UV irradiance maps to support skin cancer research and prevention

Introduction

Problem... Switzerland has the highest skin cancer rate in Europe: lack of public awareness about dangers of UV

Need... simple and clear representations of risk to support public health decision making

Need... Accurate data for individual & population risk for research

Solution: We developed UV-TAMER (Toolkit for Analysis and Maps of Exposure Risk), a software suite to address these needs.

Chronic exposure

- Long-term (i.e. chronic) exposure to UV is known to damage skin and cause basal cell carcinoma and squamous cell carcinoma (cancers)
- Maps of average UV irradiance show where chronic effects are greatest

Problem...

- Dataset not portable (336GB)

Solution...

- Take mean & standard deviation (SD) of each hour in each month for summary data files

UV-MM (Map Maker)

- Simple tool to view and compare data, find average irradiance patterns
- Option for user-defined units e.g. non-linear, piecewise etc.
- Can make many maps in one run animation option in development

Daily Dose

- Cumulative daily UV exposure is the best indicator for chronic effects

Problem... Some people work outdoors, some in offices etc.

Solution... How to account for different activities?

Solution... We developed an exposure schedule system

UV-CAT (Chronic Analysis Tool)

- Schedules can account for shade, skin colour, clothing, posture, sunscreen application...
- ... highly extendible
- Applicable for occupational cancer, health insurance, epidemiology, person use - are your habits risky?

Compare scenarios

- Work life in Lausanne (Jun)
- Skiing in Crans-Montana (Feb)
- Swimming at Saint-Sulipice (Jun)
- Swimming with skin type IV (vs I)

Determine chronic exposure risk

- Probability of acute events (>9)

Acute exposure

- Short-term high intensity UV exposure (i.e. acute) events are known to cause melanoma (cancer)

Problem...

- Need to determine probability of acute exposure

Solution...

- Construct UV histograms
- Generate summary data as above Histograms in place of mean, SD
- Obtain the probability of exceedance of a user-defined threshold
- Combine probability with population distribution e.g. residents, employees, specific occupations, etc.
- Multiply population by probability to give population risk
- Find regions with the most individual acute exposure events

π primary targets for public awareness

Conclusion

- UV-TAMER includes easy-to-use tools for assessing exposure danger
- Chronic and acute exposure risk of UV, pollutants, or other data...

- Simple representations of risk + accurate data for research
- Suitable for government, epidemiology, public use (web integration)