

Statens strålevern
Norwegian Radiation Protection Authority

Estimated UV doses to psoriasis patients during climate therapy at Gran Canaria in March 2006

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Background

- **About 2-3% of the Norwegian population has psoriasis**
(increased cell proliferation in epidermis - upper layer of skin)
(PASI=psoriasis area severity index)



Background

- **UV radiation has a positive effect on the lesions**
 - Local and systemic immune suppressive effect
 - Reduces cell proliferation
 - UVB decreases the production of pro-inflammatory cytokines by stimulated T cells

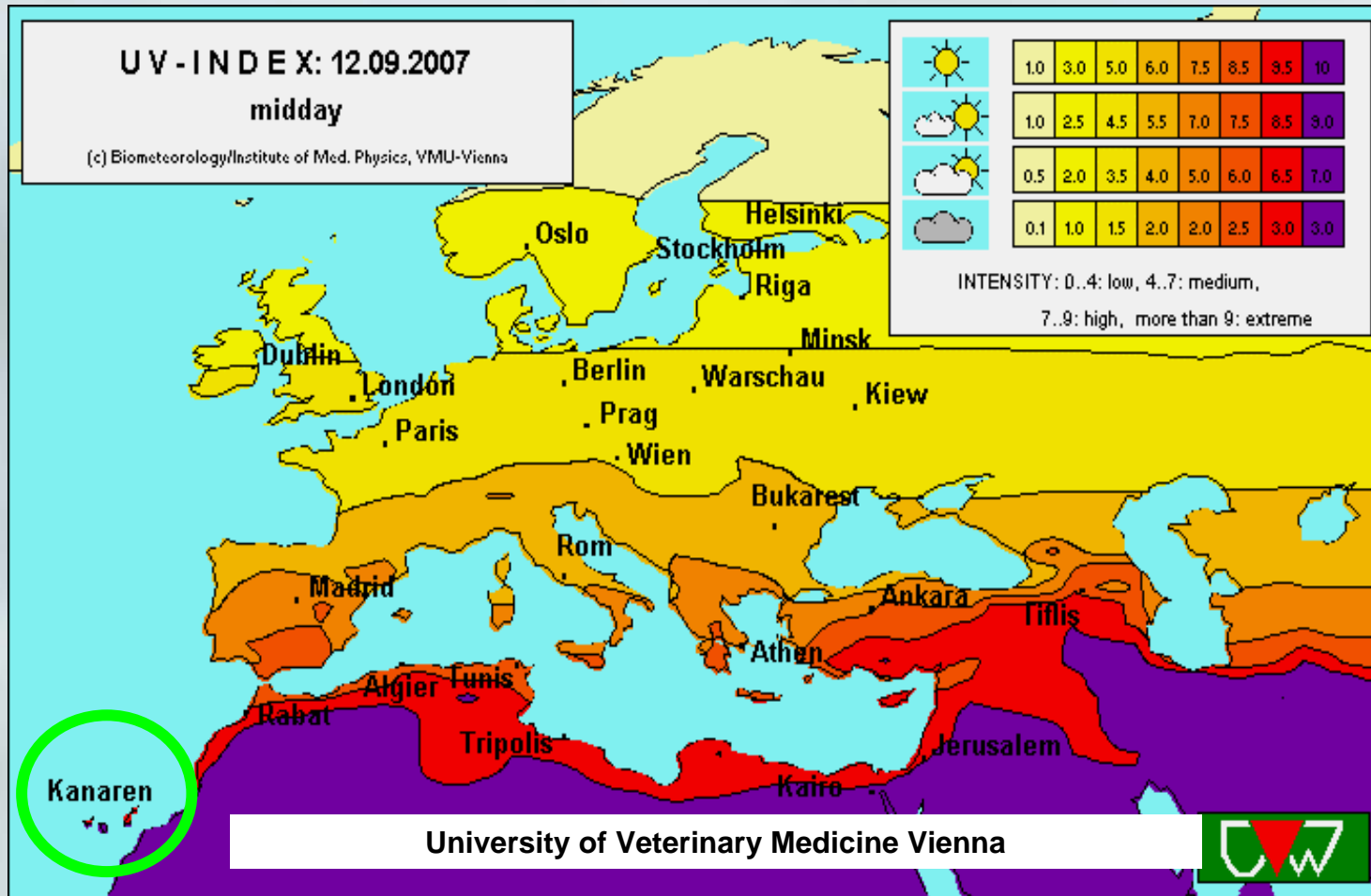
(H. Sigmundsdottir et. al. Arch Dermatol Res. 2005)



Background

- **Treatment:**
 - Localized medication (ointment)
 - Phototherapy: UVB, narrowband UVB, PUVA, intense sunlight = climate therapy (BUT not SUNBURN)
 - Systemic medication (pills, injections)

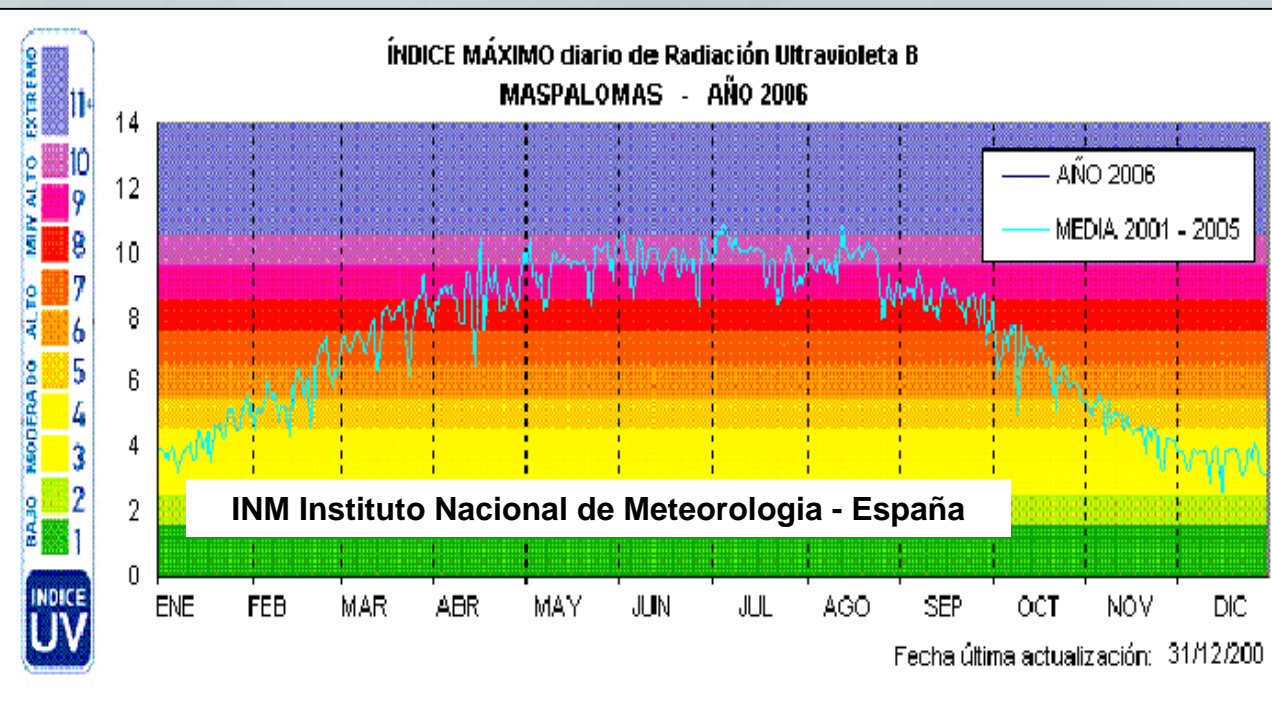




- Many patients are sent to Gran Canaria for intensive sun exposure (Climate therapy) through "Behandlungsreiser"
- 900 patients yearly from Norway, Sweden, Finland, Iceland
- Moderate to severe psoriasis
- 3 weeks: Sept. – June and 80-100 hours sun exposure
- Effect of treatment lasts for 4 months

Background

– purpose of climate therapy



- Improve psoriasis therapy outcome through natural UV exposure (+ salt water bathing and resting)
- Increase knowledge and insight into and how to manage the disease
- Increase knowledge on diet and physical activity
- Socialize with other psoriasis patients



Adverse effects

- **UV causes direct DNA damage in the skin cells with resulting increased skin cancer risk**
- **Increased skin cancer risk for the so called "climatologic" patients.**



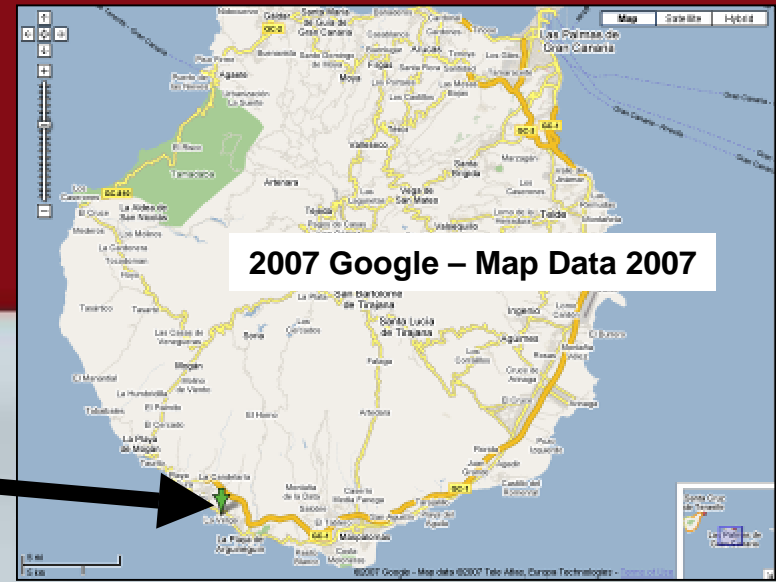
Aim of study

- **To increase knowledge about how the sun influences the immune system (local and systemic)**
 - To investigate how the sun influences production of vitamin D and how it affects the immune system of these patients
 - To achieve data on how much UVB and UVA each patient has received throughout the treatment period



Study design

- **Location: Valle Marina Treatment centre at Gran Canaria (27°N, 15°W)**
- **Period: 15-29 March 2006**



Study design

- **20 patients**
 - 18 skin type III, 2 skin type II
 - Moderate to severe psoriasis
 - Average PASI before treatment ca. 10
- **Blood tests and skin biopsies taken before sun exposure, after 1 day of exposure and after 15 days**
- **Analyzed regarding: Inflammatory markers, T cell profiles, vitamin D**
- **PASI assessed by dermatologists before and after 15 days**



Study design

- **Measured UV every hour from 9 to 17**
 - using broadband UVB and UVA plus narrowband 311 nm detectors
 - broadband CIE-weighted UVB and spectral UVA-detectors
- **Calibrated broadband CIE-weighted UVB and spectral UVA-detectors against spectroradiometer at Izaña, Tenerife, at the INM (Instituto Nacional de Meteorología España), by Alberto Redondas**



Photo: A. Redondas, INM



Therapy / exposure schedule

- **First day: controlled sun exposure**
 - 30 min front
 - 30 min back
 - 15 min of one side
 - 15 min other side
 - Without any sunscreen
 - Then: If desirable, free exposure/activity with standard sunscreen (SPF 25)
- **After first day:**
 - Free exposure – as much as possible, but acclimatization the first week
 - Only sunscreen outside lesions
- **Patient diary: time of exposure, use of sunscreen, ...**

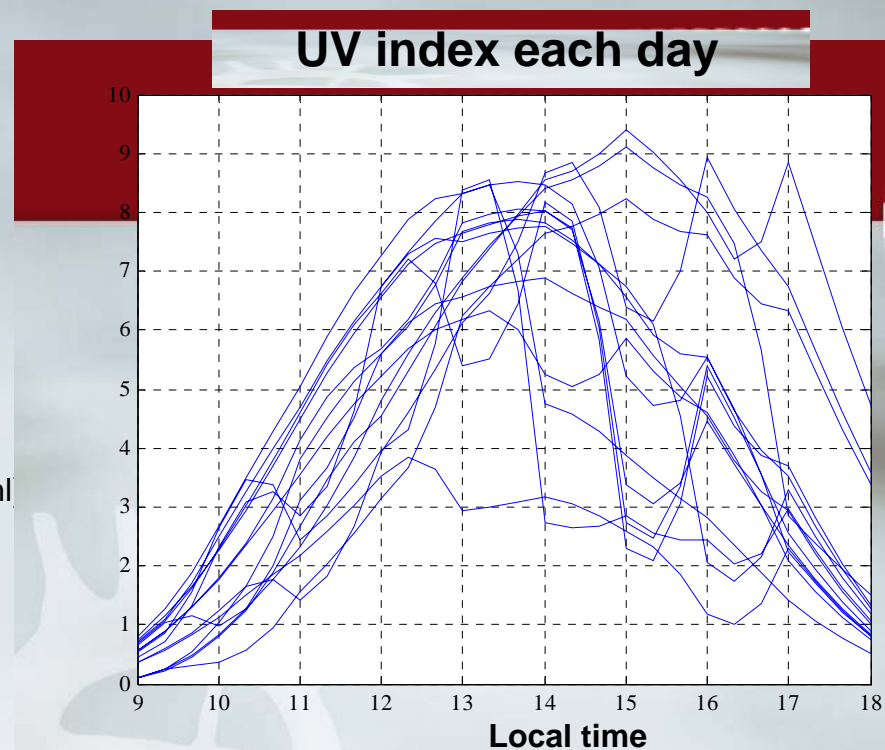


UV estimates

- **Using LibRadtran¹**
 - Ozone from TOMS²
 - Albedo 0.05
 - Correct for weather (+ aerosols, diff. in albedo from 0.05 etc) – using the UV measurements

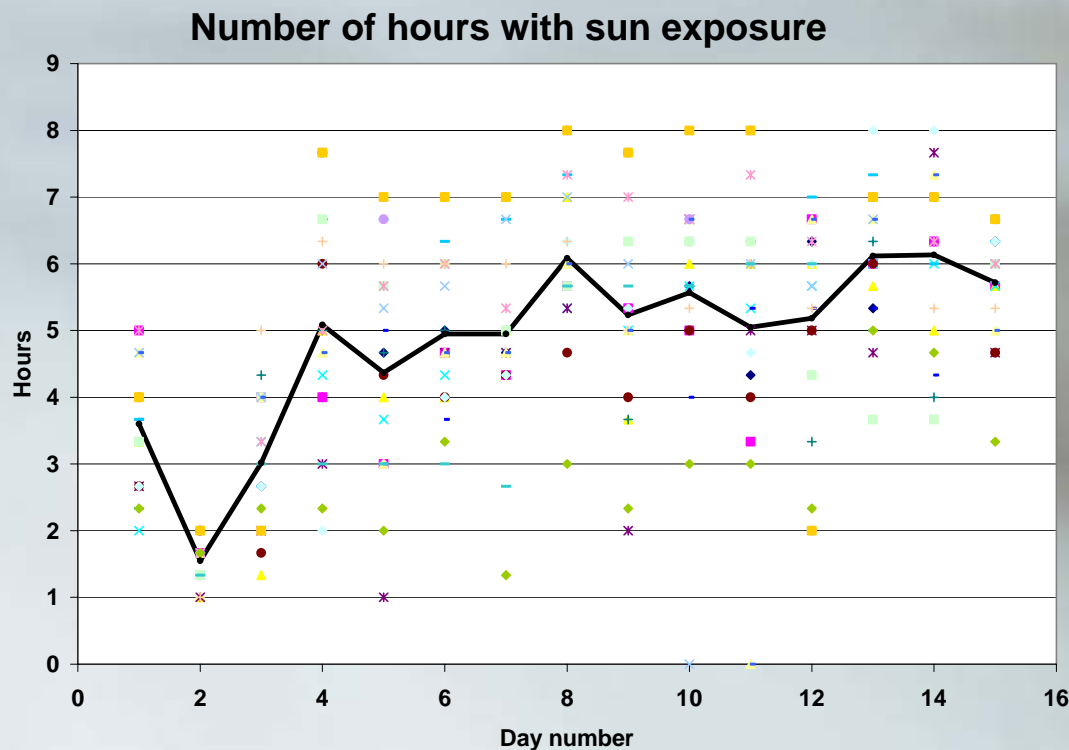
(1. Mayer & Kylling, Atmos Chem Phys 2005)

(2. http://toms.gsfc.nasa.gov/teacher/ozone_overhead_v8.html)



UV dose estimates

- CIE-weighted UVB
- Dose (SED)
(Standard Erythema Dose)
(1 SED = 100J/m² = 0.01J/cm²)
- All doses to psoriasis lesions and normal skin = dose to horizontal surface divided by 2

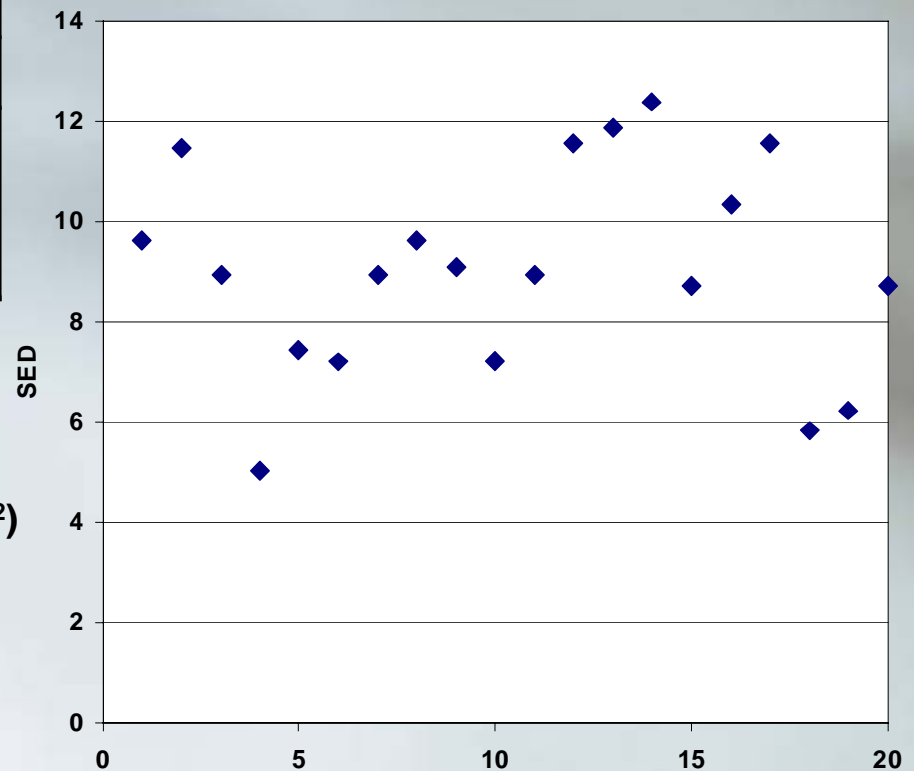


Day 1

Doses - DAY 1	Mean	Range
No. of hours sun exp.	3.6 h	2.0-5.0
CIE-weighted UVB	0.073 J/cm ² (730 J/m ²)	0.040-0.100
Dose (SED)	9.0 SED	5.0-12.4

Conventional broadband UVB treatment in clinic
- first CIE-weighted UVB-dose: 0.03 J/cm² (300 J/m²)

Number of SEDs at Day 1 for the 20 patients



Day 1 – Side effects

Sun exposure at Day 1:

- Mean value for all patients: 9.0 SEDs
- Without exposure with sun protection (SPF 25): 5.1 SEDs
- 14 of 20 patients reported erythema
- Minimal erythema for most white skin occurs at 3 SEDs (1-3 SEDs skin type I+II, 3-7 for III+IV)
- Moderate sunburn at 5-8 SEDs
- Painful, blistering sunburn at 10 SEDs (Harrison&Young, Methods 2002)



Full period - day 1-15

Doses - DAY 1-15	Mean	Range
No. of hours / sun exp.	72.6	42 – 91
CIE-weighted UVB	1.39 J/cm ²	0.88 - 1.72
Number of SED	170	107 – 210
PASI score	2 - 2.5	



But some exceptions



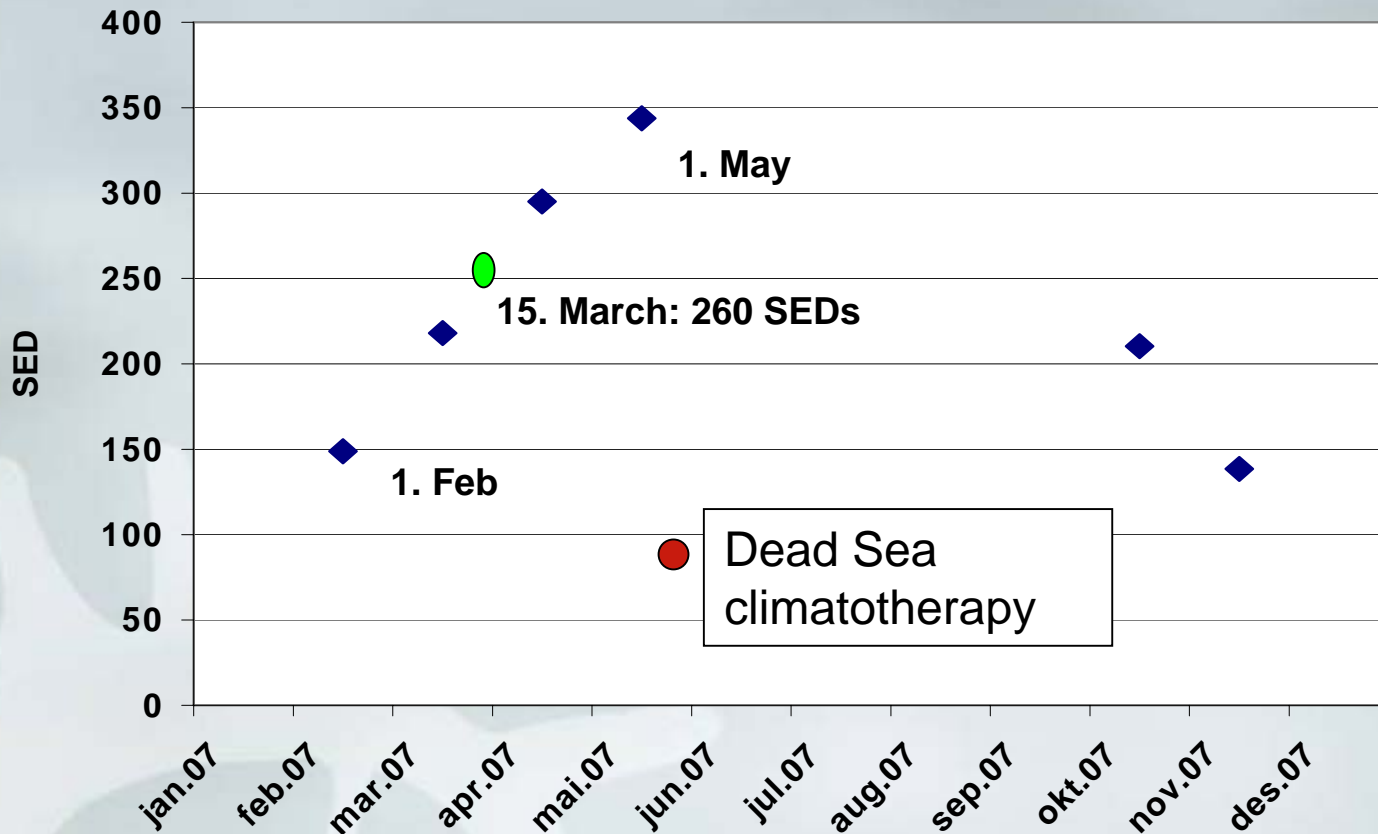
Regular climate therapy lasts for 3 weeks

- **Approx. 80-100 hours sun exp. independent of time of the year**
- **No significant difference in PASI reduction**



Regular climate therapy lasts for 3 weeks

Estimated SED for other periods of year



Acknowledgement

- **Behandlingsreiser!** **Behandlingsreiser** 
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- **Mr. Alberto Redondas, INM (Instituto Nacional de Meteorologia – España)**
- **Dr. Ola Engelsen, NILU**
- **Mr. Bjørn Johnsen, Mr. Tommy Aalerud, NRPA**

