

# **Light absorption in turbid waters**

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## Determination of suspended matter concentration

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### problematic issues:

- offset problems especially with glass fiber filters by salt retention in the rim of the filter (Banse et al. 1963; Stavn et al. 2009) and loss of filter material
- methodology in sea water:
  - 1) rinsing of the rim after filtration
  - 2) collection of high sample masses to reduce the rel. effect of the offset
  - 3) Stavn et al. 2009: prepare process filters with particle-free sample water to determine the offset
- **problem: process filter offset highly variable: -0.1 – 1 mg, mean 0.5 mg (n=150)**

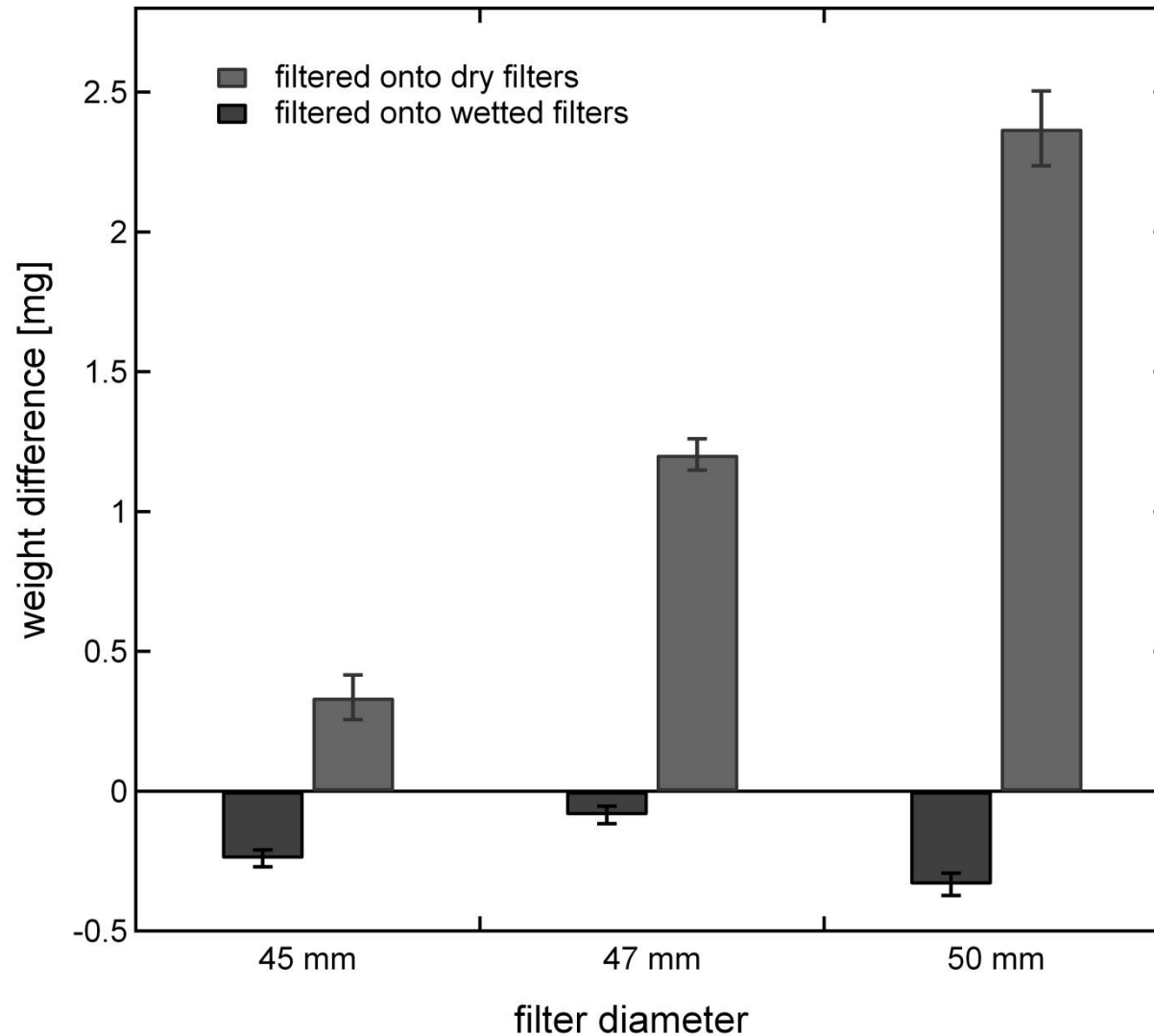
# Determination of suspended matter concentration

## problematic issues

- offset problems (see Stavn et al. 2009)

- methodology in series  
 1) rinsing  
 2) collection  
 3) Stavn et al.

- **problem: process**



Stavn et al. 1963;

to determine the offset

## Determination of suspended matter concentration

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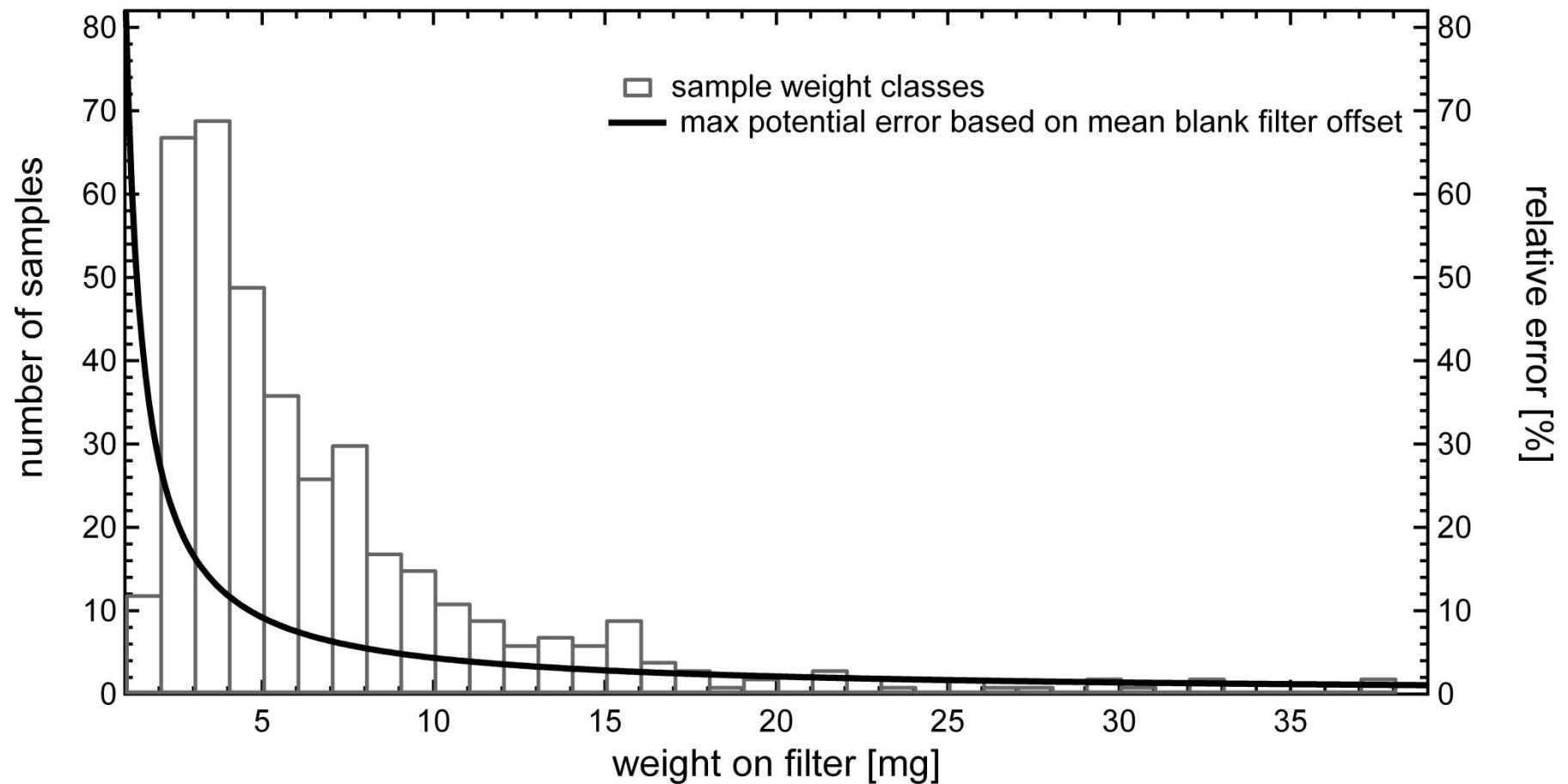
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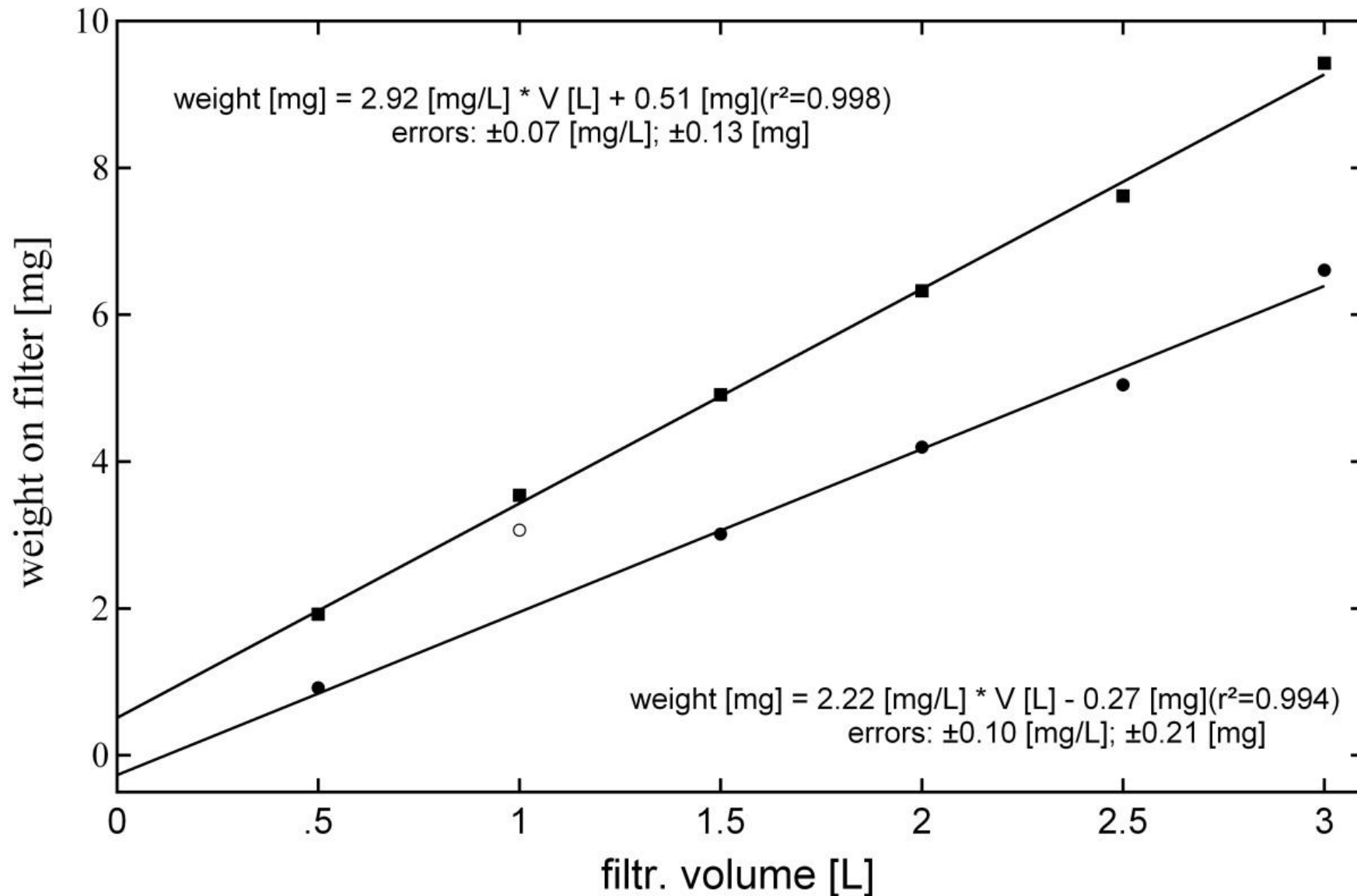
# Determination of suspended matter concentration

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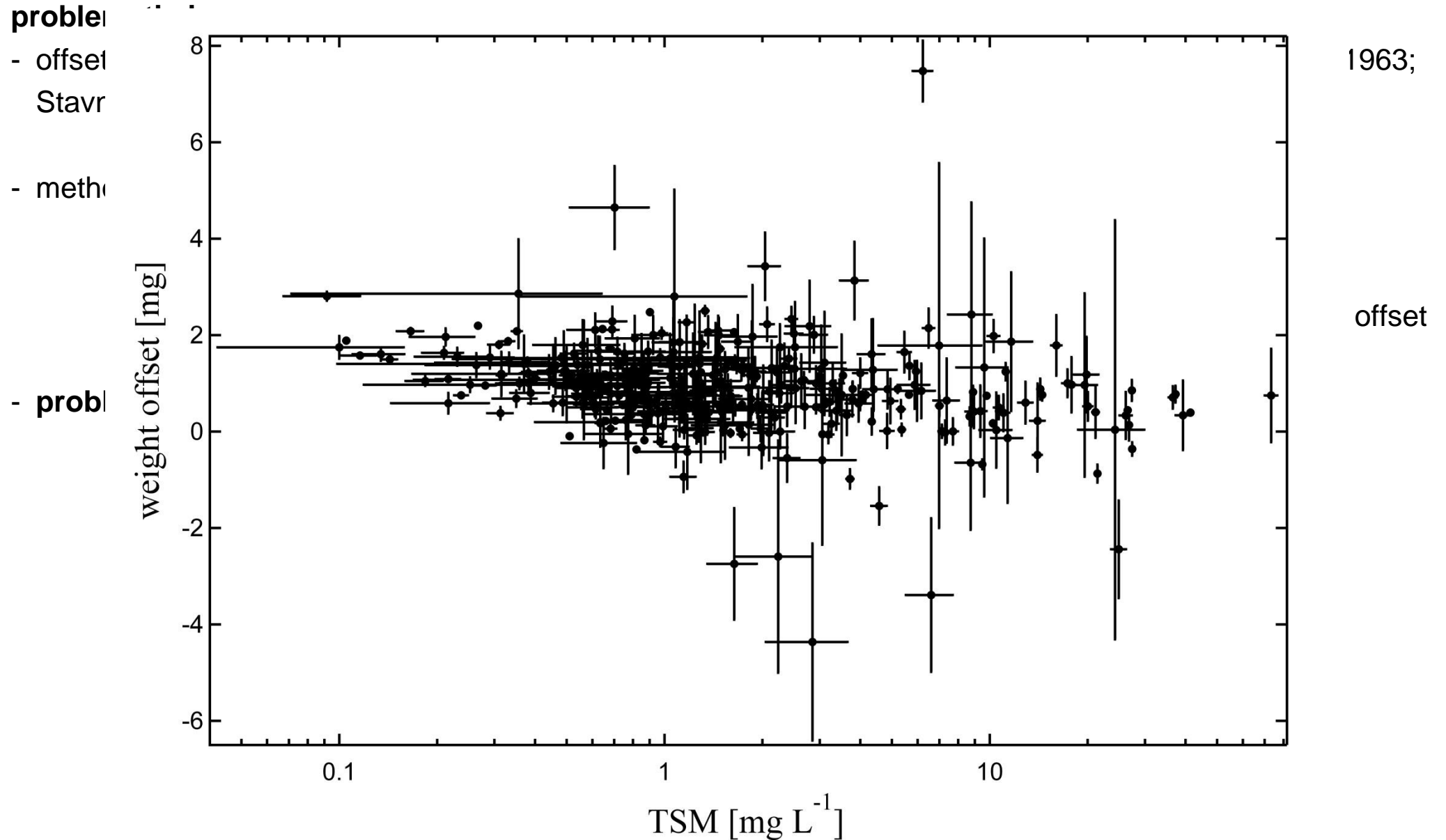
- offs
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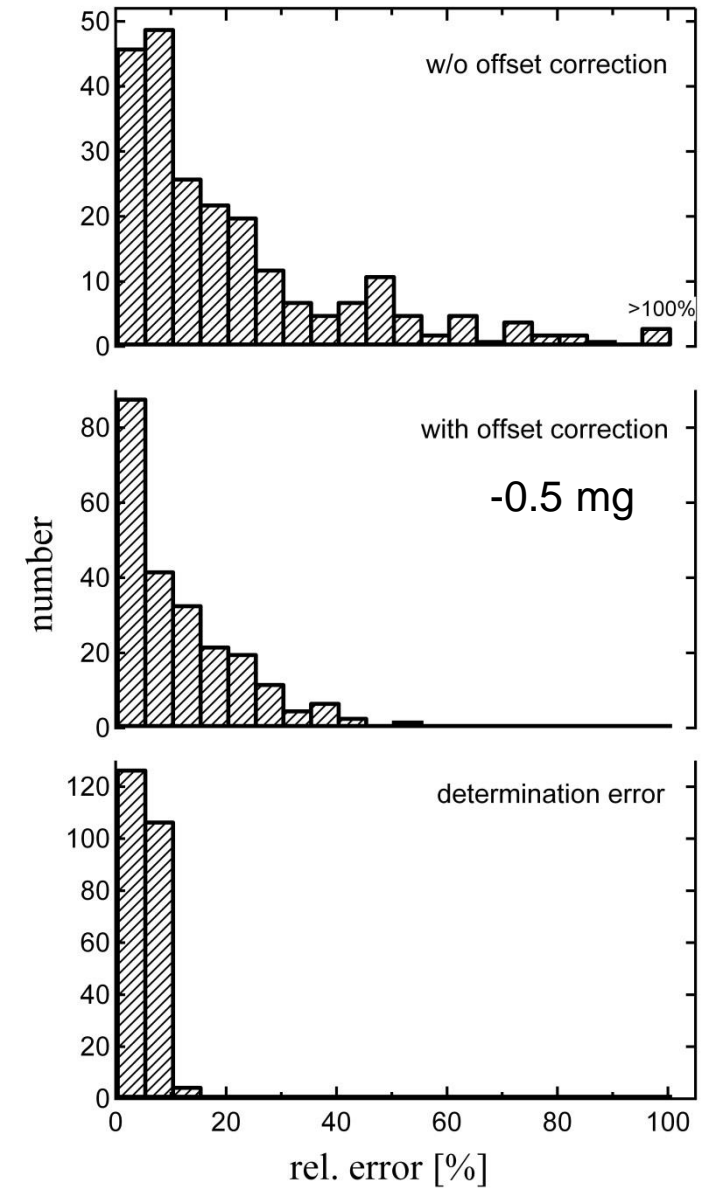
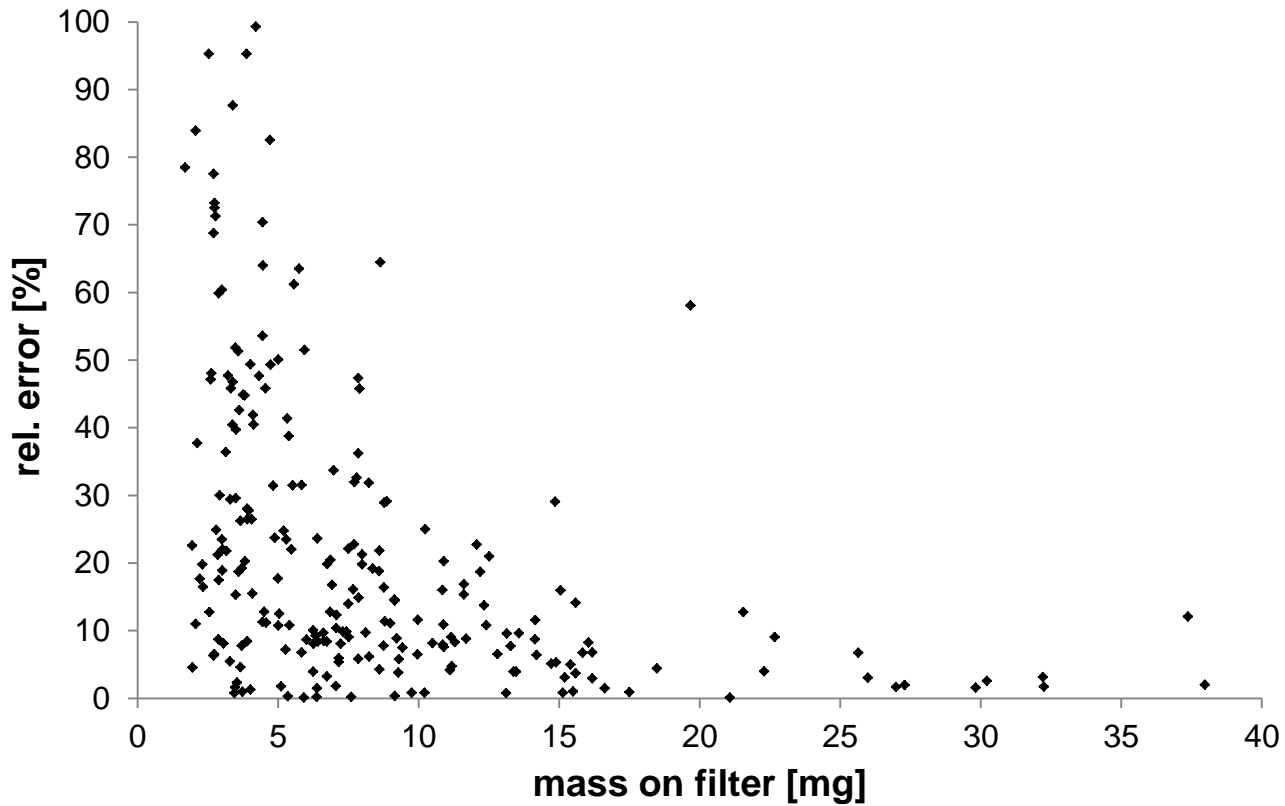
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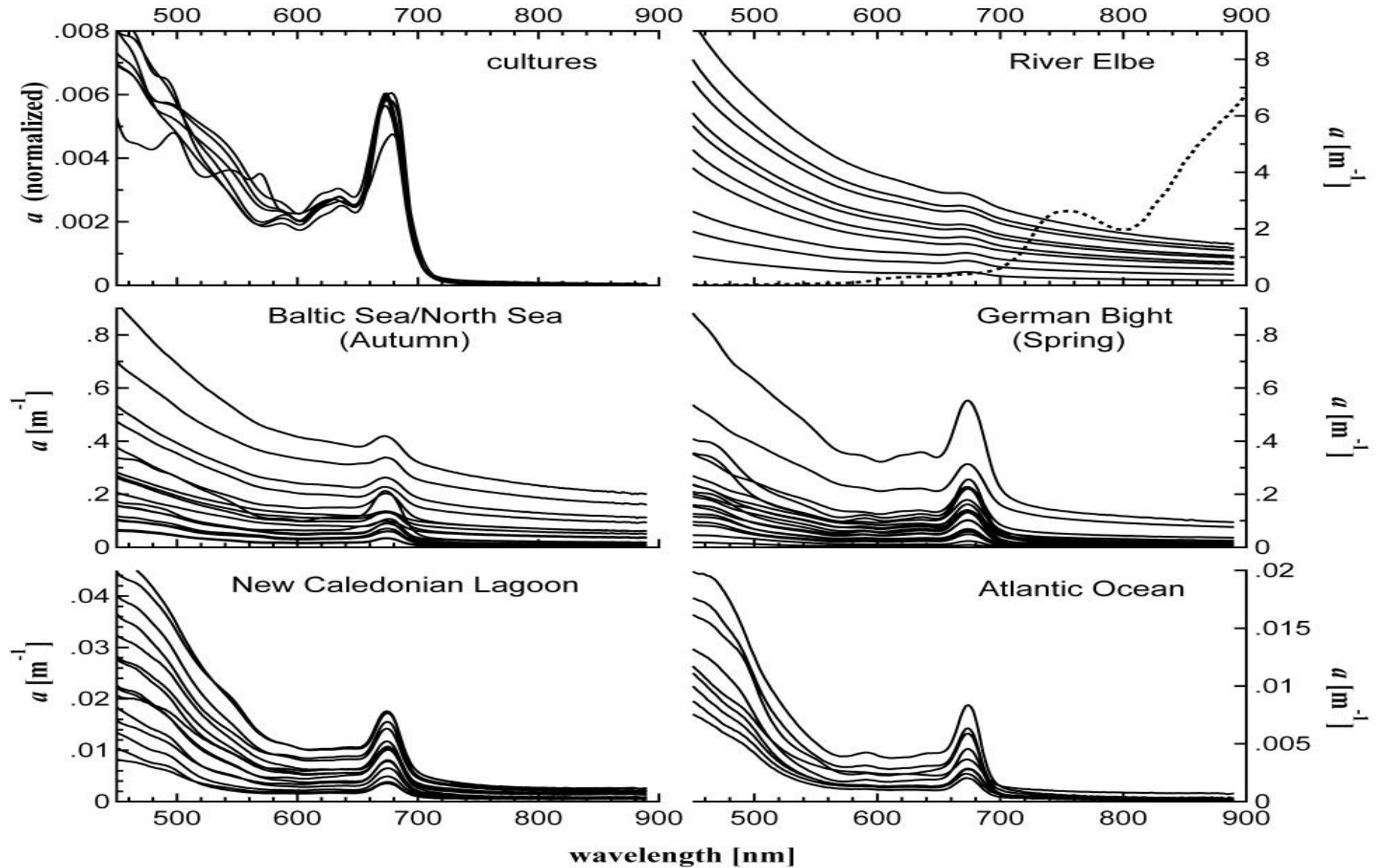
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  - 3) Stavn et al. 2009: prepare process filters with particle-free sample water to determine the offset
- **problem: process filter offset highly variable: -0.1 – 1 mg, mean: 0.5 mg (n=150)**
- **real sample filter offset varies even more: -4 – +7 mg, mean: 1 mg (n=380), inducing error of >100 % to reach error of <15%, >20 mg have to be collected**

## Light absorption in turbid waters

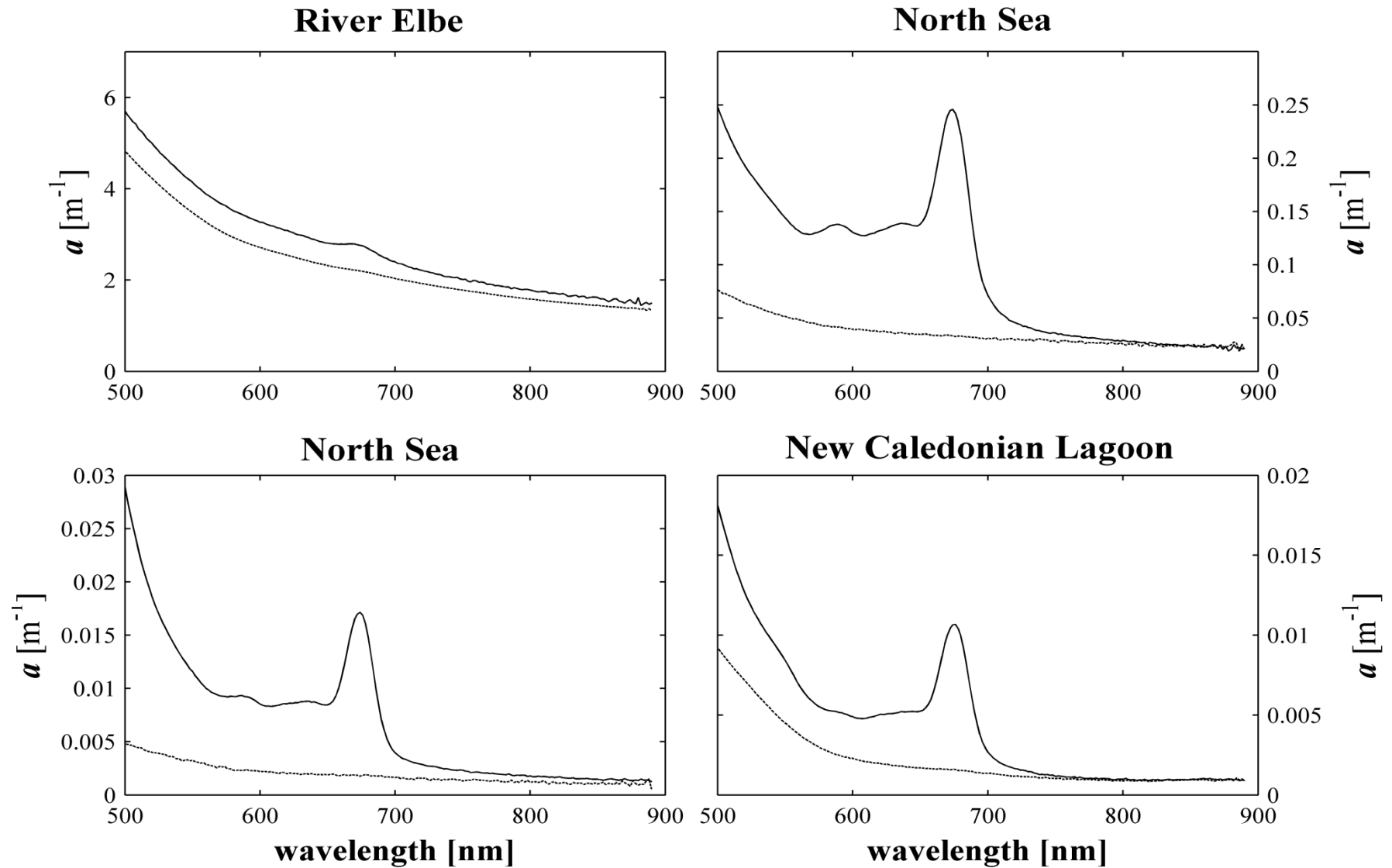
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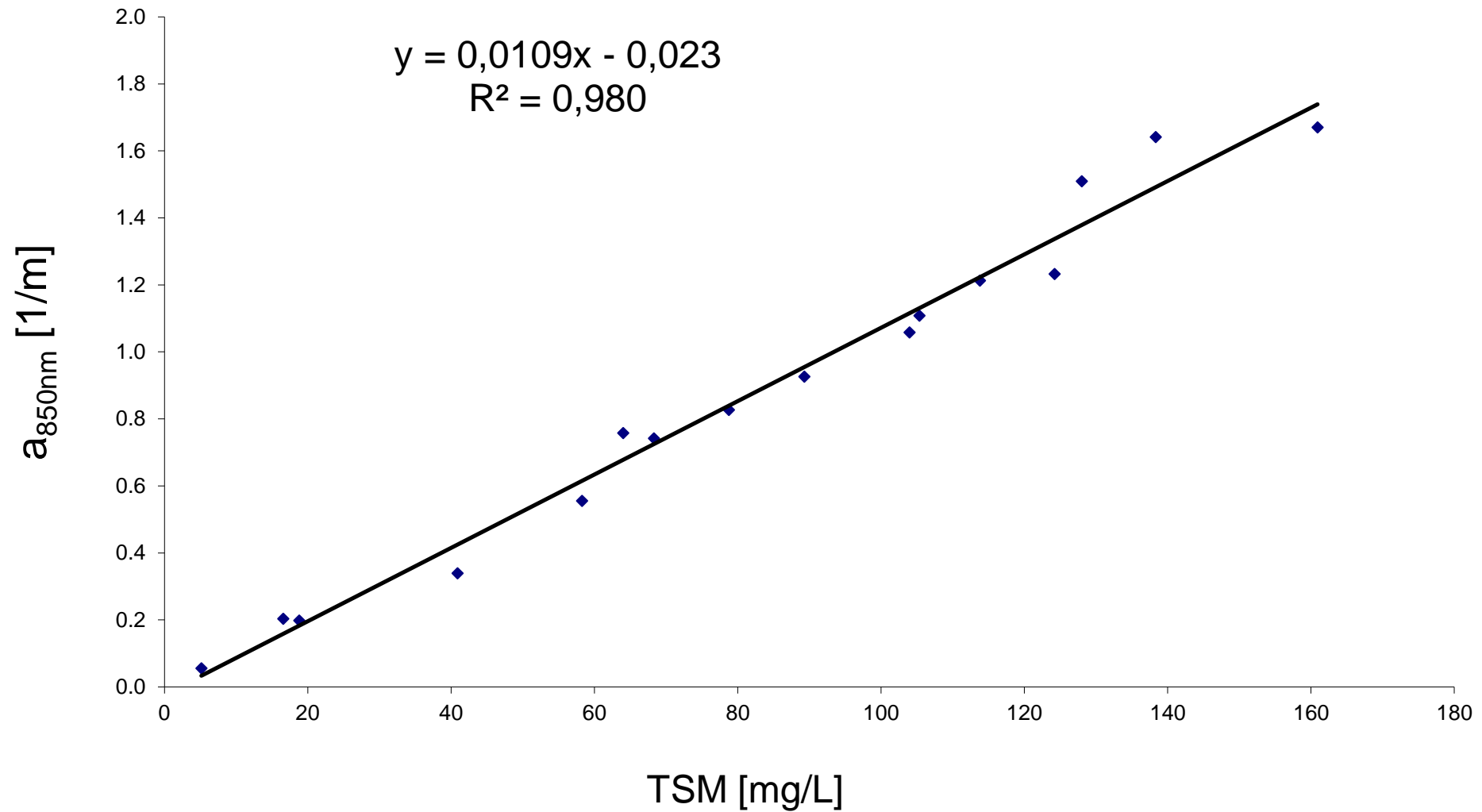
- what are the dominating absorbing water constituents in turbid waters?
- how large is the absorption in the NIR/SWIR region?
- what absorbs light in the NIR/SWIR region?

# particulate absorption, $a_p$



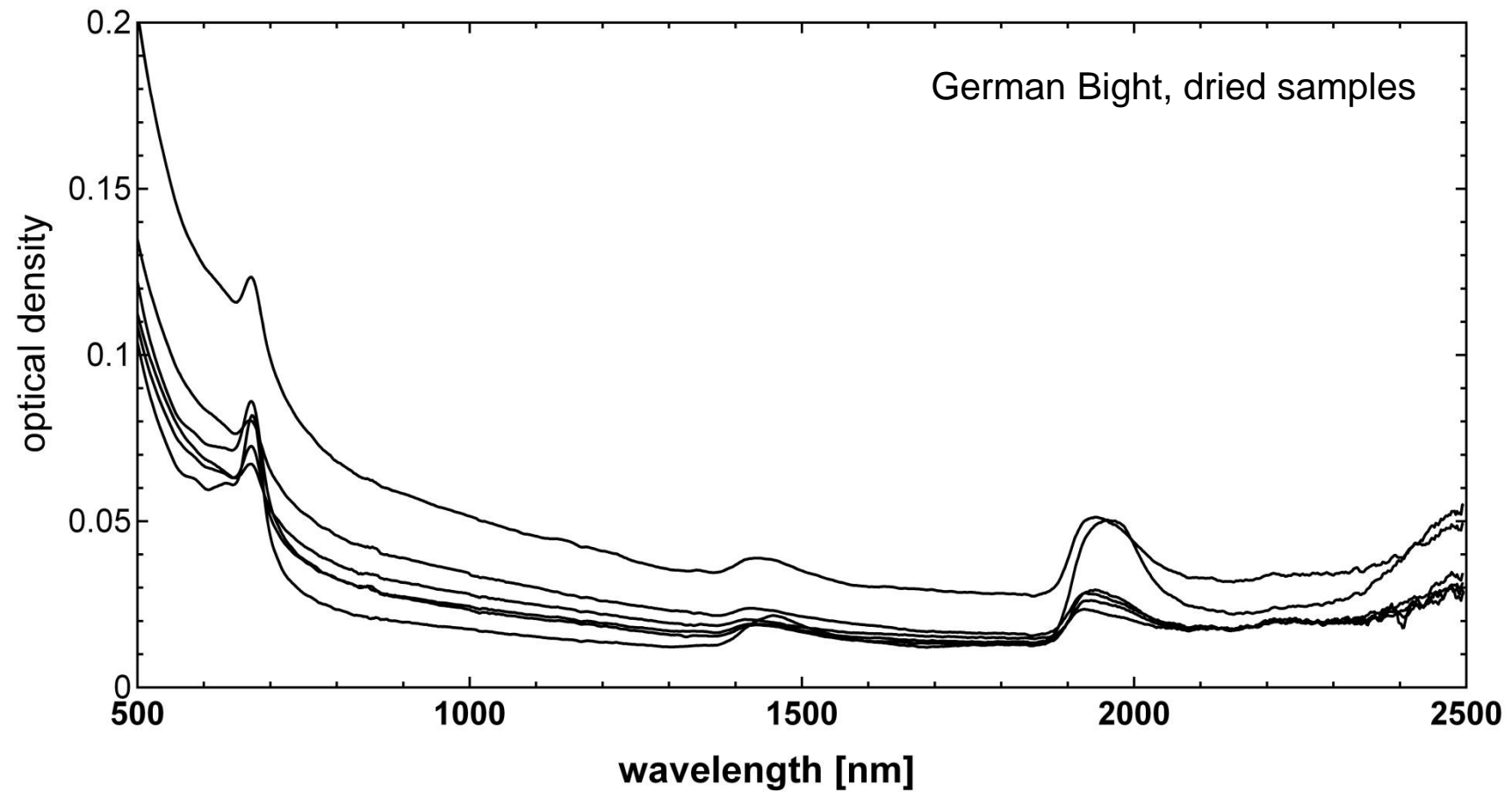
# bleached particulate absorption



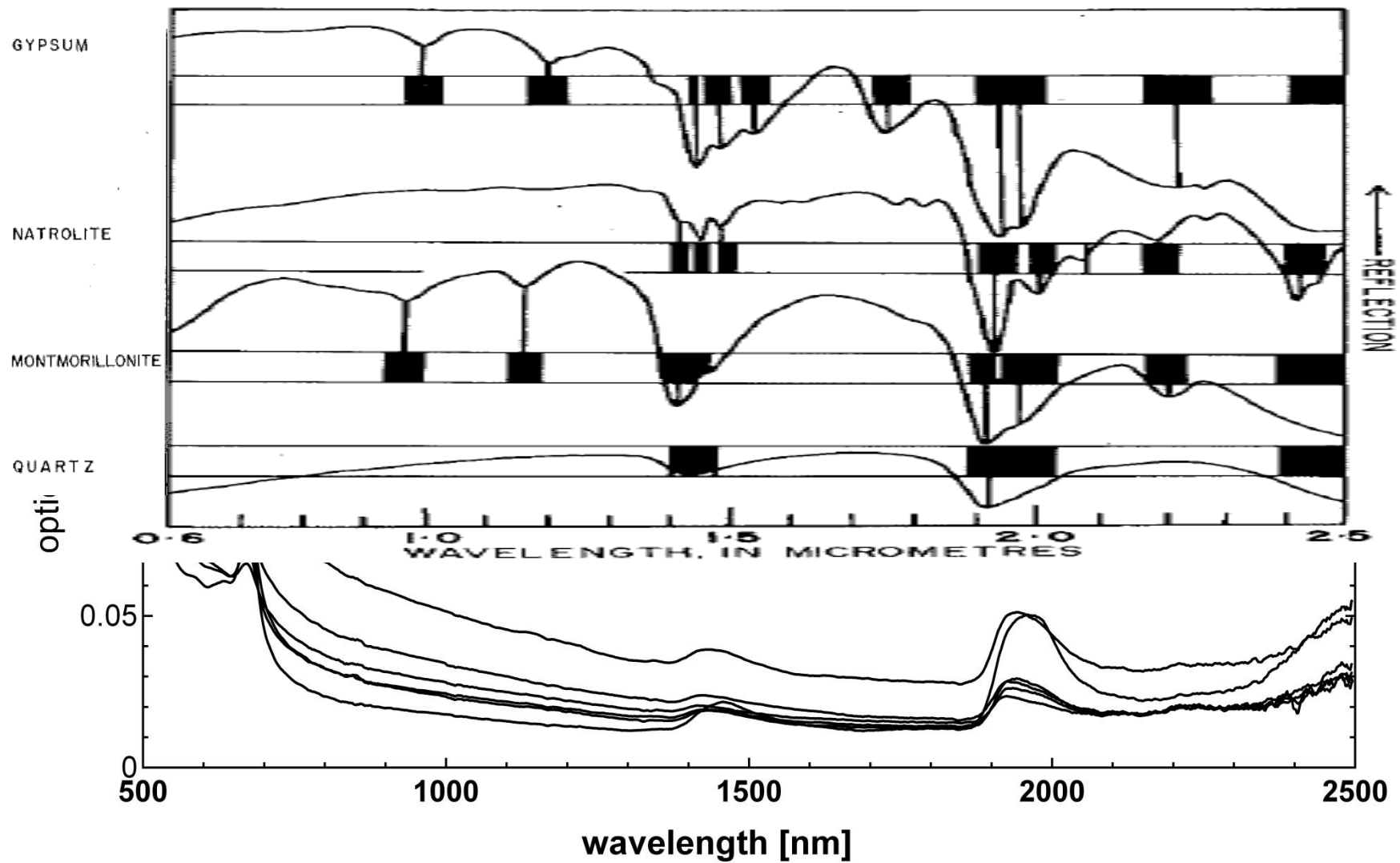


## Absorption of dried matter

To reduce influence by water absorption filter pad samples were dried at ca. 60 °C.

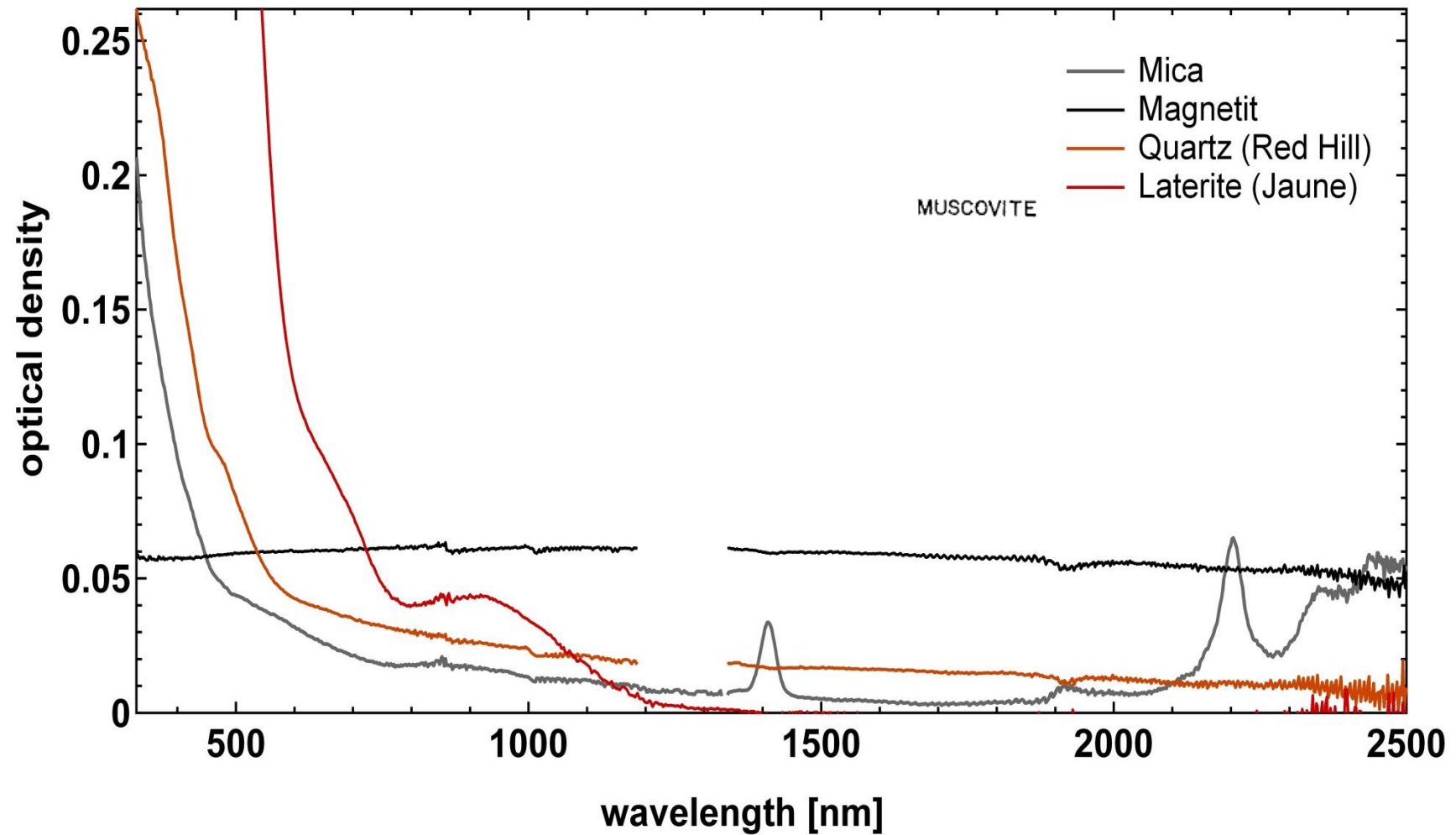


# Absorption of dried non-algal matter



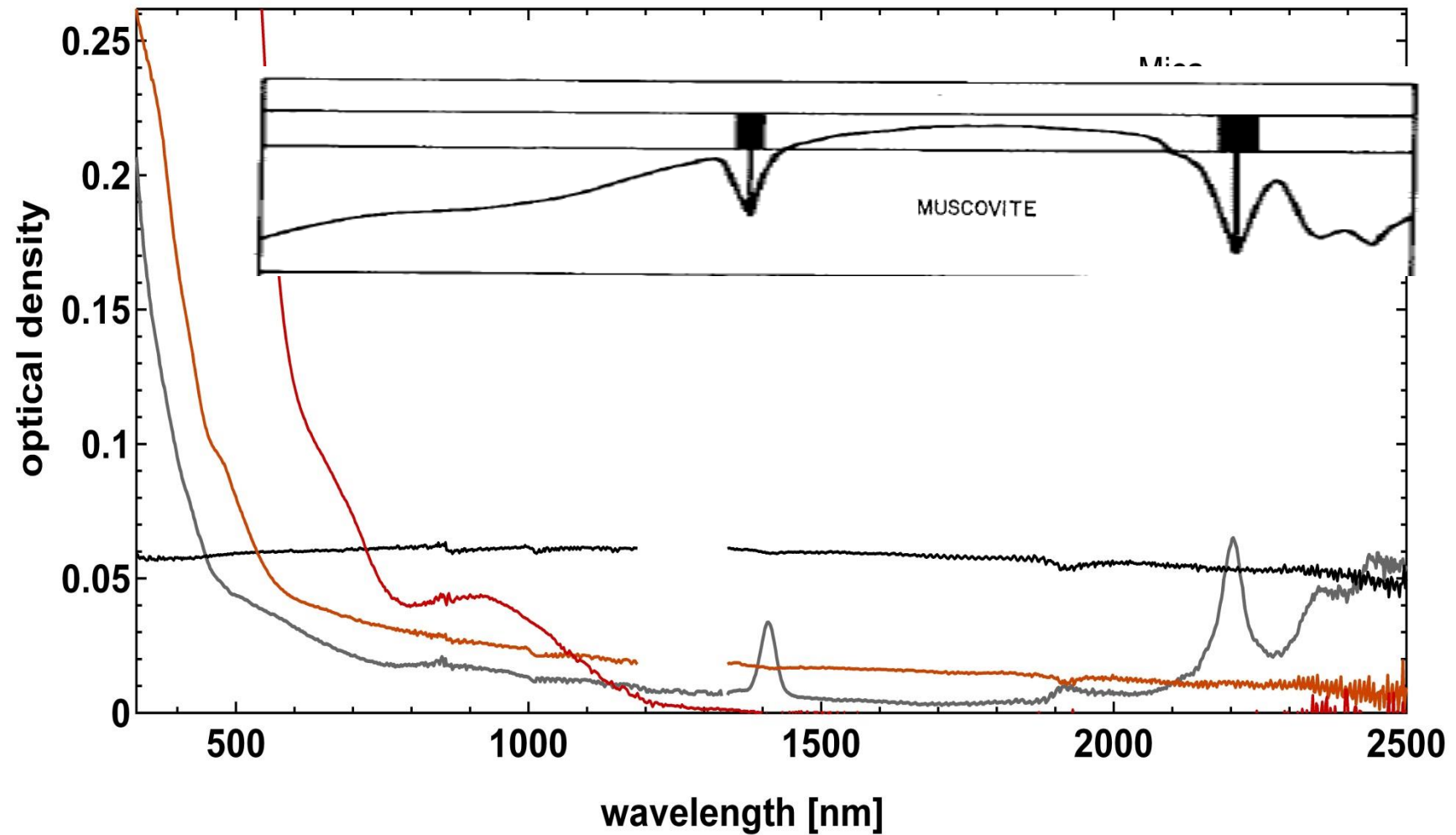
from Graham R. Hunt, 1977

# NIR/SWIR Absorption of Minerals



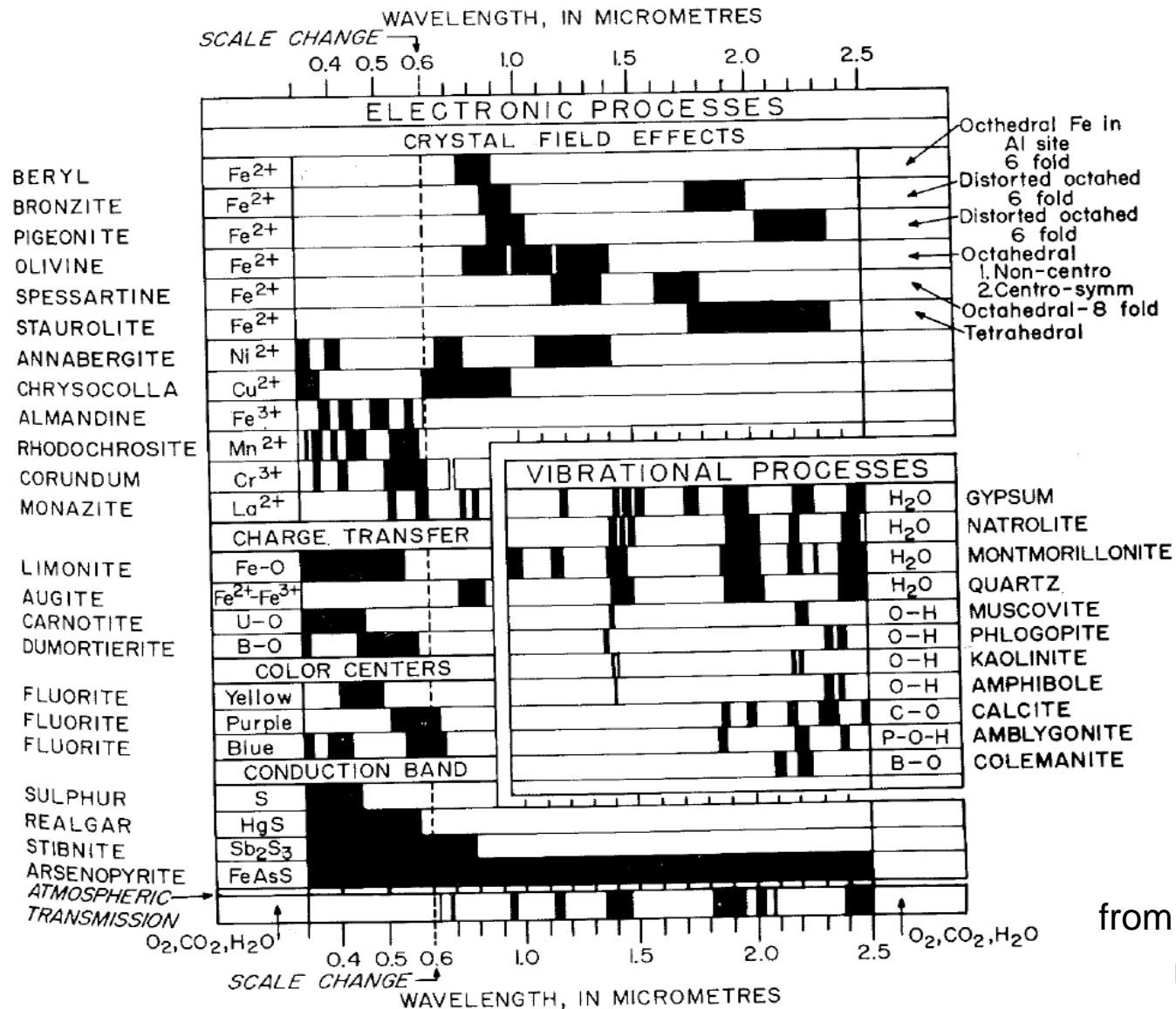


# NIR/SWIR Absorption of Minerals



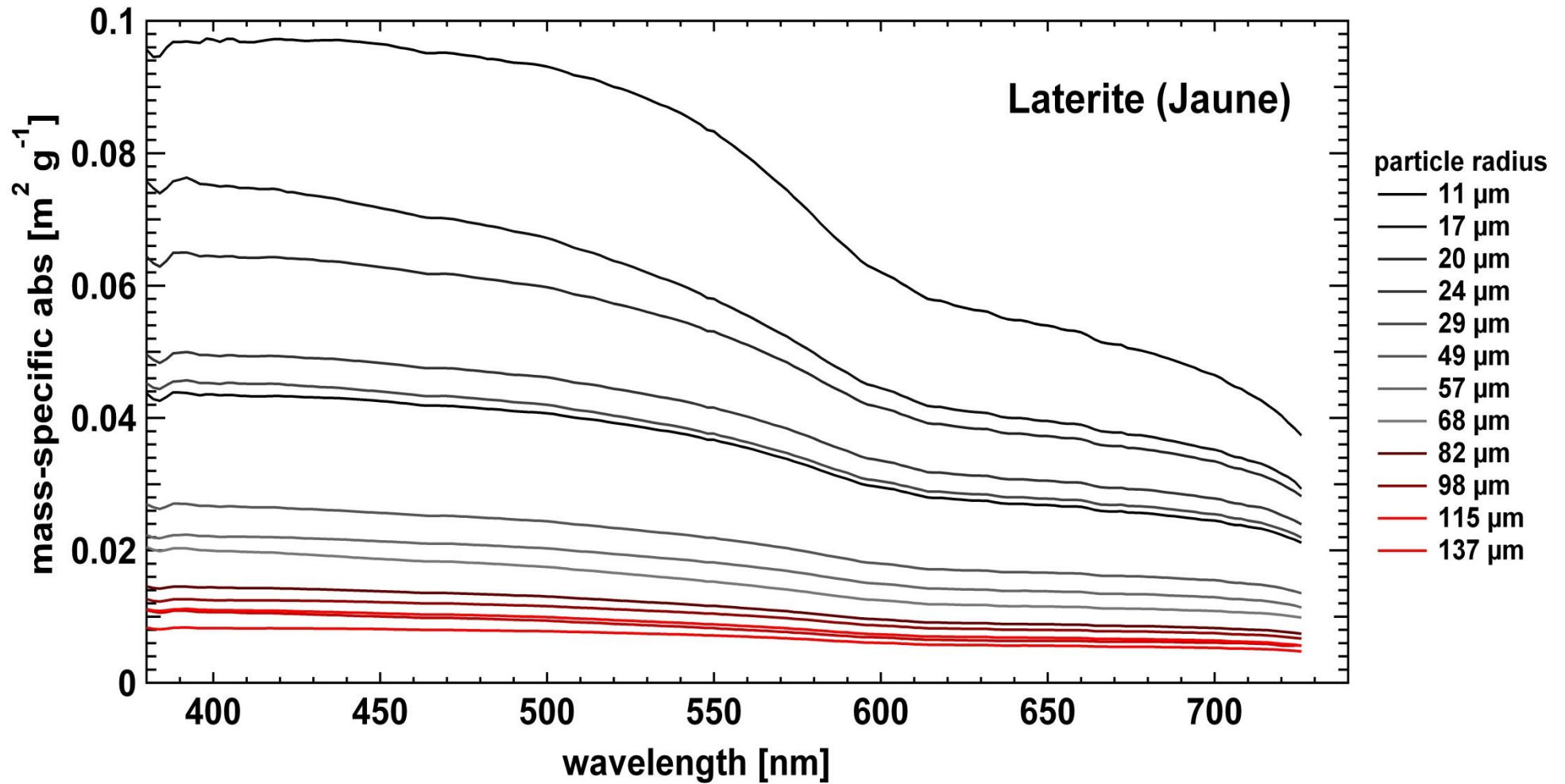
from Graham R. Hunt, 1977

# NIR/SWIR Absorption of Minerals

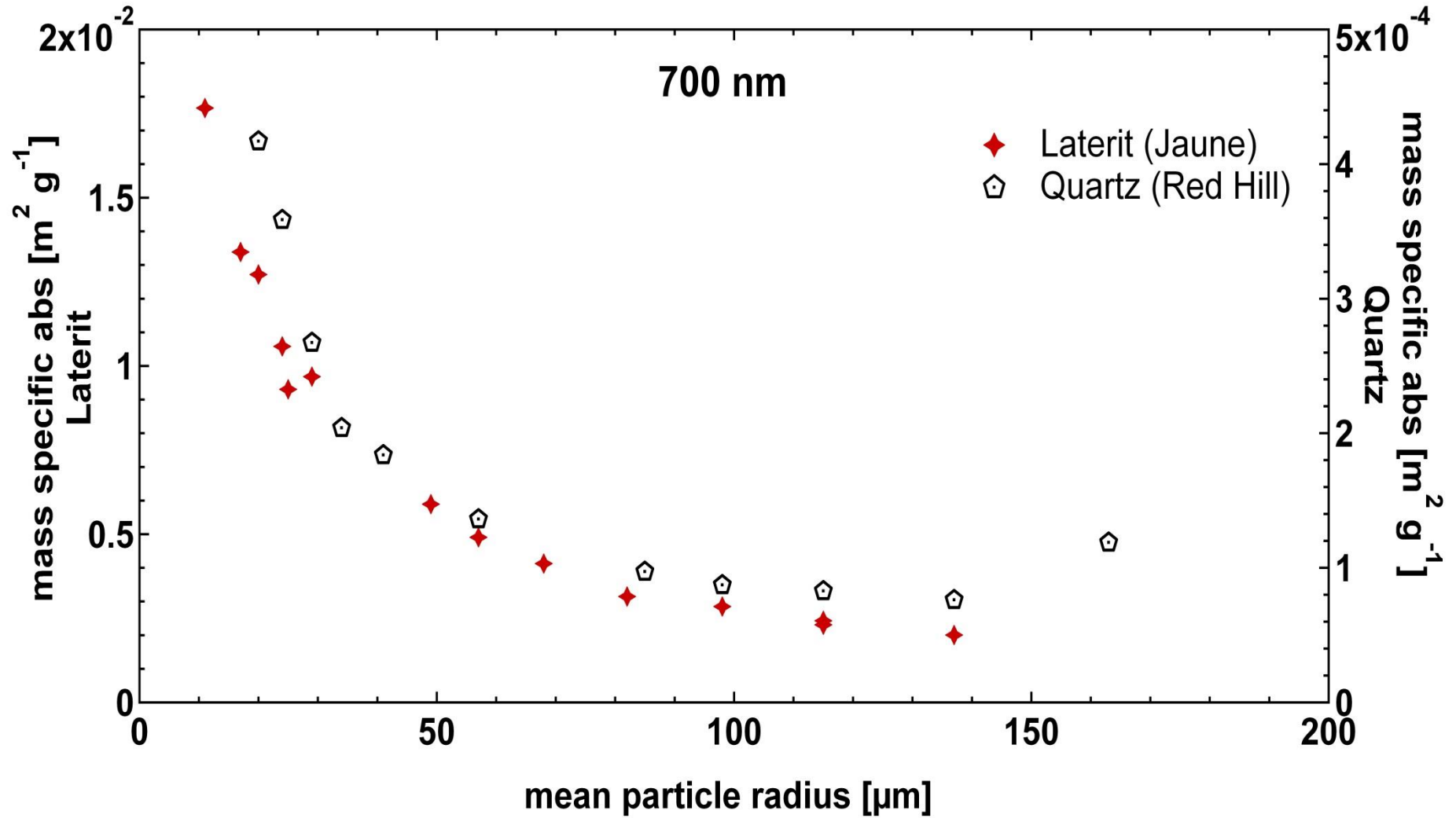


from Graham R. Hunt, 1977  
reflectance studies

## NIR/SWIR Absorption of Minerals vs. Particle Size



## NIR/SWIR Absorption of Minerals vs. Particle Size



## Summary / Conclusions

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- absorption in turbid water is dominated by non-algal matter
- NIR/SWIR absorption is substantial in natural samples,  $a_{800nm} > 1$  - 25 % of the  $a_{442nm}$  and can be measured exactly
- absorption in NIR/SWIR is dominated by minerals, mainly from water structures in the mineral
- absorption by organic detritus has still to be determined, as separation of inorganic and organic part remains difficult
- NIR/SWIR absorption might be used for identification of mineral types in suspended matter
- dependencies of absorption on particle size can be determined → imaginary part of the complex refractive index