

Sigrid Wuttke, 7 March 2006

Seminar in Ny Ålesund

Measurements of solar spectral UV irradiance

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Outline

- Goals of UV measurements at AWI
- AWI UV monitoring sites
- UV irradiance - definitions
- UV in 2005
- UV effects on algae
- Summary

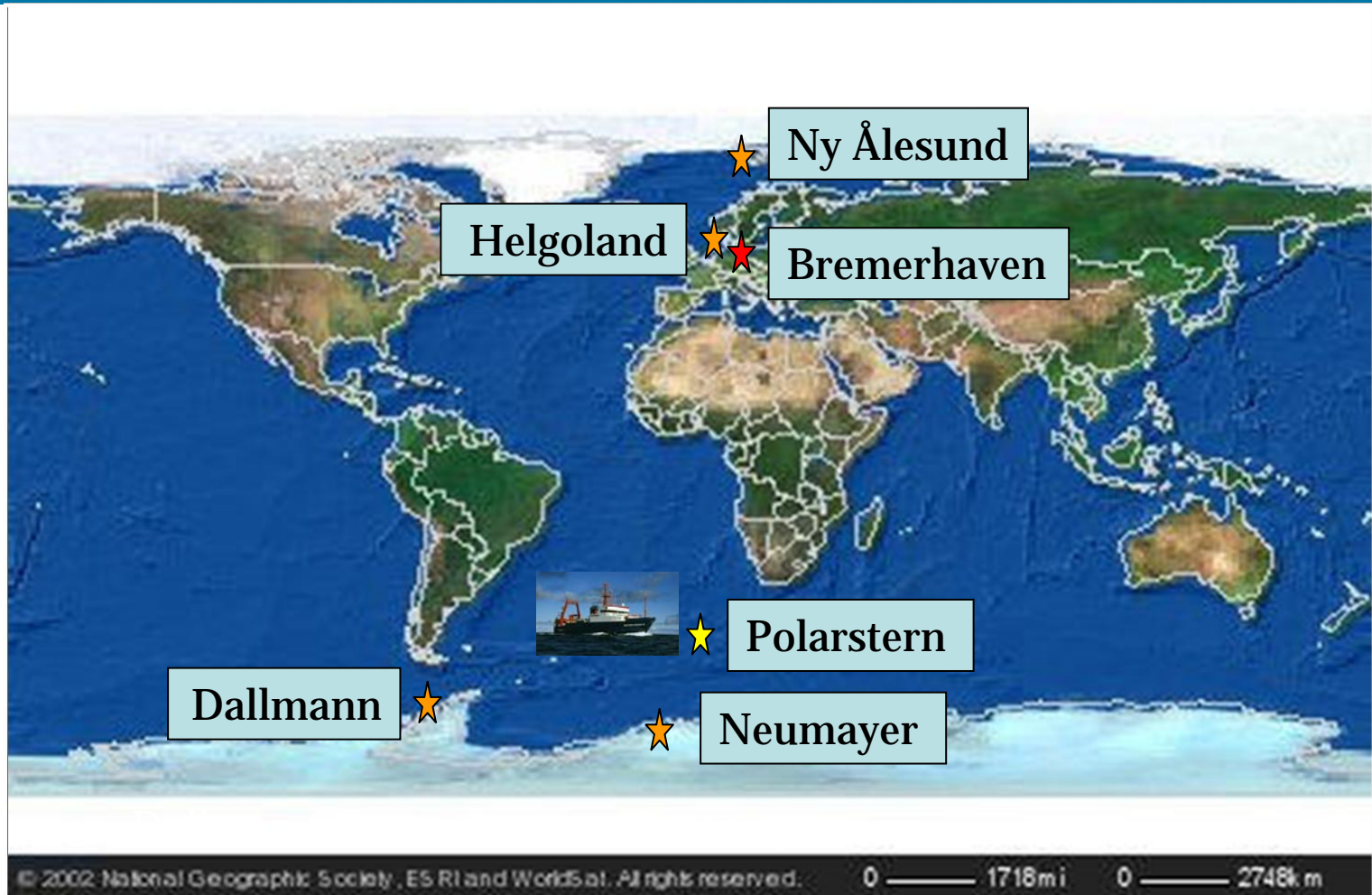


Goals of UV measurements at AWI

- Atmosphere
 - Monitoring of UV irradiance to detect long-term trends
 - Achieving instrumental requirements of the Network for the Detection of Atmospheric Composition Change (NDACC, formerly NDSC)
 - Comparison of radiation conditions in northern and southern polar regions
- Biology
 - Investigating effects of changing UV irradiance on aquatic eco systems



UV Measurements at AWI

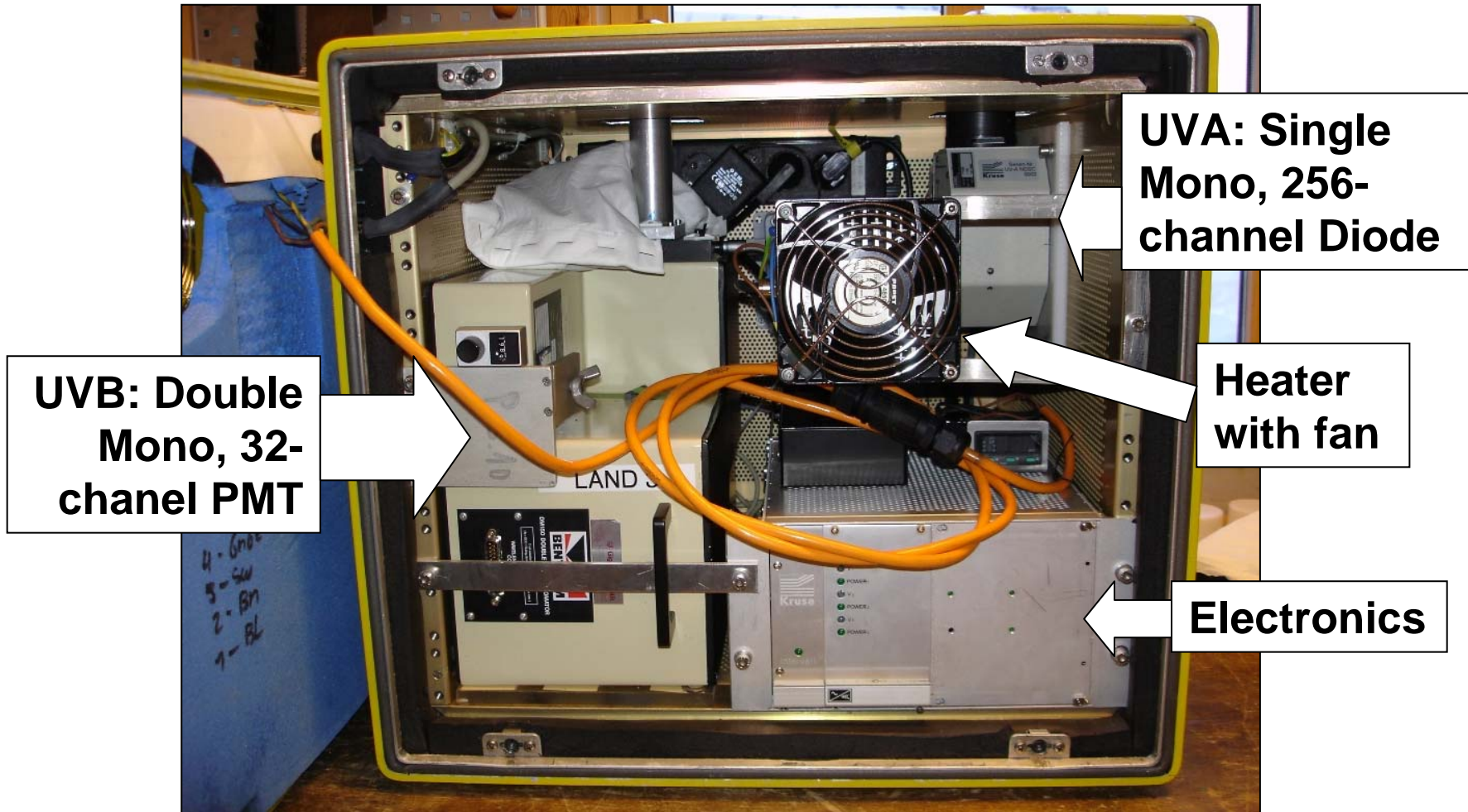


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Setting up the spectroradiometer



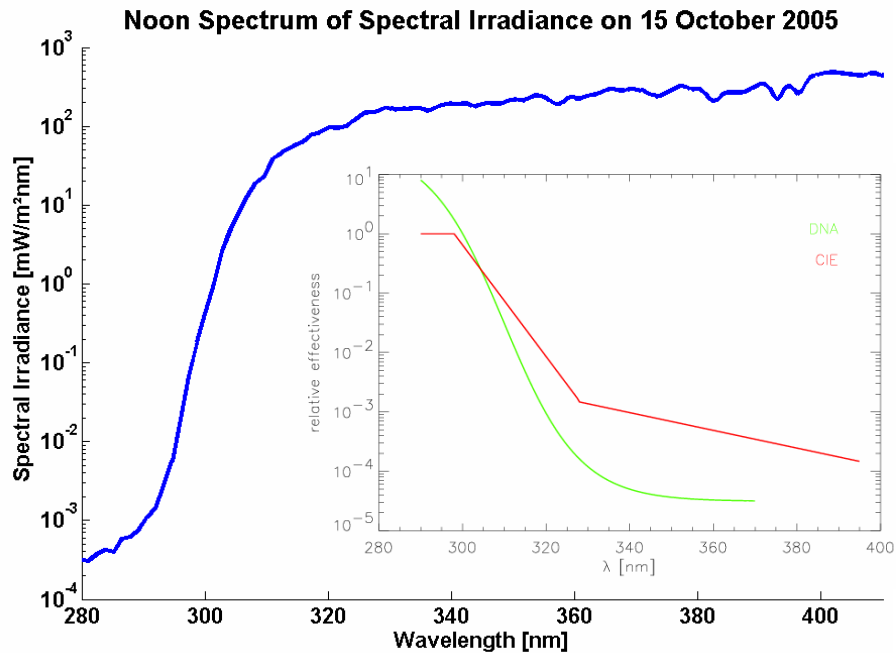
Inside the yellow box



Definitions

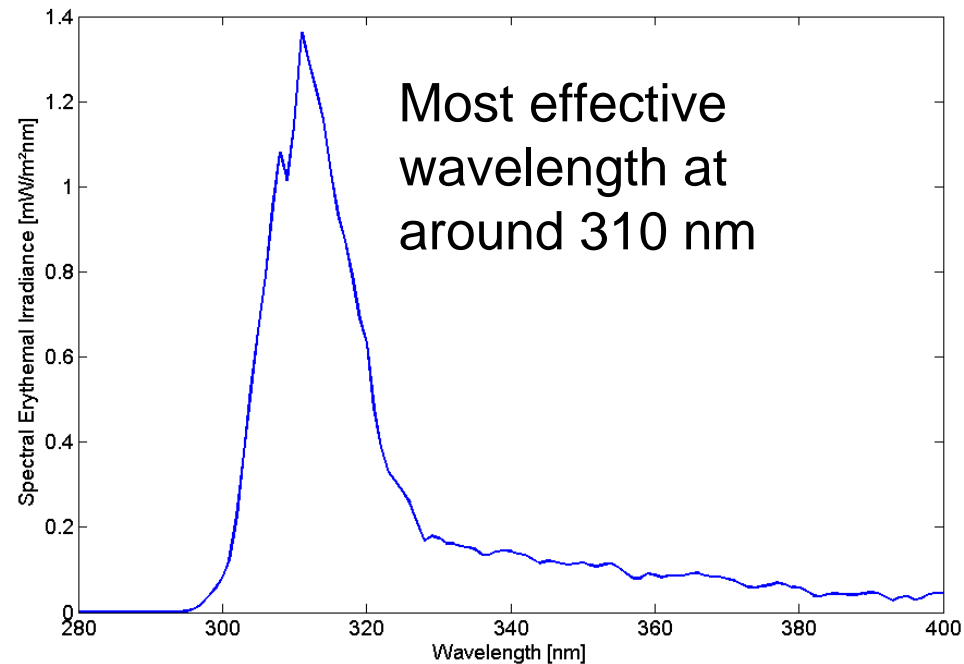
Spectral UV irradiance

$$E_{\lambda} = \frac{d\phi}{dA d\lambda} \left[\frac{W}{m^2 nm} \right]$$

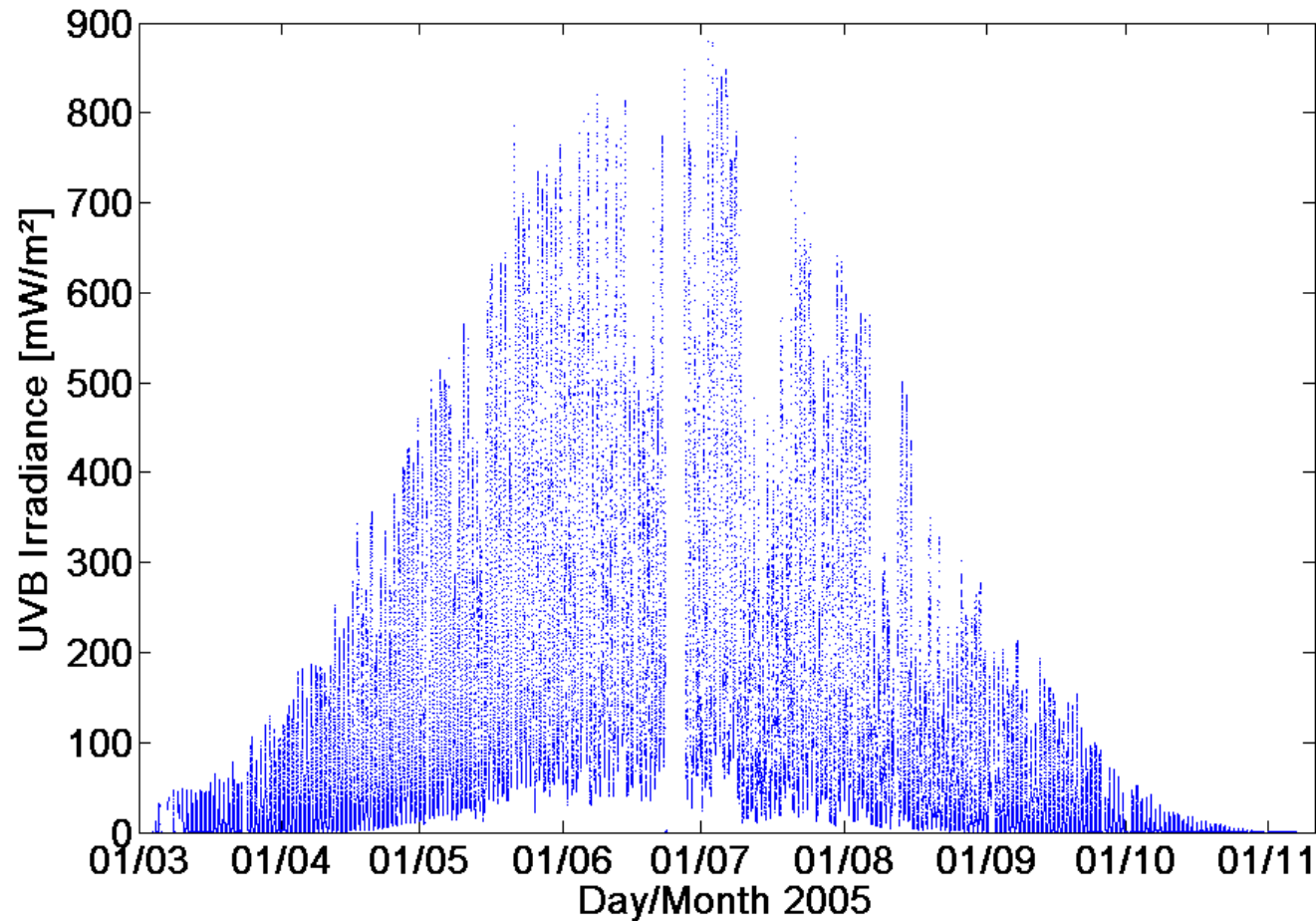


Biologically effective Irradiance

$$E_{bio} = \int_{280}^{400} E_{\lambda} \cdot W_{\lambda} d\lambda$$



Yearly Cycle of Irradiance in 2005



Data already corrected for:

- Timing errors
- Stability changes
- Wavelength changes

Corrections that still need to be applied:

- Deviation from the ideal cosine response
- Stray light correction



UV Effects on Algae - *Laminaria digitata*

Natural light exposition:

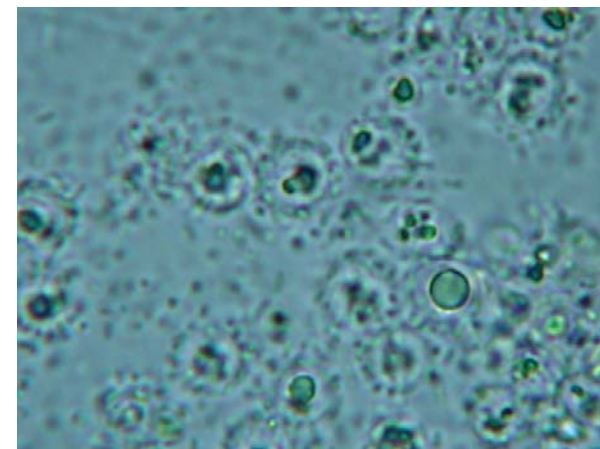
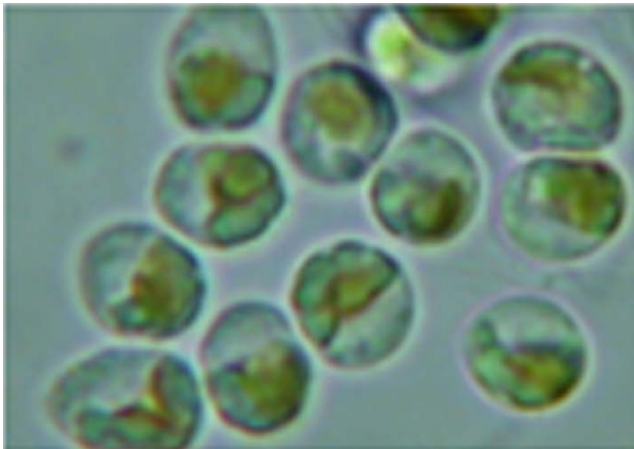
Spores of algae are healthy

Enhanced visible light:

Spores show deficient development

Enhanced UV and visible light:

Spores can hardly be recognised, became completely infertile



UV effects on algae - Results

- UV is harmful to photosynthesis (plants) and DNA (all organisms)
- Plants: Defects can often be repaired or avoided by development of protecting pigments
- Humans: Use of sun screen lotion

- Can changes in the eco system be attributed to changes in incident UV radiation?



Possible future tasks

- Comparison of AWI and NP UV spectroradiometer to assure data quality?
- Development of new spectroradiometer complying with the standards of the NDACC
- Development of an under water spectroradiometer for biological applications



