

Working Group 3

Requirements for biological UV effects

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Tasks following the MoU:

- 1. Collection of action spectra for photobiological effects induced by UV radiation and selection of representative action spectra.**
- 2. Derivation of requirements for ancillary data collection, reconstruction, climatology and trend analysis.**
- 3. Recommendation of biological action spectra, time resolution and other requirements for UV modelling.**
- 4. Dissemination of information on the biological importance of effective UV radiation and gained results to a broader audience.**

1. Collection of Actionspectra:

1.1 Collection:

>400 AS collected

1.2 Questionnaire: Which Action spectra are applied?

Austria, Cyprus, Estonia, Germany, IT, Poland,
Slovakia, Spain, Sweden, Switzerland,..

-> 15 different AS

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1.2 Which Action spectra are applied?

EFFECT	Action Spectrum	Accomp. Measurements	Accomp. Modelling	Ident.
Photoconjunctivitis, Photokeratitis	CIE 1986a CIE1986b	Licor 1800 Macam spectroradiometer		Spain1 Spain1
Skin Lipid peroxidation	Morliere et al. 1995			Spain1
Skin elastosis	Wulf et al, 1989			Spain1
Photoisomerization	Gibbs et al. 1993			Spain1
Photoimmunosuppression	de Fabo et al. 1990			Spain1
Erythema	CIE 1987	SpectrAIR Portable UV-VIS, Spectroradiometer Brewer MKIV Brewer MK III, UV-MFR-4, MFR-7, TSI-440 RT, Yankee Model UVB-1 Kipp & Zonen , CUVB1 Solar Light Model 501 Solar Light Model 501, Eldonetmeter Solar Light Model 501, Brewer +other rad. Instr. UV-B 306nm,UV-A 320 390 nm,UV-B 280-315 nm Yankee UVB-1, Bentham DMc150	STAR model discrete ordinate Meloni et al. 2003. TUV, Madoonich 1993 libRadtran Improved Diffey, Schmalwieser et al 2002 STRÅNG-system Landelius et al. 2001 Schothorst model Vishvakarman et al. (2003) Neural Network P+P in press	Italy1 Italy2 Italy 3 Cyprus1 Cyprus2 Austria1 Austria2 Nor.1 Est. 1 CH1 Spain2
Erythema	Mc Kinlay& Diffey, 1987	Solar Light model 501A, Yankee Env. Syst. UV	radiometer Statistical, RT TUV model Pribulova 2001,	Slowa1
Human skin cancer	de Gruijl et al. 2003		Schothorst model Vishvakarman et al. (2003)	CH1
Photosynthesis	Caldwell 1971 IL1400 SED 240/UV-B1/W		UV-B _{BE} according to Caldwell 1971	Poland2
Induction of flavonoid synthesis in higher plants	Caldwell MM et al. 1983	Kipp & Zonen broad band sensors (UV-A and UV-B)		Germ1
Vitamin D3	VioSpor device	Presentation on the Conference, Copenhagen, June 2004		Poland1
Vitmain D3	McLaughin et al,		improved Diffey, Schmalwieser et al. 2002	Austria2
Microbicidal	Önorm M5873-2	IL1700 + several SED240		Austria2

2. Derivation of requirements

2.1 Uncertainties from measurements, spatial and temporal variability of total ozone to erythemally effective irradiance at noon and daily dose (50°, 30°, 0°)

Presented: SPIE Conference Stockholm 2006, MCM 7

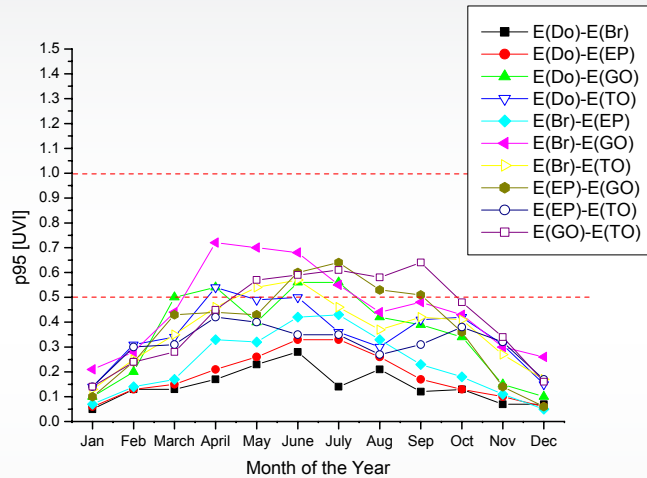
Published:

- Schmalwieser et al. 2007 Sensitivity of Erythemally Effective UV Irradiance and Daily Exposure to Uncertainties in Measured Total Ozone, Photochem.Photobiol. 83
- Schmalwieser et al. 2008 Sensitivity of UV Erythemally Effective Irradiance and Daily Dose to Spatial Variability in Total Ozone, Photochem. Photobiol. 84, 1149-63
- Schmalwieser et al. 2009 Sensitivity of Erythemally Effective UV Irradiance and Daily Exposure to Temporal Variability in Total Ozone, Photochem.Photobiol. 85

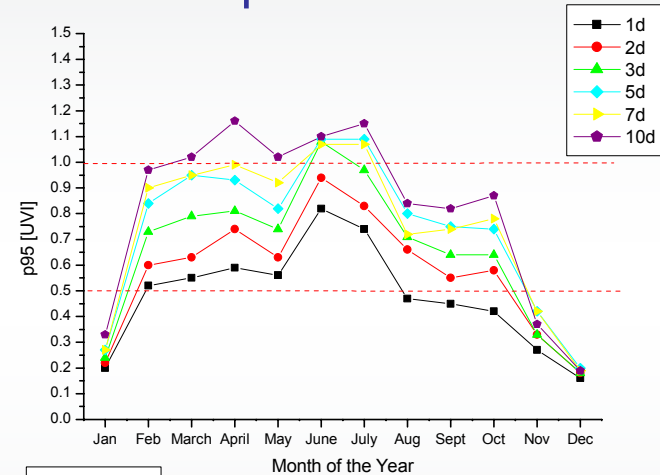
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50°N (Hradec Kralove):

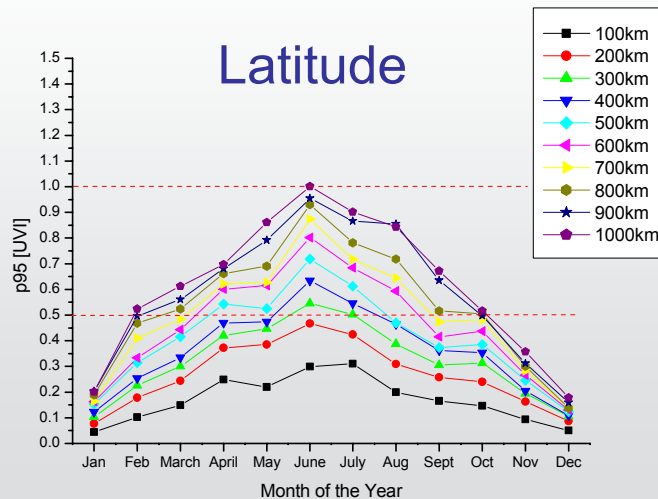
Measurements uncertainties



Temporal resolution



Latitude



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2.1 Uncertainties O_3

Measurements uncertainties O_3 :

independent of geograph. Position:

± 0.75 UVI, ± 5 UVIh, SPF ± 2 (ST 1,2) \rightarrow SPF+2

Spatial resolution (Lat./Long.) O_3 :

independent of geograph. Position:

p95(200km) ± 0.5 UVI

p95(700km) ± 1.0 UVI, ± 7.5 UVIh, ± 3 SPF₁₂

Altitude cor. (< 0.1 UVI und < 1.0 UVIh)

Temporal resolution O_3 :

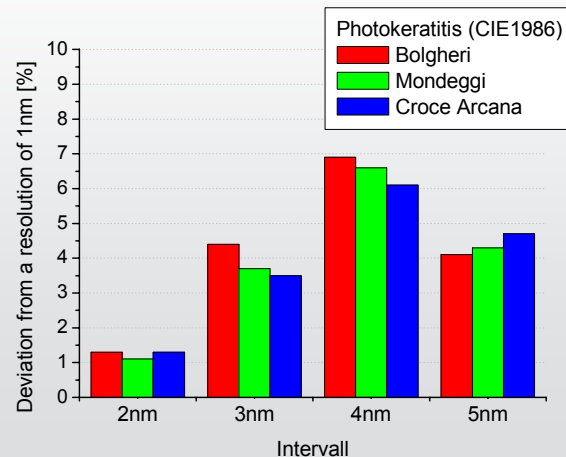
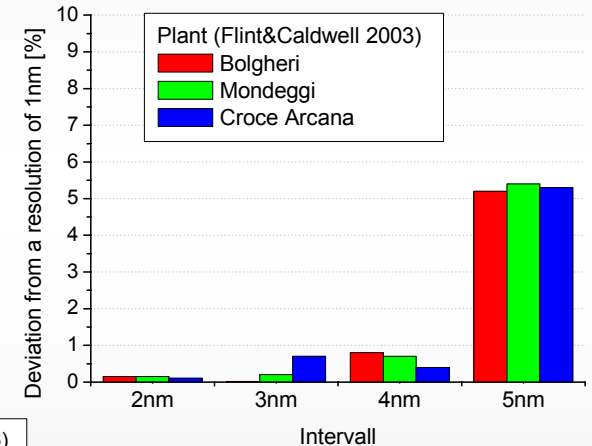
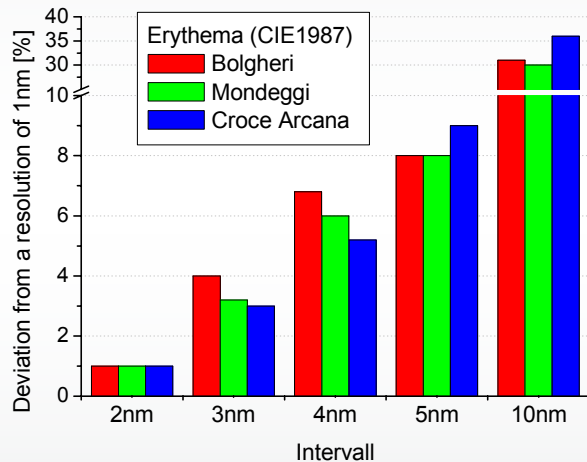
p95(1d) ± 0.5 UVI

p95(2-3d) ± 1.0 UVI, ± 7.5 UVIh, ± 3 SPF₁₂

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2.2 Influence of spectral resolution to biol. eff. irradiance,...)

Exercise: G. Zipoli et al. : GPD, keratitis, erythema, ...



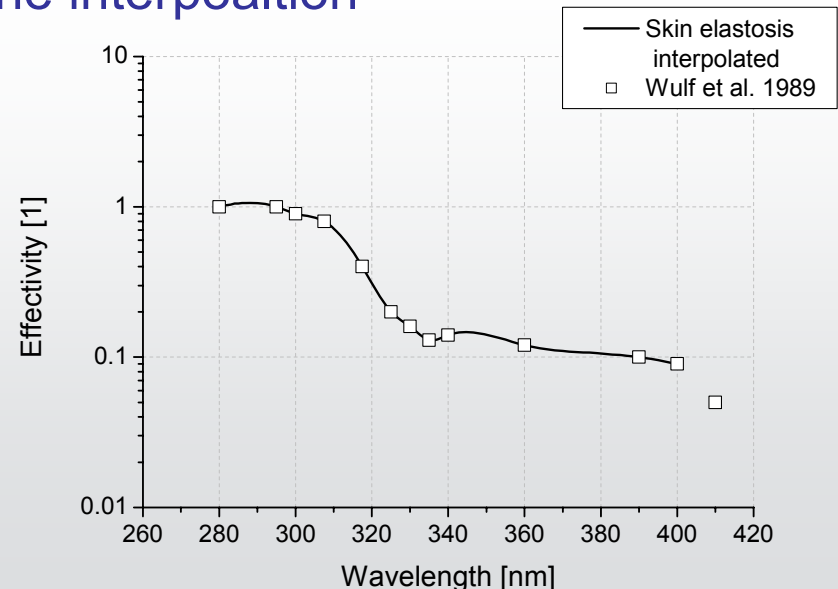
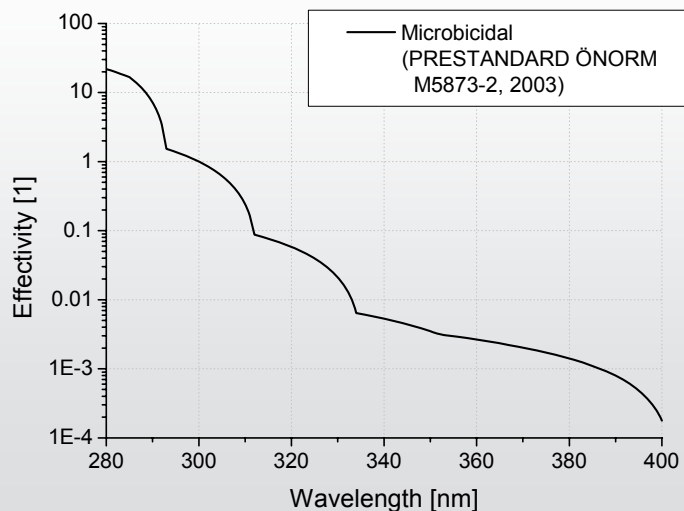
3. Recommendation of biological action spectra, and other requirements for UV modelling

3.1 Selection of AS: 16 (Questionnaire)

3.2 Preparation of Action Spectra for modelling

High Spectral resolution -> Interpolation

-> Logarithmic spline interpolation



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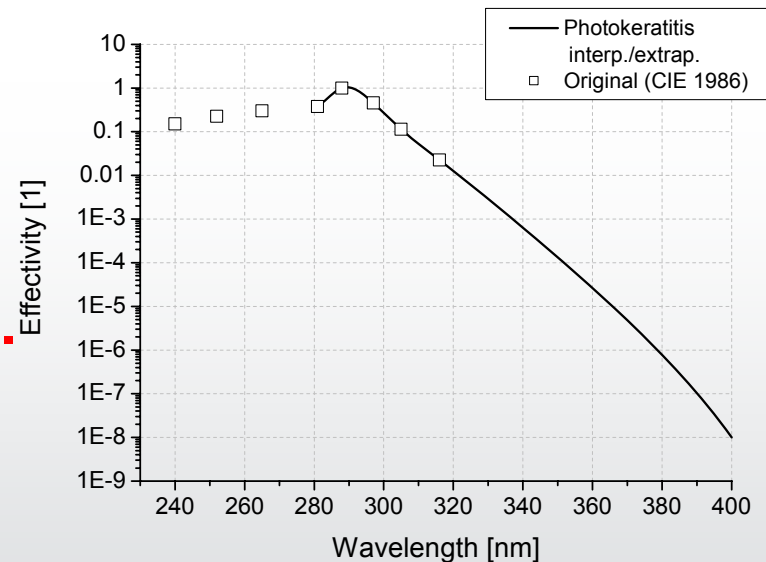
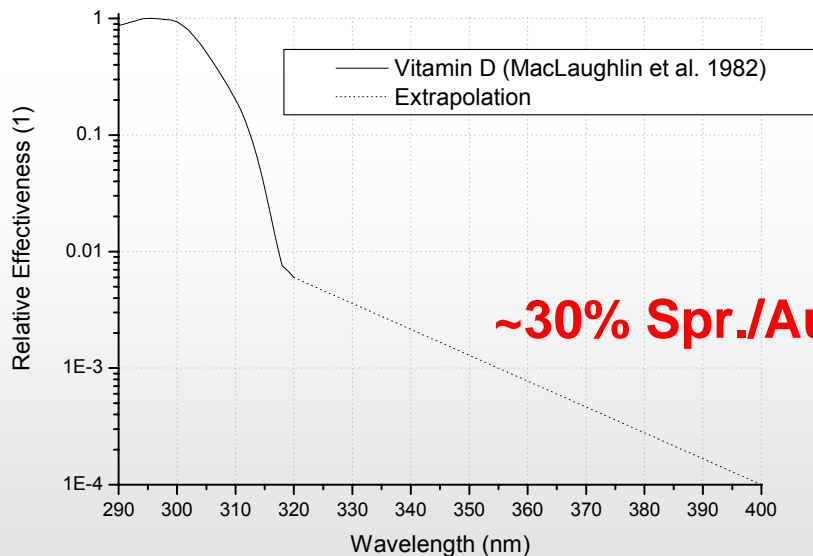
3.2 Preparation of Action Spectra for Modelling

Spectral range? -> Extrapolation

Used as published: accepting 0 (Vitamin D)

Extrapolation: Expanding the last slope

Effective Dose? (MED,...)



4. Dissemination of information on the biological importance of effective UV radiation and gained results to a broader audience

4.1 Web-page: www.cost726.org

4.2 Symposium at the Conference of the European Society of Phycobiology (Bath UK 2007)

4.3 Training School (Vienna, Oct. 2008)

4.4 Booklet

4.5 Electronic Atlas

WG3 - Requirements for biological UV effects

4.1 Web-page

THE CHALLENGE

Goals of COST 726, UV-Radiation, UV and Climatology

MEETING THE CHALLENGE

WG 1 (Data Collection): General, Activities, Members

WG2 (UV-Modelling): General, Accomp.Publications, Activities, Members

WG3 (Biol.Effectiveness): General, Accompanying Information, Activities, Members

WG4 (Quality Control): General, Activities, Members

PARTICIPANTS: Secretary and Chair, National Delegates, Experts

MEETINGS

S.T. SCIENTIFIC MISSIONS

4.1 Web-page:

OUTCOME

Minutes

Progress Reports

Publications

Public Information

Theses

Total Ozone Climatology over Europe

Training School

Broadband UV Monitoring in Europe

Action Spectra for Modelling

UV CMF Climatology over Europe

TOTAL CONTENT:

>2 GB: +190 htm, +440 pdf, +550 others, COST726 O₃-
database

4.2 Symposium at the Conference of the European Society of Photobiology Sept. 2007, Bath, UK

A reconstruction of the past UV climatology over Europe for photobiological Studies - Joint with the EU Programme COST 726

Chair: Gaetano Zipoli (Firenze, ITA)

9:45 (IL316): COST 726: Long term changes and climatology of UV radiation over Europe

Alois W. Schmalwieser (Vienna, AUT)

10:15 (IL317): Quality of UV measurements

Mario Blumthaler (Innsbruck, AUT)

10:45 (IL318): Modeling UV radiation in the past: achievements and limitations

Peter Koepke¹, Jean Verdebout² (1Munich, GER; 2Ispra, ITA)

11:15 (IL319): The role of action spectra in determining the biologically effective UV radiation

Gaetano Zipoli, Daniele Grifoni (Firenze, ITA)

11:45 (OC320): Exploring the details of UV irradiances, human exposure and dosimetry

Richard Kift, Liam McNulty, Lucy Bunhill, Marie Durkin, Donald Allan, Jacqueline Berry, Lesley E.

Rhodes, Ann R. Webb (Manchester, GBR)

12:00 (OC321): Reconstructed long-term erythemal irradiance over Europe from measurements of solar irradiance and total ozone

Andreas Kazantzidis¹, Alkiviadis Bais¹, Peter Den Outer², Harry Slaper², Tapani Koskela³, Uwe Feister⁴, M. Woldt⁴ (1Thessaloniki, GRE; 2Bilthoven, NED; 3Jokioinen, FIN; 4Lindenberg, GER)

12:15 (OC322): Photoprotection and skin cancer prevention in the Czech caucasian population

Michal Janouch, Karel Ettler (Hradec Kralove, CZE)

12:30 (OC323): UVBE maps for Poland – preliminary results for selected action spectra

Zenobia Litynska¹, Aleksander Curylo¹, Bozena Lapeta², Julita Byszczuk¹, Janusz Krzyscin³, Barbara Bogdanska³, Jakub Walawender² (1Legionowo, 2Krakow, 3Warsaw, POL)

4.3 Training School (Vienna, 6.-10. Oct. 2008)

Students:

20 students from COST726 countries

Teachers:

Measurements: A.Webb, M.Blumthaler

Modelling: P. Koepke

Biol.Effects: G. Zipoli, A.Schmalwieser, H.Maier*,

G.Schauberger*, A.Cabaj*

Summer School:

Theory + Exercises

All materials, lectures,.... via
web-page and *.zip from
www.cost726.org



4.4 Booklet: “UV RADIATION AND LIFE”

1. Introduction (Z. Litynska, A.W. Schmalwieser)
 2. Solar UV radiation (Z. Litynska)
 - 2.1. Factors influencing UV radiation (J. Krzyścin)
 - 2.2. UV measurements (J. Gröbner)
 - 2.3. UV modelling (P. Köpke)
 - 2.4. Geographical distribution and temporal variability of UV radiation in Europe (J. Verdebout, P. den Outer, J. Krzyścin)
 3. Biologically effective UV radiation (A.W. Schmalwieser)
 - 3.1. Biological effects of UV radiation on human body (K. Ettlner)
 - 3.2. UV radiation and Animals (A.W. Schmalwieser)
 - 3.3. Micro-organisms and UV radiation (A.W. Schmalwieser)
 - 3.4. UV radiation and Plants (G. Zipoli)
 - 3.5. UV and aquatic systems (A. W. Schmalwieser)
 4. Expectations for the future (Z. Litynska, A.Bais)
- Appendix A: Reference Institutions in the COST726 Countries (J. Biszczuk-Jakubowska)
- Appendix B: List of www pages with UV information (J. Biszczuk-J.)

4.5 Electronic Atlas

Electronic version of UV climatology

Data + Action Spectra + Easy2Use Interface

(M.Janouch et al.: ascii output+graphics)

640 GB (Apr.09) -> 8 GB (2DVD)

-> 1x1°, 1nm, ascii

4.6 Advertising/promoting !!!**COST726!!!** Results

-> + MCs + Experts

THANKS

