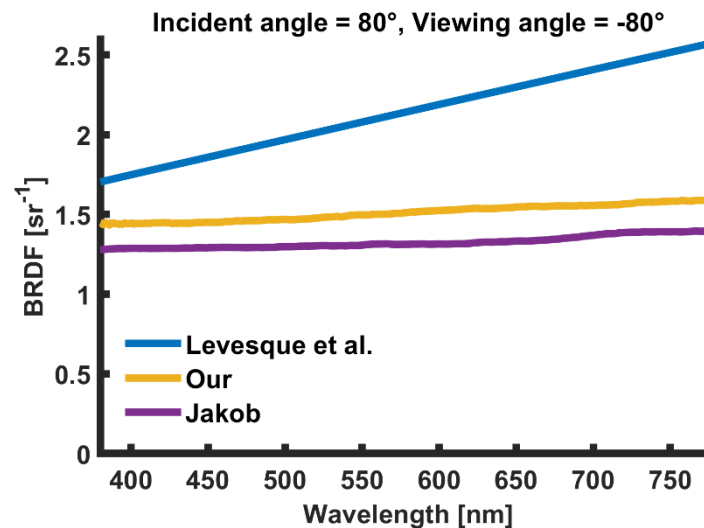
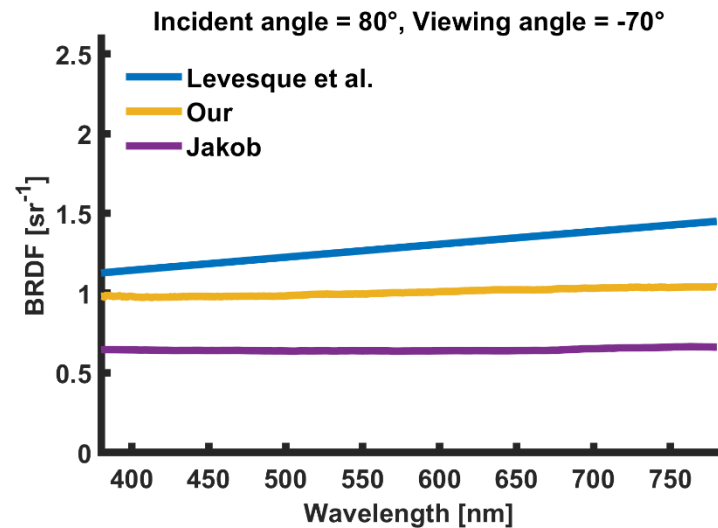
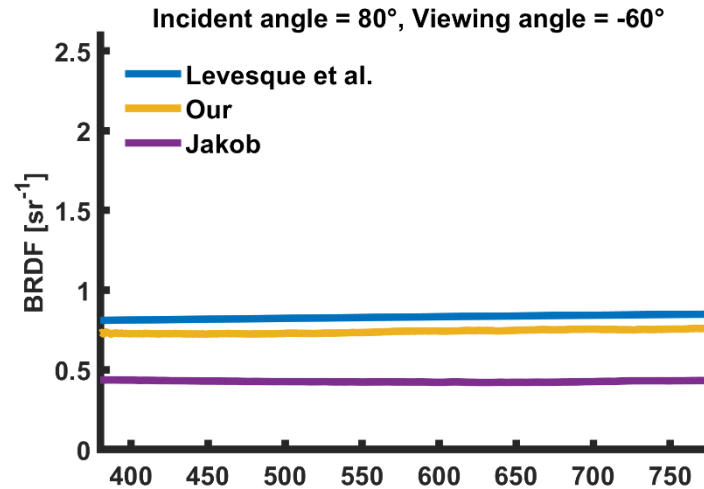
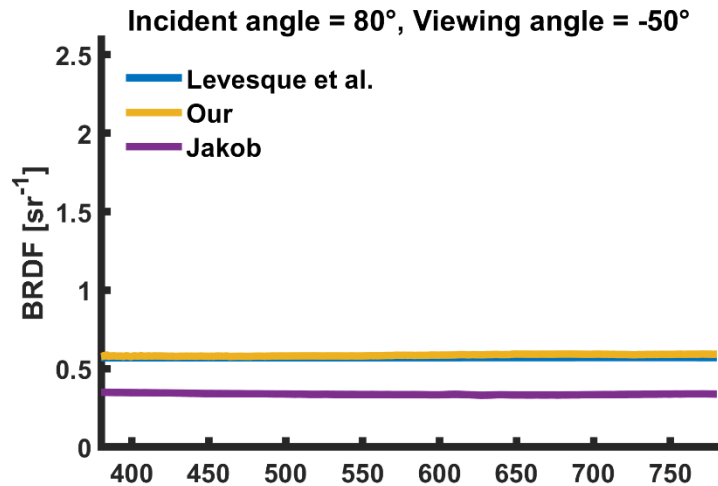
- Provide spectral BRDF at grazing incident angles  
-> **Analyse reddening effect**

# Evaluation of the Gonioreflectometers





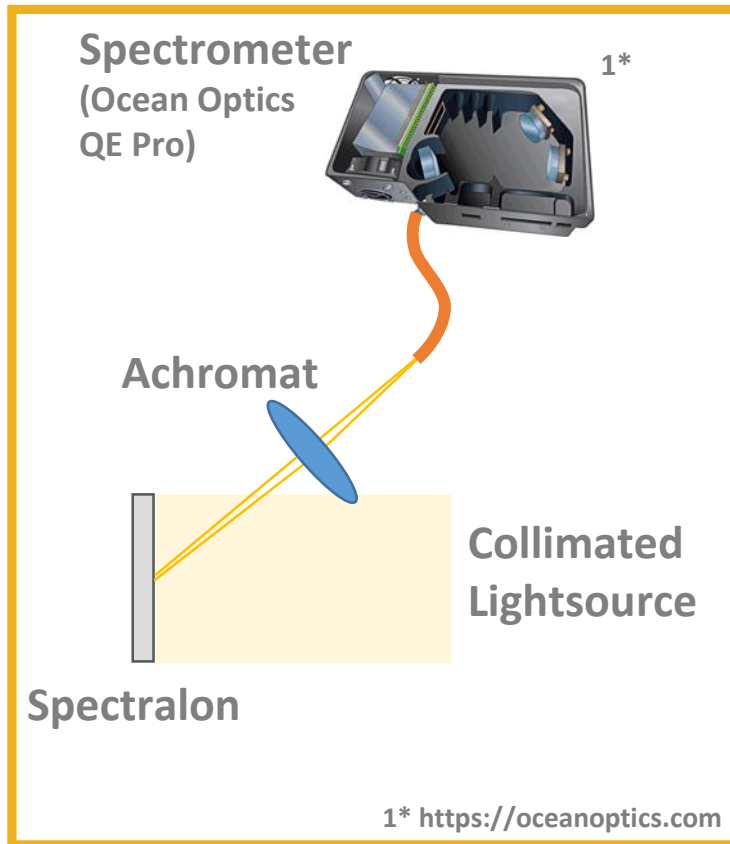
# Spectralon BRDF: Incident angle -80°



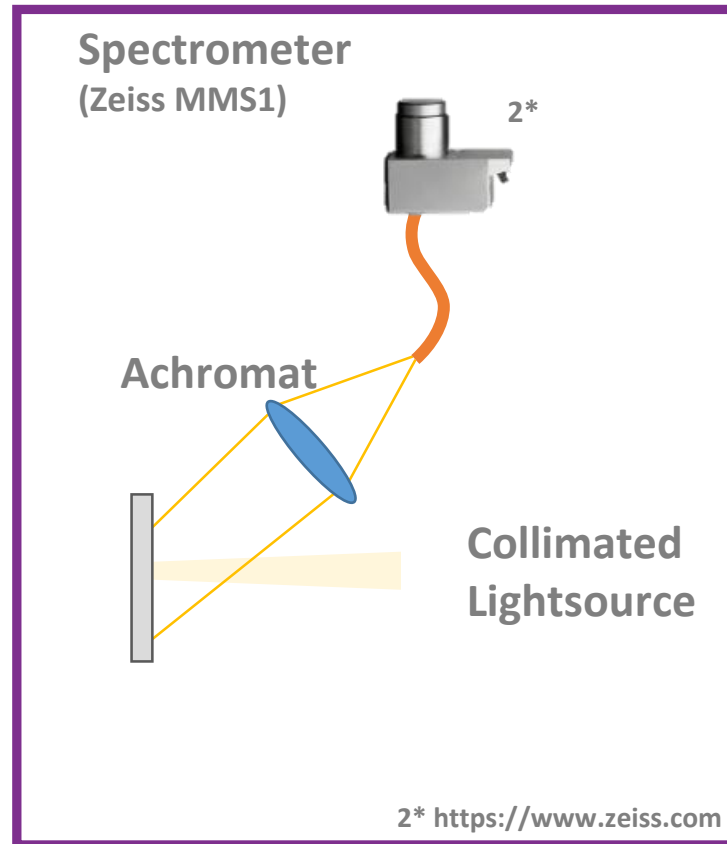
➤ All three sources show the reddening effect

# Gonioreflectometer Setups

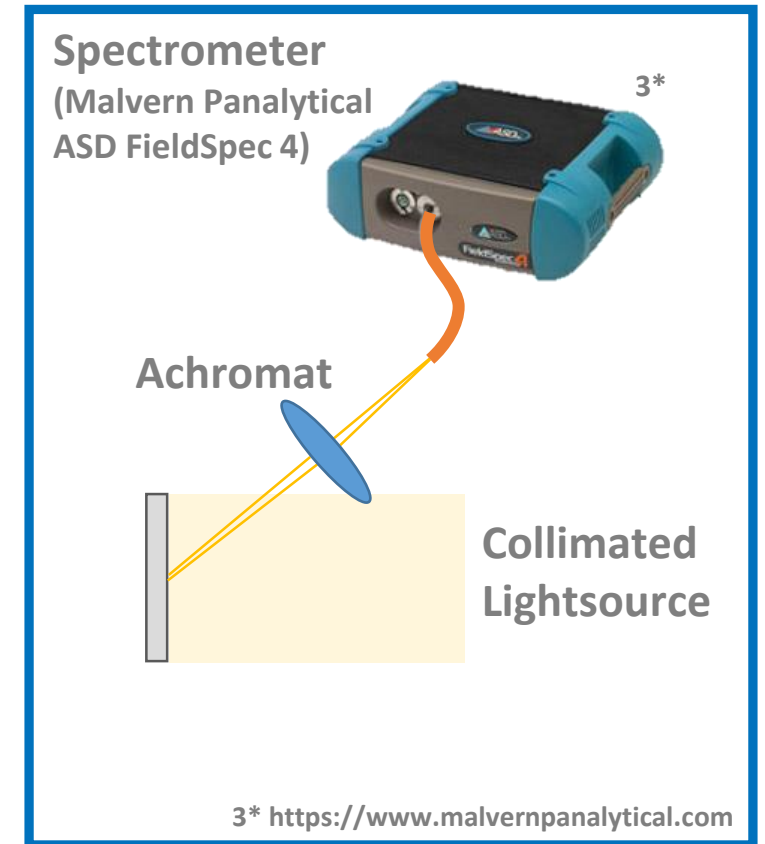
## Our standard setup



## Dupuy et al.

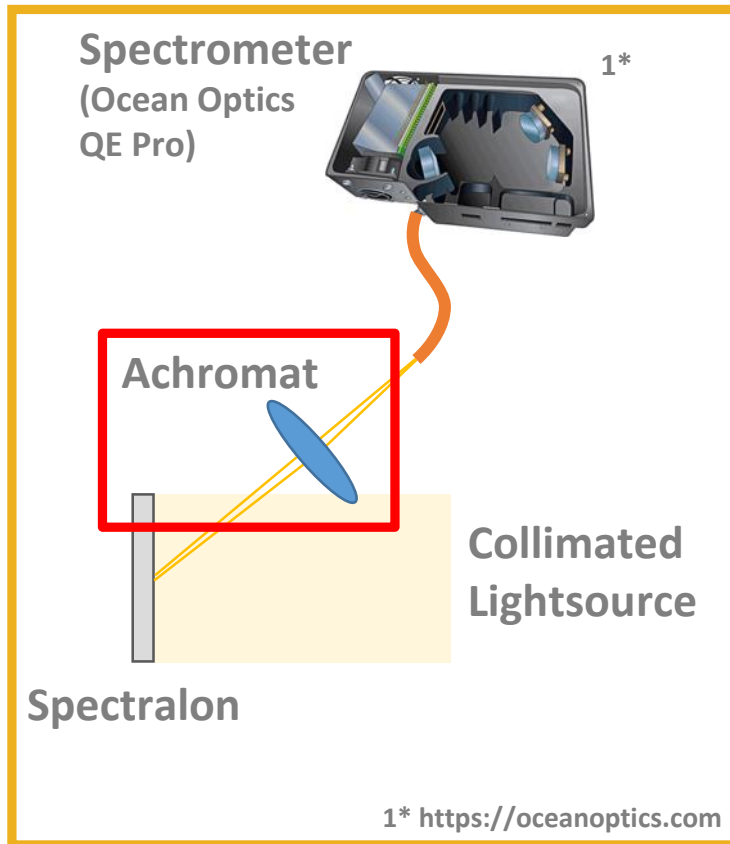


## Levesque et al.

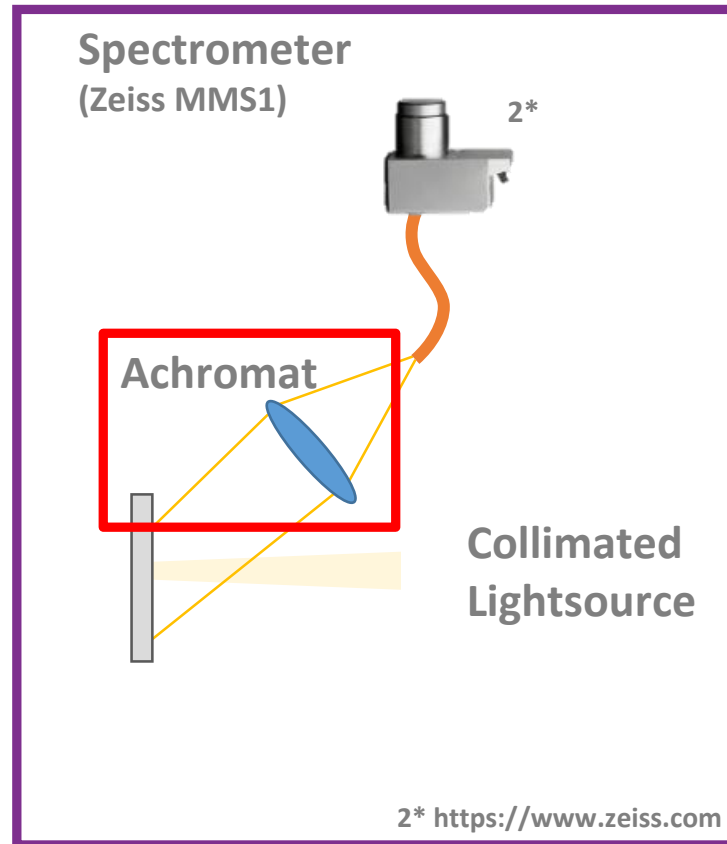


# Gonioreflectometer Setups

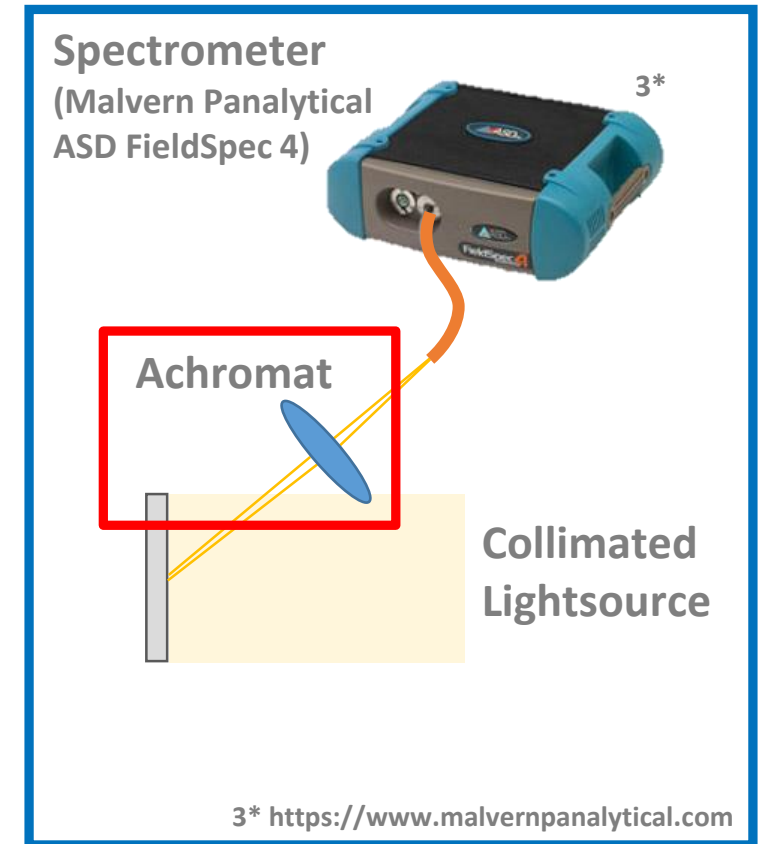
## Our standard setup



## Dupuy et al.

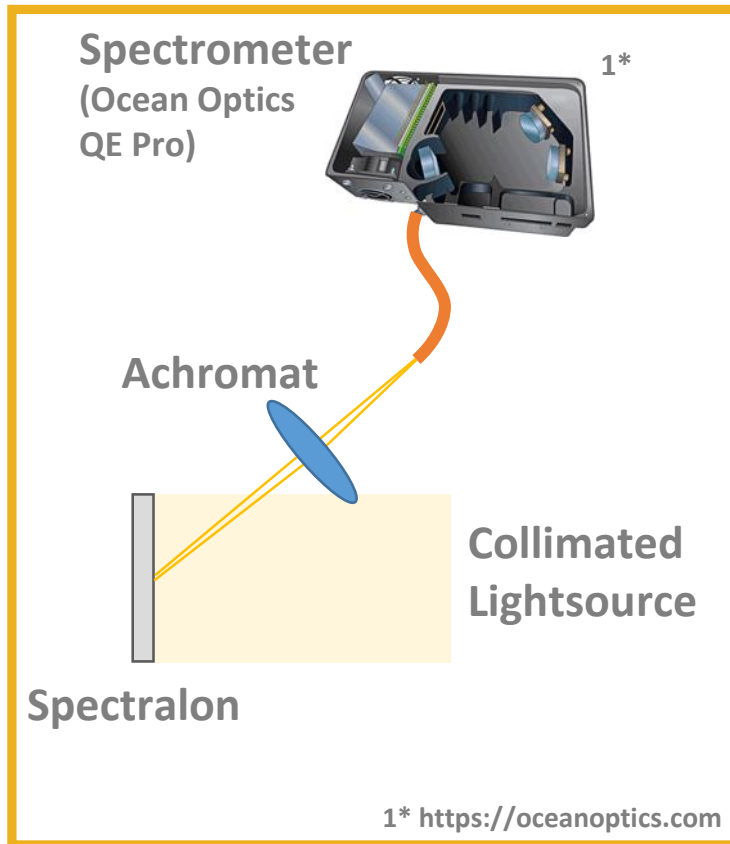


## Levesque et al.

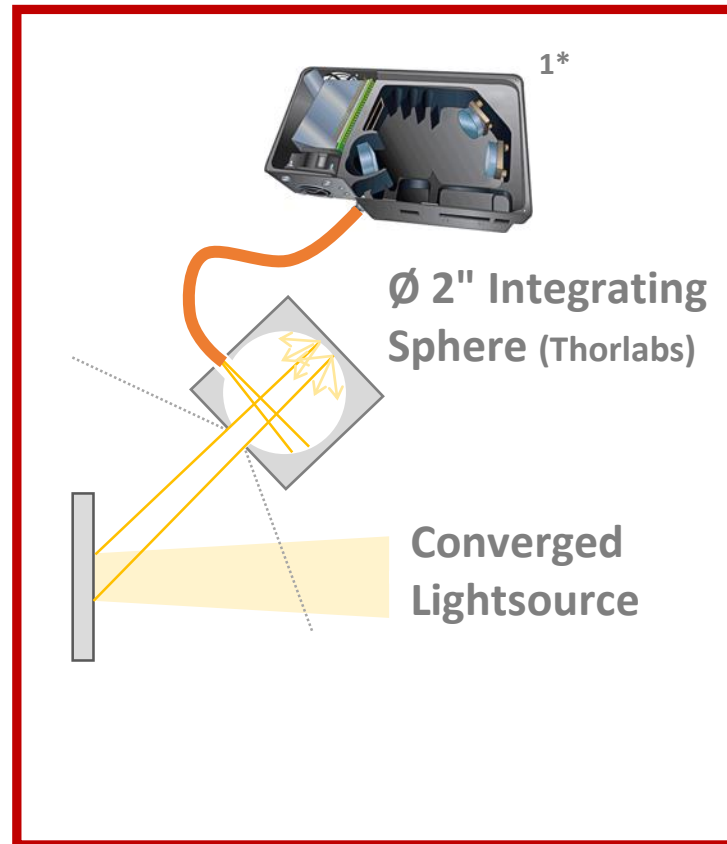


# Validation of the Detector

## Our standard setup: Achromatic lens

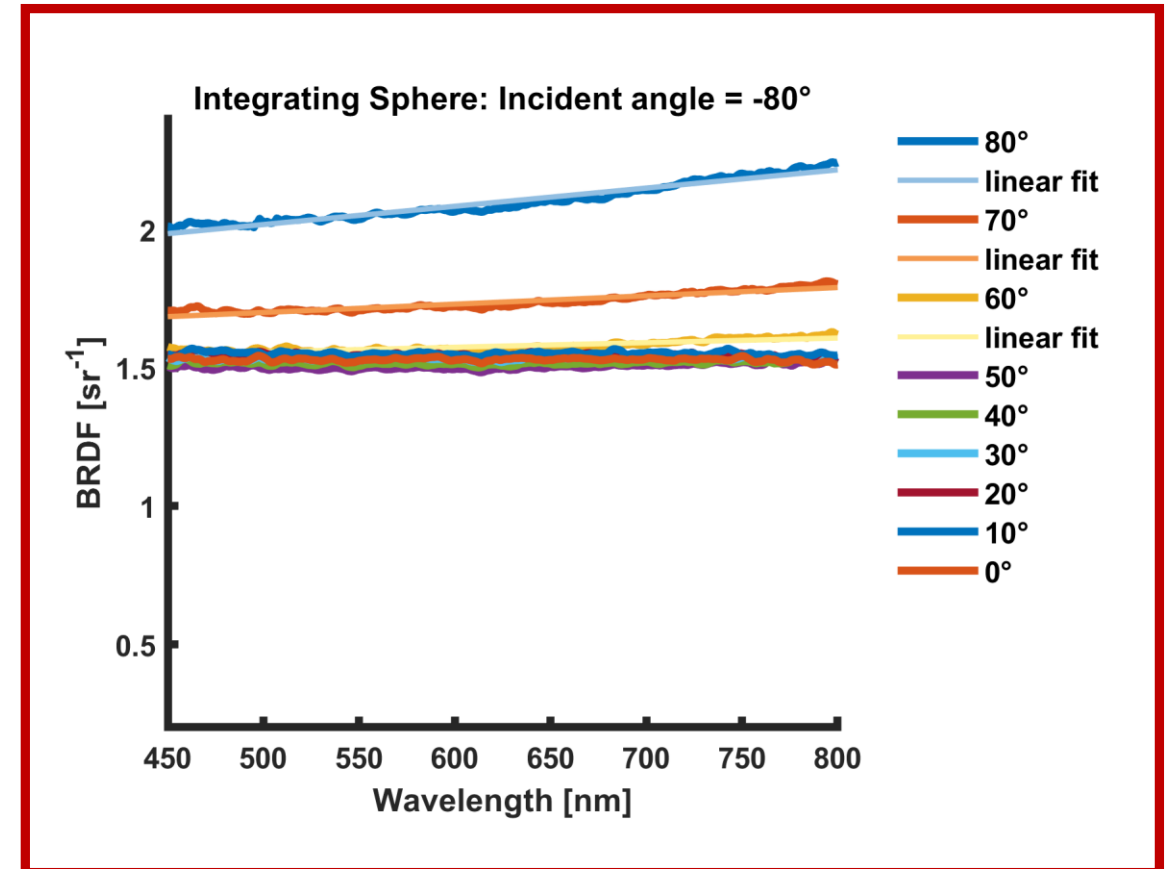
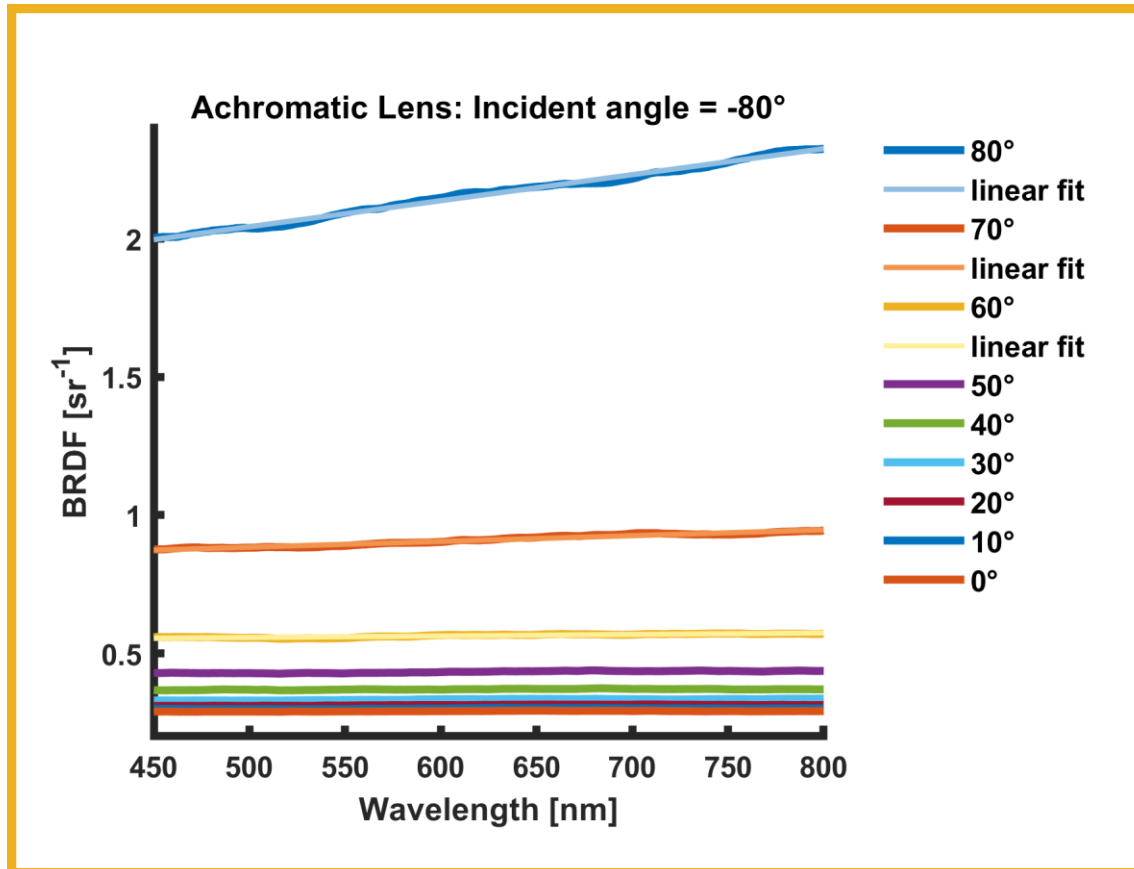


## Our modified setup: Integrating sphere



- Integrating sphere instead of achromatic lens
- Lightsource slightly converged
- Second detector smaller angular resolution

# Validation of the Detector



# Conclusion

We showed that,

... our, Jakob's and Levesque's gonioreflectometer is reliable.

... the reddening effect can be observed in several data acquired by different gonioreflectometers.

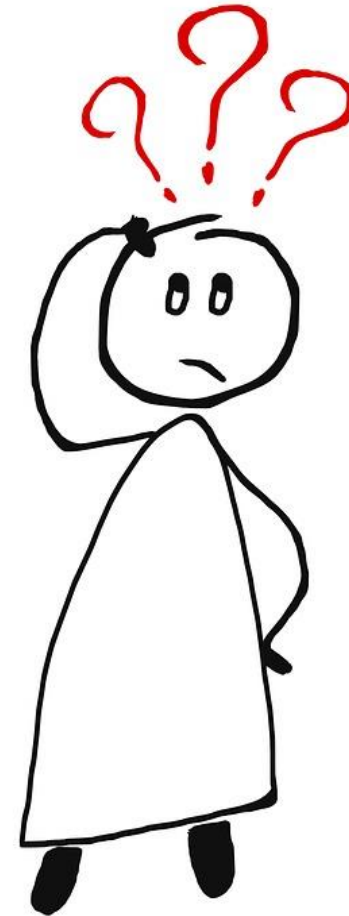
... the achromatic lens of the detector is not the cause for the reddening effect.

➤ **The reddening effect is a property of the material reflectance function**



Thank you for  
your attention!

Questions?



# References

- [Clausen et al. 2018] CLAUSEN O., MARROQUIM R., FUHRMANN A.: Acquisition and Validation of Spectral Ground Truth Data for Predictive Rendering of Rough Surfaces. *Computer Graphics Forum* (2018).
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- [Levesque et al. 2018] LEVESQUE M. P., DISSANSKA M.: Correction of the calibration measurement by taking into account the spectralon spectro-polarimetric brdf model, 2018.
- [Jakob 2010] JAKOB W.: Mitsuba renderer, 2010. <http://www.mitsubarenderer.org>.